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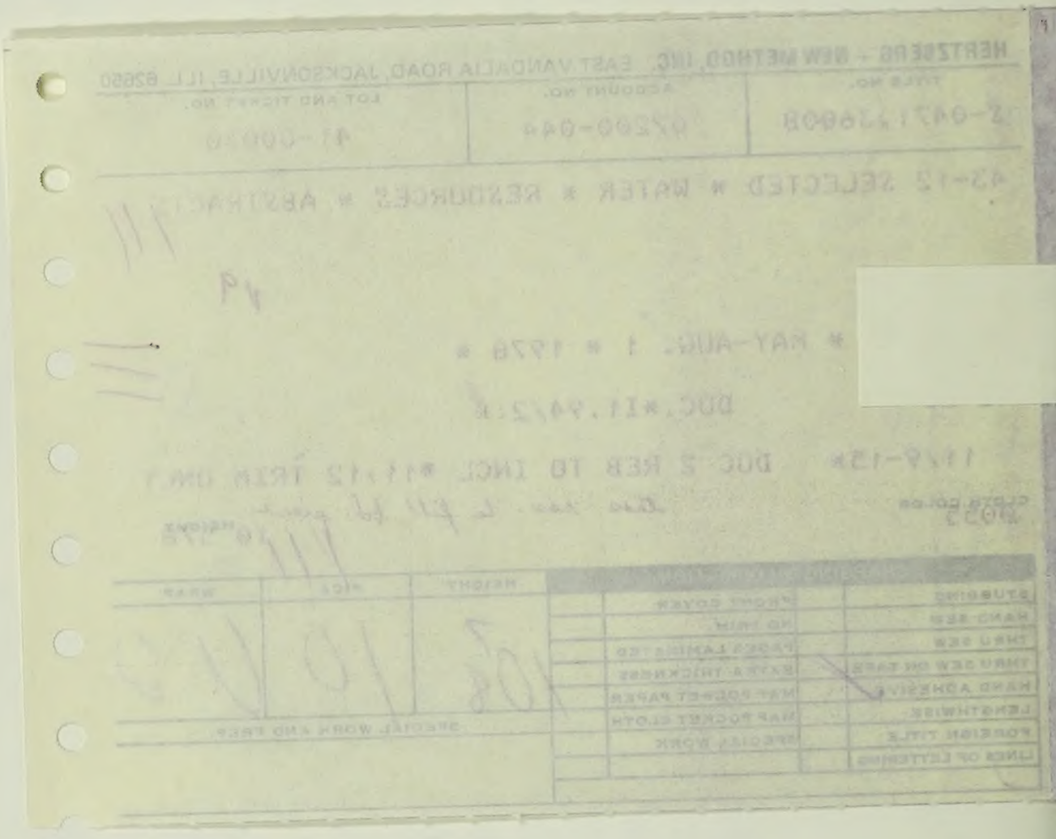

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SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

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Some documents abstracted in this journal can be purchased from NTIS. Price codes are given in the entries and a current code-price conversion table is attached to the outside back cover. Other documents are available from originating organizations or authors as indicated in the citation.

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 9
MAY 1, 1978

W78-03701 -- W78-04200

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL
Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION
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06 WATER RESOURCES PLANNING
Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development

07 RESOURCES DATA
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08 ENGINEERING WORKS
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09 MANPOWER, GRANTS, AND FACILITIES
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10 SCIENTIFIC AND TECHNICAL INFORMATION
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

DESIGN OF WATER RESOURCES PROJECTS WITH INADEQUATE DATA, VOLUME 2.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 4A.
W78-03783

WATER RESOURCES PROJECTS IN NIGERIA AND THE HYDROLOGICAL DATA EMPLOYED IN THEIR PLANNING AND DEVELOPMENT,
Ife Univ. (Nigeria). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W78-03784

APPLICATION OF COUTAGNE'S AND TURC FORMULAS TO THE SOUTHERN MOZAMBIQUE RIVERS,
For primary bibliographic entry see Field 4A.
W78-03789

RELATION OF HYDROLOGICAL PROGRAMS OF THE CENTER OF HYDROGRAPHIC STUDIES FOR COMPLETE STUDIES OF HYDRAULIC RESOURCES WITH INSUFFICIENT DATA,
R. Heras.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 155-198, 1974.

Descriptors: *Water resources, *Computer programs, *Data processing, Hydrologic data, Programs, Hydrologic aspects, Model studies, Foreign countries, Reservoir operation, Systems analysis, *Spain, Inadequate data.

A list and description of 153 computer programs available for studying hydrological problems were given. Programming language was not given. Types of programs available varied from those that list data to programs capable of systems analysis of hydrological systems and hydrological model studies. (See also W78-03783) (Humphreys-ISWS)
W78-03791

OBJECTIVE CRITERIA TO DECLARE A SERIES OF DATA SUFFICIENT FOR TECHNICAL PURPOSES,
A. Penta, and F. Rossi.
In: Design of Water Resources Projects with Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 227-239, 1974. 4 fig, 10 ref.

Descriptors: *Statistical methods, *Hydrologic aspects, *Estimating, Mathematical models, Model studies, Probability, Equations, Analytical techniques, Hydrology, Inadequate data.

It was supposed: that for technical purposes it is necessary to estimate the values x sub phi; a hydrological variable x may assume with a given probability phi; that x can be measured directly; and that its n values have been recorded. The series of the n values of x was defined sufficient if it consents to estimate x sub phi with a reliability adequate for technical purposes. By referring to the usual statistical methodologies, the authors presented objective criteria to recognize whether the series of n values is sufficient. Diagrams were presented that indicate which minimum values of n are necessary for the series to be considered sufficient. From the diagrams it is evident that for the same values of n the series, sufficiency is strictly linked to the variability of x. (See also W78-03783) (Humphreys-ISWS)
W78-03795

SOME CRITERIA USED IN HYDROLOGIC STUDIES WITH INADEQUATE DATA,
C. Q. Gois.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 241-252, 1974. 4 fig.

Descriptors: *Hydrology, *Africa, *Runoff, *Watersheds(Basins), Rainfall disposition, Water resources, Hydrologic aspects, Drainage, Foreign countries, Foreign research, Analytical techniques, *Angola(Africa), Inadequate data.

In territories where the hydrologic networks are still scarce, it is necessary to adopt simplified designing criteria which might lead to sufficiently reliable results. Some criteria normally utilized for hydrological studies of the general plans for the development of the water resources of rivers in semi-arid areas of Portuguese African territories were presented, and an example of their application to Okavango Basin in Angola was given. The obtained results are approximate, but they can be considered sufficiently safe for the purpose. And moreover, when decisions would be taken for the design of specific projects, further data will be available and then a more reliable analysis can be made. (See also W78-03783) (Humphreys-ISWS)
W78-03796

DETERMINATION OF HYDROLOGICAL CHARACTERISTICS IN POINTS WITHOUT DIRECT HYDROMETRIC DATA,
World Meteorological Organization, Bogota (Columbia); and United Nations Development Program, Bogota (Columbia).
For primary bibliographic entry see Field 4A.
W78-03797

NEW MODELS OF FREQUENCY LAW OF RUNOFF STARTING FROM PRECIPITATIONS,
I.T.O.P. Coll., Madrid (Spain).
For primary bibliographic entry see Field 4A.
W78-03798

ESTIMATION OF DESIGN FLOODS AND THE PROBLEM OF EQUATING THE PROBABILITY OF RAINFALL AND RUNOFF,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 4A.
W78-03801

DESIGN DISCHARGE DERIVED FROM DESIGN RAINFALL,
Public Works Research Inst., Tokyo (Japan).
T. Kinosita, and T. Hashimato.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 557-562, 1974. 2 tab.

Descriptors: *Design criteria, *Discharge(Water), *Rainfall-runoff relationships, *Design flow, Rainfall disposition, Rainfall, Hyetographs, Model studies, Data processing, Runoff, Watersheds(Basins), Hydrology, Methodology, Foreign countries, Flood control, *Japan, Inadequate data.

A design discharge for flood control in Japan is in general derived from a design rainfall since discharge data are not sufficient for designing. The procedure of derivation and its merits and demerits were explained according to the following four steps: (1) design rainfall in a certain return period is determined by a probability process; (2) design rainfall distributions are obtained by enlargement of rainfall distributions of recent representative storms; and (4) a design discharge is determined by the simulation model with enlarged rainfall distributions. The procedure is flexible, and improvement is expected with development of hydrology. (See also W78-03783) (Humphreys-ISWS)
W78-03807

METHODS FOR THE ESTIMATION OF MAXIMUM DISCHARGES OF SNOW MELT AND RAINFALL WATER WITH INADEQUATE OBSERVATIONAL DATA,
Gosudarstvennyi Gidrologicheski Inst., Leningrad (USSR).
For primary bibliographic entry see Field 2E.
W78-03811

A STUDY OF MAXIMUM FLOOD DISCHARGE FORMULAS,
Seoul National Univ. (Republic of Korea). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-03813

URBAN FLOOD WATER MANAGEMENT SYSTEMS IN SEMIARID REGIONS: MODEL EXTENSION, DESIGN AND APPLICATION,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 6A.
W78-03965

2B. Precipitation

NEW MODELS OF FREQUENCY LAW OF RUNOFF STARTING FROM PRECIPITATIONS,
I.T.O.P. Coll., Madrid (Spain).
For primary bibliographic entry see Field 4A.
W78-03798

2C. Snow, Ice, and Frost

SNOW MECHANICS SYMPOSIUM.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No 114, 1975. 452 p.

Descriptors: *Conferences, *Snow, *Ice, *Avalanches, Snowpacks, Physical properties, Mechanical properties, Stress, Deformation, Movement, Measurement, Snow cover, Melt water, Firn, On-site investigations, Surveys, Failure(Mechanics), Analytical techniques, Stress analysis, *Snow mechanics, Snow structure.

The purpose of the symposium was to focus attention on the basic physics and mechanics of deposited and moving snow. From the point of view of a fundamental scientific understanding, snow mechanics is difficult--much more difficult, for example, than ice mechanics. Snow comes in such a variety of forms that it is not at all easy to categorize it, and then not at all easy to reproduce physically the form that one has categorized. The subject areas covered included: (1) the physical fundamentals of the structure and texture of snow, the properties of ice, and the physical processes within the snowpack in relation to its mechanical properties. (2) The mechanical fundamentals of the relations between stress, deformation and history in snow, and failure criteria for snow. (3) The fluid mechanics of stress and deformation within

the natural snow pack and rapid snow movements. (See W78c03999 thru W78-04035) (Humphreys-ISWS)
W78-03998

MECHANICS AND STRUCTURE OF SNOW AS A DISPERSED SYSTEM,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
D. Kuroiwa.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No 114, p 3-15, 1975. 8 fig, 2 tab, 15 ref.

Descriptors: *Snow, *Mechanical properties, *Laboratory tests, Ice, Analytical techniques, Analysis, Compaction, Density, Foreign research, Cohesion, Porosity, *Japan, Snow mechanics.

The most fundamental structural and intrinsic properties of snow were treated in relation to mechanical properties. Two structural factors for the compression of snow, a and b, were derived from Kawakita's equation similar to van der Waal's Equation. The factor a depends on geometrical shapes of snow crystals or ice grains, and b depends primarily on their intrinsic properties such as intergranular friction and cohesiveness. In relation to the structural factors, experimental studies on the cohesive force between ice grains were reviewed. It was pointed out that the structural discontinuities found in snow texture are related closely to the discontinuities found in the density dependence of mechanical properties of snow. The experimental studies of fluidization of snow were discussed, with special reference to the cohesive force and sintering between grains. (See also W78-03998) (Humphreys-ISWS)
W78-03999

MASS TRANSFER AND METAMORPHISM IN SNOW COVER,
Moscow State Univ. (USSR). Snow Avalanche Problem Lab.
K. F. Voitkovsky, V. N. Golubev, N. I. Lapteva, E. S. Troshkina, and L. A. Ushakova.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 16-24, 1975. 5 fig, 15 ref.

Descriptors: *Snow cover, *Crystal growth, *Ice, *Thermal properties, Thermal conductivity, Mass transfer, Crystals, Foreign research, Particle size, Temperature, Diffusion, Conduction, Analysis, Analytical techniques, On-site investigations, *USSR, Snow mechanics.

Continuous metamorphic processes due to mass transfer of material and to recrystallization growth of grains take place in snow cover. This metamorphism is associated closely with the thermal regime and strained state of the snow cover. Roles played by diffusion and conduction on thermal conductivities were discussed. It was shown experimentally that at temperatures near 0C, these two components of the effective thermal conductivity of the snow cover have comparable values. The thickness of the quasiliquid film on the surface of ice crystals was determined by inert gas adsorption and nuclear magnetic resonance techniques in the temperature range of 0 to -8C. Results obtained demonstrated that at equal temperature gradients the mass transfer due to water vapor diffusion is two orders of magnitude greater than that due to material migration through the quadiliquid film. Theoretical consideration was given to the grain recrystallization growth mechanism in snow cover. Calculations demonstrated that recrystallization growth rates due to crystal dimensions differences and those due to differences in relative strain of individual grains differ by more than an order of magnitude. Results of field observations have shown that modification of some structural characteristics by metamorphic processes in snow cover is in good agreement with the values calculated by means of the recrystallization growth theory. (See also W78-03998) (Humphreys-ISWS)
W78-04000

TIME-TEMPERATURE DEPENDENCE OF SINTERING IN PERENNIAL ISOTHERMAL SNOWPACKS,
Cold Regions Research and Engineering Lab., Hanover, NH.
A. J. Gow.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 25-41, 1975. 13 fig, 3 tab, 37 ref.

Descriptors: *Snowpacks, *Crystal growth, *Ice, *Antarctic, On-site investigations, Crystallization, Snow, Isotherms, Thermal properties, Compressive strength, Growth rates, Crystals, Consolidation, Time, Age, Density, Particle size, Analytical techniques, Analysis, Data collections, Temperature, Aging(Physical), *Greenland, Sintering, Snow mechanics.

The time-temperature dependence of sintering in dry polar snowfields was investigated at several locations in Antarctica and Greeland. This study utilized samples from deep holes and shafts that actually penetrated the snow-ice transition at a number of sites, and demonstrated: (1) that density increases linearly with the logarithm of the age of the snow (sintering time), (2) that the mean crystal size of the snow increases linearly with age, and (3) that the unconfined compressive strength of the snow also increases linearly with age. The log time-lineal densification of polar snow carries through to at least 96% theoretical density. The temperature dependence of densification is demonstrated clearly in the times needed to reach the snow-ice transition; less than 100 years is required at a constant in situ temperature of -15C, whereas more than 5,000 years is needed to complete the transformation at -60C. The data further indicated that transformation times increase logarithmically with decreasing snow temperatures. Data on crystal growth in dry isothermal snow demonstrated a strong linear relationship between the mean cross sectional areas of crystals and their ages. The rate of growth of crystals also shows a very strong dependence on temperature, the rate of growth in snow at -15C being approximately 100 times faster than that at -60C. Age-strengthening data from Camp Century indicated a value of 125-130 x 10 to the 5th power N/sq m for the ultimate unconfined compressive strength of bubble-free polycrystalline ice at -24C. The important effect of bubbles was demonstrated in the fact that the unconfined compressive strength of ice contaning 10% pore space (this would be equivalent to material at the snow-ice transition) is only about half that of bubble-free ice. Thin-section studies of the changes occurring in pore-crystal relationships during sintering showed that the snow-ice transformation is entirely analogous with the full-scale isothermal sintering of powder compacts. The two processes differ mainly in the rates of change which occur very much more slowly in a dry polar snowpack. Most of the difference can be attributed to the much larger sizes of grains in snow, such grains generally being two to three orders of magnitude larger than the particles in powder compacts. (See also W78-03998) (Humphreys-ISWS)
W78-04001

STUDIES ON DEPTH HOAR,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
E. Akitaya.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 42-48, 1975. 4 fig, 4 ref.

Descriptors: *Crystal growth, *Snow, *Laboratory tests, Thermocline, Physical properties, Snow cover, Frost, Heat transfer, Thermal properties, Analytical techniques, Crystals, Particle size, Density, Temperature, Analysis, Foreign research, *Japan, Snow mechanics, Snow structure, *Depth hoar.

A series of experiments on growing depth hoar were carried out in a cold laboratory. Depth hoar crystals grew in snow when the snow was subjected to a consistent negative temperature gradient for a long period. Depth hoar crystals were classified into the two types: skeleton type and solid type. The solid-type depth hoar (comprising short-column and thick-plate grains) grew predominantly under temperature gradients smaller than about -0.25 C/cm, and the skeleton type depth hoar grew in snow having a large air space under large temperature gradient. Hardness of depth hoar decreased, changed scarcely, or increased according to the magnitudes of temperature gradient and density of original snow. The occurrence of natural convection of air in snow subjected to negative temperature gradients was studied by using natural snow and artificially prepared snow samples and by measuring the heat flow. Natural convection of air occurred only in artificial samples with vary large air spaces. (See also W78-03998) (Humphreys-ISWS)
W78-04002

GRAIN AND BOND GROWTH IN WET SNOW,
Cold Regions Research and Engineergineering Lab., Hanover, NH.
S. C. Colbeck.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 51-61, 1975. 6 fig, 11 ref. ARMY 4A061102 B52E, Task Area 02.

Descriptors: *Snow, *Crystal growth, *Thermodynamic behavior, *Mathematical studies, Crystals, Physical properties, Theoretical analysis, Thermal properties, Particle size, Density, Melting, Thermocline, Temperature, Consolidation, Analytical techniques, Heat flow, Bonding, Snow mechanics, Wet snow, Snow structure.

Grain growth, bond growth and densification of wet snow are determined partly by the distribution of equilibrium temperature in the snow matrix. At high water saturations the equilibrium temperature decreases with grain size, causing small particles to melt and large particles to grow. Melting also occurs at intergrain contacts, causing low strength and rapid densification. At low saturations the capillary pressure controls temperatures, and particle size has a smaller effect. Grain growth proceeds slowly, although melting at the contacts does increase with overburden pressure. At low saturations the water 'tension' causes large attractive forces, and large bonding strengths occur. (See also W78-03998) (Humphreys-ISWS)
W78-04003

ROLE OF THE LIQUID-LIKE LAYER IN SNOW METAMORPHISM,
Moscow State Univ. (USSR). Snow Avalanche Problem Lab.
L. A. Ushakova, and E. S. Troshkina.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 62-65, 1975. 12 ref.

Descriptors: *Snow cover, *Crystals, *Ice, Consolidation, Diffusion, Physical properties, Melting, Foreign research, Foreign countries, *USSR, Snow mechanics, Sintering, Snow structure.

Available experimental and theoretical data demonstrate that a liquid-like layer, whose thickness increases when temperature approaches 0C, reaching the value of the order of 0.000001 cm, exists on the surface of ice particles below the ice melting point. Mobility of water molecules in this layer is extremely high and determines the kinetics of sintering metamorphism because the specific surface area of the ice-air interface, measured by means of inert gas adsorption, is quite substantial. Viscosity of the liquid-like layer and surface diffusion coefficient were evaluated on the basis of experimentally obtained absorption line width of nuclear magnetic resonance. It was concluded that efforts to interpret snow metamorphism exclusively by observation of sintering of ice spheres or by observation of changes in the ice-air interface surface area cannot be successful. Further investigation is necessary to elucidate the nature of the ice surface, and, if particular, quantitative estimation is required of surface molecules mobility. (See also W78-03998) (Humphreys-ISWS)
W78-04004

THE ROLE OF MELTWATER IN DENSIFICATION PROCESSES OF SNOW AND FIRN,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
G. Wakahama.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 66-72, 1975. 4 fig, 1 tab, 13 ref.

Descriptors: *Snow cover, *Melt water, *Firn, *Percolation, Melting, Ice, Laboratory tests, Density, Percolating water, Crystal growth, Flow, On-site investigations, On-site tests, Physical properties, Particle size, Consolidation, Crystals, Analytical techniques, Foreign research, *Japan, Snow mechanics, Wet snow, Snow structure.

It is well known that melt water can weaken the mechanical strength of snow and that the densification of snow may be accelerated by the existence of melt water within the snow. Experimental studies on the densification processes and the metamorphism of wet snow containing free water of 0-30% were made both in a snow field and in a cold laboratory. It was found that the rates of densification, density, and hardness of snow vary with the lapse of time as the function of free water content of snow. The percolation rate of melt water in a snow cover was also measured in connection with the free water content of snow. Microscopic studies on the densification and metamorphism of wet snow were conducted, and 16 mm motion pictures were taken in an effort to clarify the mechanism of densification of snow. In the case of wet snow free from stress, snow grains turned into coarser rounded particles and ice bonds between the snow grains became smaller in number. This may result in the mechanical weakening of the snow. When wet snow was compressed, snow grains were brought closer as packing proceeded, whereby ice bonds between the snow grains grew thicker, until finally they turned into a coherent body of bubbly ice. This may be a predominant transformation process from firn to glacier ice in the accumulation area of a temperate glacier. (See also W78-03998) (Humphreys-ISWS)
W78-04005

THE MECHANISM OF ROTTING OF ICE LAYERS WITHIN A STRUCTURED SNOWPACK,
National Inst. of Scientific Research, Quebec.
E. J. Langham.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 73-81, 1975. 7 fig, 1 tab, 8 ref.

Descriptors: *Snowpacks, *Ice, *Permeability, *Melting, Thermal properties, Thermal conductivity, Snowmelt, Deterioration, Crystals, Radiation, Temperature, Absorption, Mechanical properties, Meteorology, Structure, Diffusion, Erosion, Theoretical analysis, Mathematical studies, Analytical techniques, Equations, Foreign research, Snow mechanics, Snowpack structure.

Ice layers that form on the surface of a snowpack become part of its structure when the layers are buried by subsequent snowfalls. The evolution of the ice layers plays a key role in determining both the mechanical properties and the permeability of the snow to water. The permeability controls the movement of water in the snowpack and is important in the release of wet avalanches and snowmelt floods. The processes which lead to the disintegration of ice layers are not responsible for the transfer of large amounts of energy. Rather, they function in the manner of a trigger mechanism which can operate when the snowpack has reached a critical temperature of about -0.1C. Warming by thermal conduction produces an exponential approach to the ice point, which, under suitable conditions, may bring the snow to this threshold temperature during the course of a single day. When this happens, one of the trigger mechanisms, or a combination of them, can take over and cause the ice layer first to become permeable and later to disintegrate. A sharp drop in temperature following these events will restore the status quo, providing that air has not entered the ice layer. This means that an ice layer could become permeable for a brief period during a day which would produce corresponding surges in a runoff hydrograph. In the case of avalanches, there would be a time of day when the mechanical strength is least and the avalanche hazard is greatest. Various calculations were made with the purpose of showing the nature of the phenomenon of disintegration of ice layers. The lack of suitable data prevented a more detailed analysis, and more measurements are needed. In view of the consequences of the ideas proposed here, there is also a need to conduct some careful experiments to test their validity. (See also W78-03998) (Humphreys-ISWS)
W78-04006

METAMORPHISM OF SNOW AND ICE SINTERING OBSERVED BY TIME LAPSE CINE-PHOTOMICROGRAPHY,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
D. Kuroiwa.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 82-88, 1975. 4 fig, 11 ref.

Descriptors: *Snow, *Crystallization, *Laboratory tests, Crystals, Ice, Photography, Microscopy, Temperature, Thermocline, Analytical techniques, Methodology, Melting, Freezing, Foreign research, Snow mechanics, Photomicrography.

Metamorphism of snow crystals and grains was observed under an alternating temperature gradient by using time lapse cine-photomicrography. Original forms of the snow crystals were destroyed by vapor transfer due to the alternating temperature gradient, but in high density snows, ice bondings between grains were accelerated by the vapor transfer. The following conspicuous phenomena were observed during the sintering processes: surface migrations of liquid-like layers, complicated movements of air bubbles in ice, and change of crystallographic orientations of ice spheres. Ice spheres containing 0.01% KCl were used to investigate the effect of liquid phase, which exerts great influence on the sintering of ice. The activation energy for sintering was 30 kcal/mol for pure ice and 16 kcal/mol for KCl ice. (See also W78-03998) (Humphreys-ISWS)
W78-04007

NUMERICAL PARAMETERS TO IDENTIFY SNOW STRUCTURE,
Swiss Federal Inst. for Snow and Avalanche Research, Weissfluhjoch-Davos.
W. Good.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 91-102, 1975. 4 fig, 3 tab, 15 ref.

Descriptors: *Snow, *Crystallography, *Physical properties, *Alpine, Sampling, Ice, Particle shape, Particle size, Instrumentation, Crystals, Laboratory tests, Equipment, Computers, Computer programs, Photogrammetry, Data processing, Model studies, Mathematical studies, Analytical techniques, Analysis, Numerical analysis, Foreign research, *Japan, *Greenland, Snow structure.

Thin sections of snow and ice samples were analyzed using an automatic scanning microscope in combination with a software package to perform subsequent data analysis. From the light intensities, software determines the homogeneous areas of the cut crystals and parameterizes these areas (pattern recognition). The technique of factorial analysis was used to find a geometrical interpretation of th 21 parameters calculated for each sample. Independent factors, formed as linear combinations of these parameters, span a vector space. In this space, 62% of the total content of information of the parameter set is represented in the plane of first two factors. Three axes account for 70% of the information. The first factor (49%) correlates negatively with the nonplanar specific grain surface and positively with grain diameter, planar area, and mean radius of convex grain boundaries. Alpine and Greenland snow samples in different states of equitemperature metamorphism and ice from a desalination experiment were compared. Examples were given showing the difference between homogeneous and inhomogeneous snow samples as well as demonstrating the change of structure as a function of depth (time) for Greenland snow. (See also W78-03998) (Humphreys-ISWS)
W78-04008

THE TEMPERATURE DEPENDENCE OF HARDNESS OF SNOW,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
K. Tusima.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 103-109, 1975. 6 fig, 4 ref.

Descriptors: *Snow, *Mechanical properties, *Laboratory tests, Temperature, Instrumentation, Equipment, Compaction, Youngs modulus, Density, Methodology, Analysis, Equations, Foreign research, *Japan, Snow structure, Hardness(Snow).

The temperature dependence of hardness of snow was investigated by the use of Kinosita's hardness gauge in a temperature range from 0 to -56C. The value of hardness increased linearly with decreasing temperature down to -40C. However, below -40C the value of hardness did not change. In order to convert the values of hardness measured at various temperatures to the values of hardness at a specific temperature, -5C, an empirical formula

was proposed. The relation between the temperature dependence of hardness and density of snow also was discussed. (See also W78-03998) (Humphreys-ISWS)
W78-04009

ON THE RAMMSONDE HARDNESS EQUATION,
Swiss Federal Inst. for Snow and Avalanche Research, Weissfluhjoch-Davos.
H. U. Gubler.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 110-121, 1975. 11 fig, 2 ref.

Descriptors: *Snow, *Mechanical properties, *Testing procedures, Strength, Laboratory tests, Equipment, Analysis, Data collections, Instrumentation, Mathematical studies, Penetration, Foreign research, Equations, Tensile strength, Density, Analytical techniques, Sounding, *Switzerland, Hardness(Snow), Sonde, Rammsonde hardness, Snow mechanics.

A new Rammsonde equation was developed which better describes the real energy transfer from the sonde to the snow. The energy transfer was measured with the help of a built-in force transducer and a penetration length measurement device. The well-known simple Rammsonde equation can be improved easily to account for the energy losses. The correlation between ram hardness and tensile strength was measured and discussed. The Swiss Rammsonde has been used universally for many years to measure the displacement resistance to penetration of the layers of a snowpack. This instrument is suitable for snow hardness measurements from low to very high hardness, but it cannot be adapted for very low hardness snow. The hardness profile is measured from the highest layer down. The material displacing probe has the shape of a cone with a point angle of 60 deg. The experiments showed that the deformation mechanism responsible for the hardness depends strongly on the rate of deformation. The displacement-hardness changes one to two orders of magnitude as a function of penetration speed. Shaft, extensions, and hammerguide of the Rammsonde should be fixed together. This would improve the energy transfer by 30-60% and at the same time simplify the energy loss calculation. Also, the reproducibility of the ram tests would be better. For an improved understanding of the correlation between ram hardness and tensile strength, the dependence of the strength on the intergranular structure has to be investigated. A correlation without knowing further characteristics of the snow sample will not be possible. (See also W78-03998) (Humphreys-ISWS)
W78-04010

DEUTERIUM AND OXYGEN-18 CONTENTS AS AN INDEX OF THE PROPERTIES OF SNOW COVERS,
Gesellschaft fuer Strahlen- und Umweltforschung m.b.H., Neuherberg bei Munich (West Germany). Inst. fuer Radiohydrometrie.
H. Moser, and W. Stichler.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 122-135, 1975. 13 fig, 17 ref.

Descriptors: *Snow cover, *Properties, *On-site investigations, Snow, Laboratory tests, Oxygen, Deuterium, Oxygen isotopes, Crystallization, Chemical properties, Temperature, Profiles, Evaporation, Surveys, On-site data collections, Analysis, Distribution, Spatial distribution, Foreign research, Snow structure.

On the basis of the results of observation on natural snow covers supplemented by laboratory tests in cold chambers, it was shown and explained in part how and whereby the original deuterium and oxygen-18 contents of snow undergo a change in the snow cover in the course of time. Variations in isotope content thus are produced among other factors by evaporation of the snow, by condensation of the air humidity into the snow cover, and by melt, sublimation, and recrystallization (metamorphism) phenomena. Since all of these effects occur in layers close to the surface, the isotope contents of the deeper strata of a snow profile remain unaltered. Also, a possible percolation of melt water through these layers is practically of no influence. A comparison of the variation of the deuterium content with that of the oxygen-18 content provided information on whether the changes in isotope content take place in a thermodynamical state of equilibrium of the phases involved. The still qualitative results from laboratory and field tests indicated that measurements of the stable isotope content are capable of providing information on origin and ageing of a snow cover as well as insights into internal mass transport processes. (See also W78-03998) (Humphreys-ISWS)
W78-04011

ON THE DIELECTRIC CONSTANT OF WET SNOW,
Innsbruck Univ. (Austria). Physikalisches Inst.
W. Ambach, and A. Denoth.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 136-142, 1975. 4 fig, 11 ref.

Descriptors: *Snow, *Electrical properties, *Mechanical properties, Mathematical models, Frequency, Measurements, Instrumentation, Melt water, Mixing, Analysis, Analytical techniques, Foreign research, *Dielectric constant, Snow structure, Wet snow, Fine grain snow, Coarse grain snow.

A study was reported on the dielectric constant of wet snow, yielding optimum conditions for the construction of an instrument for determining the free water content in the snow cover by dielectric measurements. The frequency dependence of the dielectric constant of fine-grained snow samples can be described by the Cole-Cole model (spectrum of different relaxation times), whereas that of coarse-grained snow samples satisfies the Debye model (one relaxation time only). From this, the conclusion may be drawn that the relation between the dielectric constant and the free water content depends on the snow structure when using frequencies of measurement of f less than 1 MHz. Already at frequencies of 20 MHz, the structural influences are negligibly small. Therefore, a twin T bridge was developed as an electronic measuring instrument for the frequency region of 20 MHz. For the evaluation, a generally valid nomograph was given. Furthermore, it was shown that the mixing formula by Polder and Van Santen which contains the depolarizing factor g = (0.4912/0.4912/0.0176), very well reflects the dielectric constant of wet snow. G corresponds to inclusions having the shape of rotational ellipsoids with an axial ratio of 1:10.9 with the mixing formula referring to a statistic distribution of inclusions. A statistic distribution of ice discs in air was assumed as being the carrier medium (dry snow). (See also W78-03998) (Humphreys-ISWS)
W78-04012

KAISER EFFECT IN SNOW,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
C. C. Bradley, and W. St. Lawrence.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 145-154, 1975. 5 fig, 3 ref.

Descriptors: *Snow, *Physical properties, *Prestressing, *Acoustics, Laboratory tests, Dead loads, Compressive strength, Loads(Forces), Tensile strength, Equipment, Testing procedures, Stress relieving, Laboratory equipment, Snow mechanics(Kaiser effect).

Acoustical signals emanating from stressed snow indicate that snow, in common with other crystalline materials, exhibits Kaiser effect or 'memory' of previous stress. This memory can be quite specific as to the magnitude of the prestress (compressive or tensile). These conclusions were drawn from laboratory experiments in which dimensioned snow columns were subjected to uniaxial dead loads, both in compression and in tension, and then restressed after relaxation periods. Experiments on the longevity of the memory function indicated that most of the decay takes place in the first 6 h, but that it is still detectable after relaxation periods of up to 24 h. (See also W78-03998) (Humphreys-ISWS)
W78-04013

THE DEFORMATION OF SNOW IN TERMS OF A STRUCTURAL MECHANISM,
Montana State Univ., Bozeman. Dept. of Earth Sciences.
W. St. Lawrence, and C. C. Bradley.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 155-170, 1975. 6 fig, 1 tab, 9 ref. NSF GA 3943, DA-ARO-D-31-124-71-G59.

Descriptors: *Snow, *Deformation, *Theoretical analysis, *Structural behavior, Physical properties, Analytical techniques, Laboratory tests, Analysis, Elastic deformation, Elasticity(Mechanical), Mathematical models, Mechanical properties, Strain, Stress analysis, Snow mechanics.

A one-dimensional theory was developed to describe the deformation of snow. This theory considers the deformation process in snow in terms of integranular and intragranular deformations. These two components of deformations were considered further in terms of their elastic and inelastic components. As part of this development, the nature of acoustical emissions in snow was defined. This definition was applied then to include acoustical emission data in the constitutive law. A comparison between theoretical and experimental results showed good agreement. (See also W78-03998)(Humphreys-ISWS)
W78-04014

CREEP-INDUCED CHANGES IN STRUCTURE AND DENSITY OF SNOW,
Moscow State Univ. (USSR). Snow Avalanche Problem Lab.
K. F. Voitkovsky, A. N. Bozhinsky, V. N. Golubev, M. N. Laptev, and A. A. Zhigulsky.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 171-179, 1975. 6 fig, 3 ref.

Descriptors: *Snow, *Mechanical properties, *Structural behavior, *Creep, Ice, Density, Compaction, Compressibility, Elastic deformation, Plastic deformation, Physical properties, Laboratory tests, Laboratory equipment, Analysis, Analytical techniques, Equations, Acoustics, Data collections, Temperature, Foreign research, *USSR, Snow structure, Snow mechanics.

Creep of snow is directly related to changes in density and structure. As a result, the mechanical properties of snow undergo continuous changes. Experiments on uniaxial compression demonstrated that three stages of creep-induced structure changes can be singled out which correspond

to three main stages of creep. These are also accompanied by appreciable changes of elastic wave propagation velocities in snow. Thus, it was found possible to utilize the method of ultrasonic wave propagation through snow samples to study structural changes. It was established experimentally that snow samples offer different resistance to compression and extension. In the uniaxial compression of snow, the creep rate is 1.4-2.0 times larger than that in the case of extension (at equal loads, other factors being identical). Compaction of snow also develops during creep at pure shear stresses. Observations of snow cover changes on mountain slopes and near obstacles in conjunction with laboratory studies provided new data for the evaluation of creep process effects on changes of density and structure of snow. A rheological model of snow was suggested. Further studies of laws governing deformation of snow require further information on the quantitative relation of creep and strength characteristics of structure, density and temperature. Additional information on these relations will make it possible to solve such problems as prediction of changes in mechanical properties and stability of snow cover on mountain slopes. (See also W78-03998) (Humphreys-ISWS)
W78-04015

CONTINUUM MECHANICS: A POWERFUL TOOL IN SOLVING ICE AND SNOW PROBLEMS,
Eidgenoessische Technische Hoschschule, Zurich (Switzerland). Div. of Mechanics.
H. Ziegler.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 185-195, 1975. 14 fig, 12 ref.

Descriptors: *Snow, *Ice, *Mathematical studies, *Theoretical analysis, Analytical techniques, Glaciers, Flow, Anisotropy, Elastic deformation, Shear stress, Mathematics, Equations, Analysis, Structural behavior, Stress analysis, Structural analysis, Movement, Foreign research, *Continuum mechanics, Snow mechanics.

The laws of continuum mechanics and of their applicability of practical problems were discussed. Continuum mechanics consists of two types of statements: laws that are generally valid (although they may be expressed in various forms) and relations characterizing (and, at the same time idealizing) special classes of bodies. The most outstanding property of the theory is that it can be carried through to a large extent on a general level, regardless of the properties of the body considered, and that the constitution of the body is introduced at the latest possible stage. In this way, the various branches as elasticity, plasticity, fluid mechanics, etc., are obtained as speical cases of the same unified theory. In order to treat any problem in continuum mechanics in a serious and competent manner, a complete system of differential equations express the general laws of mechanics, possibly thermodynamics, and the particular properties of the material considered. The side conditions are boundary and possibly initial conditions. The examples discussed show how continuum mechanics can be used in solving practical problems. The approach is certainly more demanding than the heuristic methods still widely used in practice. However, it is the only correct approach. It is to be regretted that, in any single application, idealizing assumptions cannot be avoided. However, there is no doubt that a correct approach on a dubious basis is still better than a dubious approach of a dubious basis. (See also W78-03998) (Humphreys-ISWS)
W78-04016

STRESS AND FRACTURE OF SNOW SLABS,
Department of the Environment, Calgary (Alberta). Glaciology Div.
R. I. Perla.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 208-221, 1975. 11 fig, 27 ref.

Descriptors: *Snow, *Rupturing, *Reviews, *Avalanches, Glaciology, Stability, Mechanical properties, Movement, Stratigraphy, On-site investigations, Mathematical studies, Stress, Shear, Slabs, Fracture(Mechanics), Analysis, Analytical techniques, Snow mechanics, Snow slabs.

Observations of slab fracture geometry were reviewed. The slab bed surface (main shear sliding surface) is essentially planar, and with few exceptions inclined between 30 deg and 50 deg. The crown surface (upslope tension fracture) is nearly perpendicular to the bed surface and tends to arc around between the flanks (side boundaries) which are often sawtoothed. The flank-to-flank dimension is typically 100 and sometimes 1,000 times the slab thickness. The Stauchwall (downslope shear boundary) is generally obliterated by the moving slab; however, it appears that the crown-to-Stauchwall dimension is usually less than the flank-to-flank dimension. Stratigraphic measurements taken above the crown fracture indicated that snow slabs are not restricted to narrow bands of density, temperature, or strength indices. Data show qualitatively that a slab is a relatively weak layer. Rapid fracture depends on the interaction between slab tension and bed surface shear. The dynamic jolt of an initial tension fracture overcomes the residual strength of the bed surface. Theoretical computations of tension stress were attempted. It was shown that snow parameters which associate with relatively low tensile stress in the neutral zone associate with relatively high tensile stress near the crown; this raises questions about the importance of tension change in the neutral zone as an explanation of slab instability. Instead critical tension may originate because of strain softening at the bed surface, or perhaps due to the collapse of a thick, weak layer beneath the bed surface. Field evidence seems to support the two-dimensional model of initial crown fracture, followed by bed surface fracture from crown-to-Stauchwall. A three-dimensional fracture model was proposed to explain observed fracture patterns, especially the observed planes of intersection formed by bed and crown surfaces. (See also W78-03998) (Humphreys-ISWS)
W78-04018

A CONSTITUTIVE EQUATION FOR CREEPING SNOW,
Swiss Federal Inst. for Snow and Avalanche Research, Weissfluhjoch-Davos.
B. Salm.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 222-235, 1975. 7 fig, 3 tab, 8 ref.

Descriptors: *Snow, *Rheology, *Creep, Theoretical analysis, Mathematical studies, Mechanical properties, Mathematics, Physical properties, Analysis, Deformation, Laboratory tests, Analytic techniques, Equations, Stress analysis, Stress, Snow mechanics, Snow structure.

On the basis of the principle of least irreversible force, a constitutive equation for creeping snow in a quasistationary state was established. As a consequence of this principle, the constitutive equation depends only on the dissipation function of the system. This function was developed in power series of the invariants of the stress tensor. Tests showed that because of the distinct non-newtonian behavior of snow, terms up to the sixth degree of the invariants have to be taken into account. (See also W78-03998), (Humphreys-ISWS)
W78-04019

CREEP AND THE SNOW-EARTH INTERFACE CONDITION IN THE SEASONAL ALPINE SNOWPACK,
Washington Univ., Seattle.
D. M. McClung.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 236-248, 1975. 6 fig, 2 tab, 11 ref.

Descriptors: *Snow, *Creep, *Alpine, *Theoretical analysis, Glaciology, Mathematical models, Glaciers, Velocity, Avalanches, Snowpacks, Movement, Deformation, Physical properties, Analytical techniques, On-site tests, Mathematical studies, Poisson ratio, On-site data collections, Analysis, Shear, Stress, Topography, Interfaces, Snow mechanics, Snow sliding, Cascade mountains.

This paper was concerned with the two slow, viscous components of motion in the seasonal alpine snowpack, creep (internal deformation) and glide (slip of the entire snowpack over the ground). From field measurements in the Cascade Mountains, two nonlinear constitutive laws were deduced: (1) The relationship between the stress and deformation for well-settled, well-metamorphosed, isothermal snow, and (2) the relationship between the shear stress at the base of the snowpack and the glide velocity. In connection with the proposed glide constitutive law, a physical and mathematical theory of snow gliding was presented. In this theory, local creep around bed obstacles was defined as the important mechanism for glide. In the formalism presented, the stagnation depth was defined as the fundamental neutral zone measurement to characterize the topography or terrain roughness. Definition of the stagnation depth suggests a quantitative method of classifying topography of glide slopes as an alternative to the empirical glide factor utilized in the Swiss guidelines for avalanche defence construction. It is evident that a number of experiments would have to be performed to classify slope topography by stagnation depths. The advantage of such a classification would be that knowledge of the stagnation depth allows immediate formulation of the slip boundary condition from a quantitative physical and mathematical theory. (See also W78-03998) (Humphreys-ISWS)
W78-04020

A REVIEW OF BASIC SNOW MECHANICS,
Cold Regions Research and Engineering Lab., Hanover, NH.
M. Mellor.
In: Snow Mechanics Symposium; Proceeding of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 251-291, 1975. 20 fig, 94 ref.

Descriptors: *Snow, Properties, *Reviews, *Mathematical models, Deformation, Rheology, *Physical properties, *Mechanical properties, Elastic deformation, Creep, Poisson ratio, Failure(Mechanics), Friction, Viscosity, Equations, Model studies, Youngs modulus, Seismic waves, Frequency, Kinetics, Dynamics, Movement, Stress analysis, Analytical techniques, Compressibility, Density, *Snow mechanics.

Narrowly defined, snow mechanics deals with forces and displacements in all forms of snow, i.e., with the kinematics, dynamics and eneretics of snow in both condensed and dispersed states. More broadly defined, it also embraces the underlaying physics of processes relevant to mechanical behaviour and the useful but disconnected empiricism associated with snow engineering, avalanche prediction, etc. In an introductory section, research goals were identified, a historical perspective of snow mechanics was outlined, and requirements for theoretical analysis, in the form

of constitutive equations and failure criteria, were specified. A section of deformation reviewed idealized rheology for nondestructive loading, giving general differential equations and pertinent special solutions for one-dimensional models. Simple elastic properties, as derived from quasistatic and dynamic tests on snow, were summarized, and effects of rate, frequency, density, temperature, etc., were considered. Viscoelastic properties were described in terms of complex moduli, viscosity for creep transients, loss factor, etc., and independent variables such as temperature, density and frequency were taken into a consideration. A section of failure started with discussion of failure, strength, and failure criteria, especially as the terms apply to snow. Strength measurements in uniaxial tension and compression were considered, and available data were compiled. Correlation of strength and elastic modulus was explored as a possible method for estimating strength from nondestructive in situ tests. A section of boundary friction introduced the physical theory relating to kinetic friction of coherent snow surfaces and summarized experimental findings that give variations of kinetic friction with contact pressure, dimensions of contact areas, sliding speed, ambient temperature, and slider materials. (See also W78-03998) (Humphreys-ISWS)
W78-04021

CONTINUOUS MEASUREMENTS OF DEFORMATIONS ON AN AVALANCHE SLOPE,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
R. A. Sommerfeld.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 293-297, 1975. 5 fig, 11 ref.

Descriptors: *Snow, *Deformation, *Colorado, *On-site investigations, Measurement, Movement, On-site tests, Instrumentation, Monitoring, Equipment, Creep, Methodology, Gages, Avalanches, Testing procedures, Snow mechanics, Snow slabs, Slope-parallel gages, Vertical gages, Creep-angle gages.

Deformation measurements are necessary in order to test various methods of calculating stresses in snow slabs. Ideally, these measurements should be continuous and made with minimum disturbance to the snow slab. Instruments which can be embedded in the slab, and continuously monitor the positions of points in the slab without disturbance were described. They were used to monitor the deformations in the Roll avalanche at Berthoud Pass, Colorado, during the winters of 1972-1973. These experiments produced what was, in effect, thousands of deformation experiments on a large mass of snow whose properties are slowly changing. As such, the full potential measurements will not be realized until they are used in conjunction with stress analyses. One reason for presenting this paper was to show that the measurements exist and can be made available in various forms. (See also W78-03998) (Humphreys-ISWS)
W78-04022

A FIELD EXPERIMENT ON THE RATE OF DENSIFICATION OF NATURAL SNOW LAYERS UNDER LOW STRESSES,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
K. Kojima.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 298-308, 1975. 8 fig, 1 tab, 9 ref.

Descriptors: *Snow, *Mechanical properties, *On-site tests, Density, Stress, Strain, Measurement, On-site investigations, Methodology, Testing procedure, Analysis, Analytical techniques, Compressibility, Foreign research, Snow mechanics.

The main purpose of this paper was to determine the relation between the strain rate of densification and the compressive stress of snow. The field experiment reported was concerned with snow of low densities from 0.1 to 0.3 g/cu cm under low stresses less than 15 g/sq cm. It was found that the strain rate of snow layer was proportional to a load, but the coefficient of proportionally decreased exponentially as the density of snow increased. Considerable increase was observed in the density of a thin layer of snow, above which the overlying snow had been completely removed. It was concluded that the densification of the layer was caused by the compressive stress due to its own weight rather than to the metamorphic change of its structure. (See also W78-03998) (Humphreys-ISWS)
W78-04023

INTERNAL STRAINS AND STRESSES OF SNOW COVER ON SLOPES,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
H. Shimizu, and T. Huzioka.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 321-331, 1975. 9 fig, 1 tab, 7 ref.

Descriptors: *Snow, *Mechanical properties, *Stress, *On-site investigations, Deformation, Snow cover, Strain, On-site tests, Measurement, Foreign research, Testing procedures, Methodology, Equipment, Mathematical models, Analytical techniques, Data collections, Foreign countries, Instrumentation, *Japan, Snow mechanics, Principal stress.

Internal strains of snow cover on slopes were observed directly by use of a newly designed marking system at the avalanche observatory, Toikanbetsu, northern Hokkaido, Japan. Fine straight holes, 2 m in length and 18 mm in diameter, were bored in the snow cover on slopes in parallel to the contour line of the slope. A special boring instrument was used. From deformation of configuration of a set of holes in a unit layer of a snow cover, internal strains of the snow layer were calculated. The strain and stress conditions of a natural snow cover on a slope at Toikanbetsu were calculated. Directions of the principal stresses in a snow cover were given by the theory of finite homogeneous strain and stress. Simple formulas giving the magnitudes of the principal stresses in a unit layer of snow cover on a slope were derived, considering the condition of equilibrium of snow column along the principal axes of stresses, on the assumption that a proper homogeneous strain takes place in an individual unit layer of the snow cover. From field observations, the following were confirmed: (1) Directions and magnitudes of the principal stresses and strains varied considerably from place to place in the snow cover, and from time to time throughout winter. (2) A strong effect of Poisson's ratio of snow on the relation between the stress and strain was observed: occasionally extension was observed aong the major principal axis of stress even by compressive stress, if the major principal stress was a much smaller compressive stress than the minor principal stress. (3) An extraordinarily big principal stress appeared when the direction of the principal axis of stress was nearly parallel to the slope. (See also W78-03998) (Humphreys-ISWS)
W78-04025

STRESS ANALYSIS AND FAILURE PREDICTION IN AVALANCHE SNOWPACKS,
Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
F. W. Smith, and J. O. Curtis.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 332-340, 1975. 3 fig, 2 tab, 11 ref.

Descriptors: *Snowpacks, *Stress analysis, *Failure(Mechanics), *Colorado, Avalanches, Analytical techniques, Finite element analysis, Snow, Stress, Strain, Mechanical properties, On-site investigations, Theoretical analysis, Model studies, *Berthoud Pass(Colo), Snow mechanics, Analysis.

Results of finite element stress analyses of a five-layered avalanche snowpack which was observed at Berthoud Pass, Colorado, were given. An attempt was made to model the effects of a weak sublayer in the snowpack by prescribing nonlinear stress-strain behavior for a snow layer near the snow-ground interface. It was observed that under certain conditions, large tensile stresses oriented parallel to the slope may be produced in the upper layers of the snowpack, near the fracture line. The analyses support the hypothesis that avalanche release occurs by a shear failure in one of the lower layers. (See also W78-03998) (Humphreys-ISWS)
W78-04026

STRAIN AND STRESS IN SNOW, FIRN AND ICE ALONG THE EGIG PROFILE OF THE GREENLAND ICE SHEET,
Eidgenossische Technische Hochschule, Zurich (Switzerland).
R. Haefeli, and H. von Sury.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 342-352, 1975. 9 fig, 1 tab, 10 ref.

Descriptors: *Glaciology, *Ice, *Snow, *On-site investigations, Firn, Stress, Strain, Mechanical properties, Profiles, Surveys, Deformation, Density, Movement, Measurement, Velocity, On-site data collections, Foreign countries, *Greenland, Ice sheet, Hardness(Snow), Principal stresses.

The profile chosen for glaciological measurements by the EGIG (Expedition Glaciologique Internationale au Groenland) crosses the Greenland ice sheet from west to east between latitudes of 69 deg and 73 deg. Glaciological and geodetic measurements were made in 1959-1960 and 1967-1968. The ram profiles showed considerable differences between the two measurements, especially for the eastern slope of the ice sheet, which suggest climatic changes. At the principal stations of the EGIG profile, deformation polygons were established and measured at different times: squares of 1 km and pentagons of 15 km diameter. From these measurements, strain rates and principal stresses of the firn surface and the ice base, respectively, were deduced. Assuming a planar state of stress, the first principal stress in the ice yields approximately 1 bar (tension) and points in the direction of the EGIG profile. About 70 poles which mark the EGIG profile throughout the entire length of 900 km were surveyed in 1959 and 1967. The displacement vectors showed that the ice is flowing partially in the direction of the profile, but that it contains a northward component. The projections of these vectors on the direction of the EGIG profile showed a good agreement with the values obtained from balance equation of a two-dimensional ice sheet. The same is true for the strain rates along the profile. The strain rates deduced from the deformation polygons, together with the accumulation, were used to calculate the height variation of the ice sheet. The results were compared with the direct measurement of height variation by the survey. (See also W78-03998) (Humphreys-ISWS)
W78-04027

MECHANICS OF SNOW AVALANCHES,
Moscow State Univ. (USSR). Inst. Mekhaniki.
S. S. Grigorian.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 354-368, 1975. 25 ref.

Descriptors: *Snow, *Avalanches, *Reviews, *Glaciology, Snow cover, Snowpacks, Forecasting, Movement, Rheology, Mechanical properties, Physics, Physical properties, Mathematical models, Friction, Model studies, Creep, Theoretical analysis, Foreign research, Foreign countries, *USSR, Snow mechanics, Air waves.

The main problems of snow avalanches are those of predicting: (1) avalanches, (2) avalanche motion, (3) the action of an avalanche upon obstacles, (4) the air wave, (5) the slow moving snow cover and its interaction with protective constructions, and (6) the problem of artificial release of avalanches. This paper surveyed the modern state of scientific knowledge about the nature of physical and mechanical processes connected with these problems, the level of progress in solving them, and the foreseeable prospects. The survey was based mainly on the results of scientists (mechanicians, mathematicians, and geographers) of Moscow University. (See also W78-03998) (Hunmphreys-ISWS)
W78-04028

SIMULATION OF THE DYNAMICS OF POWDER AVALANCHES,
Grenoble-1 Univ. (France). Inst. de Mecanique.
J. C. Tochon-Danguy, and E. J. Hopfinger.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 369-380, 1975. 6 fig, 13 ref.

Descriptors: *Model studies, *Avalanches, *Snow, *Laboratory tests, Dynamics, Hydraulic similitude, Hydraulic models, Density currents, Snow cover, Mathematical models, Mathematical studies, Theoretical analysis, Analytical techniques, Testing procedures, Velocity, Measurement, Entrainment, Foreign research, Dynamics, *France, Snow mechanics, Powder avalanches.

Powder avalanches are the most spectacular and most intriguing types of avalanches, but perhaps they are also the most accessible for laboratory studies. An adequate simulation is achieved if the boundary conditions, the densimetric Froude number, and the density ratio (delta rho)/rho sub o), are maintained in the model. As for the Reynolds number, it is sufficient that it is high enough for direct viscous effects to become negligible. A salt solution gravity current respects all the similarity requirements except the density ratio. Experiments on such currents on a sloping bottom were carried out. The head growth and the front velocity as a function of downstream distance were measured for different slopes and inflow rates or volume supplies of heavy fluid. Some results on the velocity distribution in and around the head were obtained by the hydrogen bubble technique. A simple theoretical analysis showed how laboratory results can be applied and how the density parameter affects the flow. (See also W78-03998) (Humphreys-ISWS)
W78-04029

SNOW CONTROL BY MODEL TECHNIQUES,
Guelph Univ. (Ontario). School of Engineering.
F. H. Theakston.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 382-390, 1975. 7 fig.

Descriptors: *Snowpacks, Control, *Canada, *Model studies, *Laboratory equipment, Snow, Laboratory tests, Testing procedures, Avalanches, Hydraulic models, Analytical techniques, Methodology, Open channels, Flow, Open channel flow, Hydraulic similitude, Airports, Buildings, Highways, Railroads, Cities, Foreign research, *Snow simulator, Snow mechanics, *Snow control.

Snow can now be controlled by remedial solutions determined from a laboratory procedure known as a 'snow simulator'. It is an open channel water flume wherein the water represents the wind currents and silica sand represents snow. Models are placed in the flume and deposition of simulated snow occurs as the sand and water move through the flume in exactly the same manner as that in a prototype situation. Both qualitative and quantitative analyses are made of snow depths and remedial devices are installed to improve unsatisfacrtory conditions. It is a fast, certain and economical method of determining the best method of snow and wind control. Airports, highways, townsites, buildings, railways, and more recently avalanches have all been studied successfully by this method. (See also W78-03998) (Humphreys-ISWS)
W78-04030

MULTIVARIATE DATA ANALYSIS AS A TOOL FOR DAY-BY-DAY AVALANCHE FORECAST,
Grenoble Univ. (France). Lab. de Mecanique des Fluides.
P. Bois, C. Obled, and W. Good.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 391-403, 1975. 8 fig, 4 tab, 10 ref.

Descriptors: *Avalanches, *Forecasting, *Statistical methods, *Snowpacks, Analysis, Analytical techniques, Data processing, Regression analysis, Sampling, Mathematical studies, Model studies, Snow management, Decision making, Foreign research, Discriminate analysis, Wet snow avalanches, Dry snow avalanches.

Operationally, the quantitative prediction of avalanche occurrence is possible at present only with statistical methods. Among those available, discriminant analysis was used in a two-step procedure. Variables distinguishing well between subgroups (days with dry snow avalanches, days with wet snow avalanches and days without avalanches) were selected by factorial analysis, and given days were classified then into one of the subgroups on an operational basis. Periods of simulated and effective test runs showed that this method is able to give valuable avalanche forecast. The most serious problems arise due to uncertainty of which day, during bad weather, an avalanche occurs and due to the possibility that all physically important variables may not be measured. (See also W78-03998) (Humphreys-ISWS)
W78-04031

EFFECT OF GLIDE AND CREEP ON RIGID OBSTACLES,
Washington Univ., Seattle.
C. B. Brown, and R. J. Evans.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 407-414, 1975. 4 fig, 7 ref, 1 append.

Descriptors: *Snow, *Creep, *Loads(Forces), *Barriers, Snowpacks, Movement, Finite element analysis, Velocity, Mechanical properties, Kinetics, Analytical techniques, Analysis, Mathematical studies, Snow mechanics, Glide velocity.

The forces on a rigid obstacle caused by creep and glide of snow down a slope were provided by a finite element procedure. The element is a trapezium, with sides bounded by the snow surface, the snow-ground interface, and planes normal to the ground. The problem was treated as one of plane strain, but extensions to considerations of three dimensions were discussed. Glide resistance was incorporated as a basal shear dependent on the glide velocity; the snow pack was treated as having a linear nonhomogeneous flow law. In conclusion, it was noted that the force calculated is in reasonable agreement with that predicted by the Swiss guidelines for comparable glide and creep factors. (See also W78-03998) (Humphreys-ISWS)
W78-04032

ON THE EXTENSION OF HAEFELI'S ONE-DIMENSIONAL THEORY OF STRESS DISTRIBUTION WITHIN A SLOPING SNOW COVER,
National Research Center for Disaster Prevention, Niigata (Japan). Inst. of Snow and Ice Studies.
M. Shoda.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 415-424, 1975. 2 fig, 7 ref.

Descriptors: *Creep, *Stress analysis, *Snow cover, Model studies, Theoretical analysis, Velocity, Distribution patterns, Mechanical properties, Avalanches, Mathematical studies, Mathematical models, Analysis, Foreign research, Analytical techniques, Equations, Profiles, Snow mechanics.

The author generalized Haefeli's approximate solutions for one-dimensional distribution of creep velocity and stresses in a monolayer snow cover lying on a uniform slope of finite length by starting from the equilibrium equation of stresses and a few assumptions for simplifications. In order to estimate the high stress concentration at a thin viscous layer lying between layers of fine snow with more thicknesses and far lower viscosities than those of the sandwiched thin layer, the monolayer theory must be extended to multilayer theory. Such thin layers are one of the typical sliding surfaces of huge slab avalanches. Applying the method for a monolayer to a sloping snow cover composed of double layers having respecitvely different thicknesses and mechanical properties, the author showed a systematic way to derive the one-dimensional solutions for two types of creep profiles, i.e., linear and parabolic. This method will apply to multilayer snow cover, and probably similar forms of the solutions will be obtained. (See also W78-03998) (Humphreys-ISWS)
W78-04033

FRICTION COEFFICIENTS AND SPEED OF FLOWING AVALANCHES,
National Research Council of Canada, Ottawa (Ontario). Div. of Building Research.
P. A. Schaerer.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974; International Association of Hydrological Sciences Publication No. 114, p 425-432, 1975. 2 fig, 2 tab, 9 ref.

Descriptors: *Avalanches, *Snow, *On-site investigations, *Canada, Friction, Kinetics, Movement, Velocity, Density, Theoretical analysis, Foreign research, Foreign countries, On-site tests, British Columbia, *Rogers Pass(British Columbia), Snow mechanics.

Observations were made of the speed of avalanches by timing the advance of their front over a section of track covered with deep snow. The track under observation had uniform incline and cross section, and the avalanches could be as-

sumed to have constant mass and a uniform flowing motion. The observed speeds u could best be expressed by sq u = 1420R(Sin alpha - f cos alpha), with R the hydraulic radius and alpha the inclination of the track. The coefficient of kinetic friction f was found to be dependent primarily on the speed. Tables were presented for estimating the depth and density of the flowing snow from observations of the avalanche snow after is comes to rest. (See also W78-03998) (Humphreys-ISWS)
W78-04034

SNOW AVALANCHE IMPACT PRESSURE ON AN OBSTACLE,
Novosibirsk Railway Engineers Inst. (USSR).
E. P. Isaenko.
In: Snow Mechanics Symposium; Proceedings of the Grindelwald Symposium, Grindelwald, Bernese Oberland (Switzerland), April 1974: International Association of Hydrological Sciences Publication No. 114, p 433-440, 1975. 5 fig, 4 ref.

Descriptors: *Snow, *Avalanches, *Laboratory tests, *Stress analysis, Barriers, Loads(Forces), Deformation, Model studies, Testing procedures, Laboratory equipment, Stress, Strain, Measurement, Velocity, Movement, Analysis, Foreign research, Analytical techniques, Theoretical analysis, Mechanical properties, Density, Mathematical studies, Youngs modulus, *USSR, Snow mechanics.

Since 1968 the Novosibirsk Railway Engineers Institute has been carrying out research on the snow avalanche impact pressure on an obstacle. The volumetric and stress state of a snow mass were studied by means of a special pendulum impact testing machine. Both normal and radial stresses in the snow samples placed in steel cylinders and their axial deformation under the impact conditions were recorded on the oscillograph tape. A system of equations combining the tensor components of strain and stress in the snow samples under shock loads was derived. Modelling criteria for simulation of slab avalanche impact were determined. The experimental investigations of slab avalanche impact were carried out in two channels. Snow blocks had following dimensions: 1.4-1.7 m in width, 1.2-1.4 m in height and 1.5-6 m in length. The density of snow samples varied from 200 to 470 kg/cu m. The velocities of snow blocks movement reached 36 m/s. Sixty-four recordings of the impact process when the obstacle plane was normal to the sample movement direction, and 24 recordings when the obstacle plane was at an angle to the snow block movement were obtained. The theoretical analysis of the process of the plastic bar impact on the perfectly rigid obstacle and analysis of the experimental results showed that snow strains during the avalanche impact should be taken into account if its velocity is more than 15-20 m/s. The neglect of these strains overstates the computed values of impact forces of avalanches. (See also W78-03998) (Humphreys-ISWS)
W78-04035

2D. Evaporation and Transpiration

DRIP IRRIGATION OF SUGARCANE MEASURED BY HYDRAULIC LYSIMETERS, KUNIA, OAHU,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 3F.
W78-03753

METHODOLOGY EXISTING FOR ESTIMATING FREE SURFACE WATER EVAPORATION,
F. C. Granado.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 59-75, 1974. 5 ref.

Descriptors: *Evaporation, *Water loss, *Equations, *Reviews, Reservoirs, Estimating, Methodology, Measurement, Instrumentation, Evaporimeters, Free surfaces.

The purpose of this paper was to recount the methodology for estimating free surface water evaporation, particularly in the case of a reservoir, when studying the regulation curves thereof or the regulation-exploitation system, for statistics and empirical methods. Sixteen equations for calculating evaporation were presented and discussed in varying detail. (See also W78-03783) (Humphreys-ISWS)
W78-03785

DETERMINATION OF EVAPORATION IN CASE OF THE ABSENCE OR INADEQUACY OF DATA,
Gosudarstvennyi Gidrologicheskii Inst., Leningrad (USSR).
P. P. Kuzmin, and A. P. Vershinin.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 217-225, 1974. 1 tab, 19 ref.

Descriptors: *Evaporation, *Estimating, *Equations, Water loss, Water balance, Evapotranspiration, Water surfaces, Land, Surfaces, Foreign countries, Foreign research, Soil moisture, *USSR, *Inadequate data.

The determination of evaporation under natural conditions is of great importance for the estimation of the present and future water resources, for water resources management, and for the solution of various theoretical problems in the field of hydrology and meteorology. The existing computation methods were subdivided into three groups. The first group comprised the methods based on the physical analysis of the evaporation process. The second group included methods based on physical principles combined with semi-empirical constants which can be determined with the help of accurate measurements of actual evaporation in representative regions. The third group included methods based on the statistical analysis using only empirical relations, where empirical constants and coefficients are highly variable and depend on meteorological conditions. Practical recommendation and equations for the determination of evaporation by means of standard observational data from hydrometeorological stations were given. (See also W78-03783) (Humphreys-ISWS)
W78-03794

SOIL MOISTURE OF THE RIDGY-TAKYR COMPLEX IN CENTRAL KARA KUM, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 2G.
W78-04037

LAKE AND PAN EVAPORATION VALUES FOR NORTHERN ARIZONA,
Northern Arizona Univ., Flagstaff. School of Forestry.
C. C. Avery.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 820, Price codes: A05 in paper copy, A01 in microfiche. Completion Report, November 1977. 80 p. OWRT A-062-ARIZ(1), 14-34-0001-7005 and -7006.

Descriptors: Northern Arizona, Evaporation, *Evaporation pans, *Lake evaporation, *Lake Mary(Ariz), Lakes, *Evaporation losses, *Seepage losses, *Municipal water supply.

The objectives were to investigate and report on some site-specific water resources problems in northern Arizona. Specifically, the project has (1) contributed to the development of a hydrologic and economic analysis of the feasibility of lining Upper Lake Mary, (2) searched out and analyzed historic records of pan evaporation for Northern Arizona, (3) maintained a Class A evaporation station at Lake Mary, Coconino County, Arizona for three summers, (4) mapped the surface configuration and bottom relief of Ashurst Lake, Coconino County, Arizona, and, for this lake, determined the depth-area-volume relationships, (5) made a preliminary assessment of the water balance of Ashurst Lake, and (6) provided some basic geologic data for Upper Lake Mary.
W78-04101

2E. Streamflow and Runoff

THE ECOLOGY OF A HIGH MOUNTAIN STREAM IN THE PYRENEES: I. PHYSICAL CONDITIONS, (IN FRENCH),
Toulouse-3 Univ. (France). Lab. d'Hydrobiologie.
P. Lavandier.
Ann Limnol. 10(2), p 173-220, 1974.

Descriptors: *Ecology, High mountain streams, *Pyrenees(France), Snow, Streams, *Estaragne, Temperature, Geographical conditions, Insolation.

The physical conditions in a high mountain stream (in France), the Estaragne and its tributaries, were analyzed in relation to the general geographical conditions. The snow cover over the streams lasts 4-7 mo. according to altitude. Flow rates are constant and low under the snow in winter, high during the thaw (with some current velocities up to 2.5 m/s), and show sudden variations after the snow melts. During floods, the discharge reflects the nature and force of disturbance as well as the capacities for retention in the catchment area. Temperatures are close to zero in winter. They rise with the melting of the snow and consequently fluctuate daily, with insolation having the greatest influence on these changes. Temperature and thermal amplitude increase from source to mouth, but are continuously influenced by the addition of cold water. Over 3 yr. the mean weekly temperatures attained maximum values of 4.2C at 2350 m and 9.9C at 1850 m altitudem with thermal amplitudes of 1.5C and 6C respectively. Although the annual number of degree-days at the mouth is twice that near the source, it does not generally exceed 1000. The smallest tributaries are the earliest to be free of snow cover, they flood less frequently and are warmer than the main stream.--Copyright 1975, Biological Abstracts, Inc.
W78-03732

EFFECTS OF URBANIZATION ON FLOOD CHARACTERISTICS IN NASHVILLE-DAVIDSON COUNTY, TENNESSEE,
Geological Survey, Nashville, TN. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-03766

AN EXAMPLE OF REGIONAL CO-OPERATION FOR IMPROVING THE HYDROLOGICAL AND METEOROLOGICAL INFORMATION,
World Meteorological Organization, Managua (Nicaragua). Central American Hydrometeorological Project.
For primary bibliographic entry see Field 7A.
W78-03785

METHODS OF ANALYSING DEFICIENT DISCHARGE DATA IN ARID AND SEMI-ARID ZONES FOR THE DESIGN OF SURFACE WATER UTILIZATION,
Tahal Water Planning for Asrael Ltd., Tel Aviv.
For primary bibliographic entry see Field 4A.
W78-03788

MAPAI HYDROLOGICAL STUDY (LIMPOPO'S RIVER),
For primary bibliographic entry see Field 4A.
W78-03790

CALCULATION OF RUNOFF IN IRAQ,
For primary bibliographic entry see Field 4A.
W78-03793

ESTIMATION OF FLOODS BY MEANS OF THEIR SILT LOADS,
For primary bibliographic entry see Field 4A.
W78-03800

ESTIMATION OF DESIGN FLOODS AND THE PROBLEM OF EQUATING THE PROBABILITY OF RAINFALL AND RUNOFF,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 4A.
W78-03801

SYNTHETIC UNIT HYDROGRAPH TECHNIQUE FOR THE DESIGN OF FLOOD ALLEVIATION WORKS IN URBAN AREAS,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-03802

A DIMENSIONLESS UNITGRAPH FOR HONG KONG,
Southampton Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-03803

STUDY OF MAXIMUM FLOODS IN SMALL BASINS OF TORRENTIAL TYPE,
For primary bibliographic entry see Field 4A.
W78-03804

FLOOD ESTIMATION BY DETERMINATION OF REGIONAL PARAMETERS FROM LIMITED DATA,
For primary bibliographic entry see Field 4A.
W78-03805

PRACTICES OF DESIGN FLOOD FREQUENCY FOR SMALL WATERSHEDS IN THAILAND,
Royal Irrigation Dept., Bangkok (Thailand). Hydrology Div.
For primary bibliographic entry see Field 4A.
W78-03806

DESIGN DISCHARGE DERIVED FROM DESIGN RAINFALL,
Public Works Research Inst., Tokyo (Japan).
For primary bibliographic entry see Field 2A.
W78-03807

THE USE OF CENSORED DATA IN ESTIMATING T-YEAR FLOODS,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 4A.
W78-03808

ASSESSMENT OF DESIGN FLOODS IN BRAZIL,
For primary bibliographic entry see Field 4A.
W78-03809

METHODS FOR THE ESTIMATION OF MAXIMUM DISCHARGES OF SNOW MELT AND RAINFALL WATER WITH INADEQUATE OBSERVATIONAL DATA,
Gosudarstvennyi Gidrologicheski Inst., Leningrad (USSR).
A. A. Sokolov.
In: Design of Water Resources Projects with Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 615-623, 1974. 32 ref.

Descriptors: *Floods, *Rainfall-runoff relationships, *Reviews, Discharge(Water), Methodology, Equations, Rational formula, Hydrographs, Runoff, Melt water, *Snowmelt, Rainfall, Watersheds(Basins), Precipitation(Atmospheric), Foreign countries, *USSR, Inadequate data.

The problem of flood computation was accepted by the UNESCO Co-ordinating council for the IHD as one of the most important problems. For its solution, the Working Group on Floods and their computation was established, and several projects on the IHD program essential for future research on floods and development and improvement of methods for floods computation have been realized. This paper gave an evaluation of the up-to-data state of the problem as means for its solution. Flood discharge computation schemes reviewed included: (1) Empirical or semi-empirical formula for discharge computation based on the account of some of its most important factors (e.g., drainage area or maximum precipitation rate), providing maximum water discharge only; and (2) Methods considering flood genesis and providing the possibility of plotting the whole hydrograph on the basis of time inflow of snowmelt and rainfall water and its tranformation into runoff as a result of losses by infiltration, surface retention, lag along the slopes, and channel network. (See also W78-03783) (Humphreys-ISWS)
W78-03811

COMPUTATION OF PROBABILISTIC VALUES OF LOW FLOW FOR UNGAUGED RIVERS,
Gosudarstvennyi Gidrologicheskii Inst., Leningrad (USSR).
For primary bibliographic entry see Field 4A.
W78-03812

A STUDY OF MAXIMUM FLOOD DISCHARGE FORMULAS,
Seoul National Univ. (Republic of Korea). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-03813

2F. Groundwater

RECHARGE AND NITROGEN TRANSPORT MODELS FOR NASSAU AND SUFFOLK COUNTIES, N. Y.,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 5B.
W78-03756

DIGITAL MODEL OF THE ARIKAREE AQUIFER NEAR WHEATLAND, SOUTHEASTERN WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
D. T. Hoxie.
Open-file report 77-676, August 1977. 54 p, 20 fig, 3 tab, 12 ref.

Descriptors: *Computer models, *Surface-groundwater relationships, *Hydrogeology, *Aquifer characteristics, *Wyoming, Groundwater movement, Groundwater availability, Irrigation, Industrial water, Projections, Hydrologic budget, *Arikaree aquifer(Wyo), Southeastern Wyoming.

A digital model that mathematically simulates the flow of ground water, approximating the flow system as two-dimensional, has been applied to predict the long-term effects of irrigation and proposed industrial pumping from the unconfined Arikaree aquifer in a 400 square-mile area in southeastern Wyoming. Three cases that represent projected maximum, mean, and minimum combined irrigation and industrial ground-water withdrawals at annual rates of 16,176, 11,168, and 6,749 acre-feet, respectively, were considered. Water-level declines of more than 5 feet over areas of 124, 120, and 98 square miles and depletions in streamflow of 14.4, 8.9, and 7.2 cfs from the Laramie and North Laramie Rivers were predicted to occur at the end of a 40-year simulation period for these maximum, mean, and minimum withdrawal rates, respectively. A tenfold incrase in the vertical hydraulic conductivity that was assumed for the streambeds results in smaller predicted drawdowns near the Laramie and North Laramie Rivers and a 36 percent increase in the predicted depletion in streamflow for the North Laramie River. (Woodard-USGS)
W78-03761

GROUND-WATER LEVELS IN WYOMING, 1976,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03768

CHANGES IN AQUIFER-SYSTEM PROPERTIES WITH GROUND-WATER DEPLETION,
Geological Survey, Sacramento, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-03769

DEFINING REACTIONS AND MASS TRANSFER IN PART OF THE FLORIDAN AQUIFER,
Geological Survey, Reston, VA. Water Resources Div.
L. N. Plummer.
Water Resources Research, Vol. 13, No. 5, p 801-812, October 1977. 4 fig, 6 tab, 37 ref.

Descriptors: *Groundwater movement, *Mass transfer, *Radioactive dating, *Florida, *Aquifers, Analytical techniques, Age, Time, Chemical properties, Flow rates, *Floridan aquifer, Carbon-13, Carbon-14.

Use of mass balance relationships, mass transfer simulation procedures, and prediction of carbon isotopic composition of waters leads to the following conclusions regarding reactions occurring down the gradient in a portion of the Floridan aquifer: (1) The waters of the recharge area near Polk City have an average age of 3200 yr and have formed by congruent solution of dolomite and calcite. CO2 entering the saturated zone in the vicinity of Polk City has a mean C-13 composition of -22.5 plus or minus 0.6 percent. (2) Down the hydraulic gradient from the vicinity of Polk City, isotopically light dolomites (C-13 = -3.9 to -1.5 percent) and gypsum dissolve. All reactions south of Polk City are incongruent to low-magnesian calcites. The reaction path between Polk City and Fort Meade is partially open to CO2 presumably soil zone CO2. Farther south down the gradient, between Fort Meade and Wauchula, the Floridan aquifer becomes essentially closed to CO2. Farther south, between Wauchula and Arcadia, oxidation of lignite (possibly via sulfate reduction) adds additional carbon to the water composition. C-14 ages, corrected for the derived mass transfer reactions, are slightly younger than was previously recognized owing to consideration of incongruent dissolution. At the farthest point down the gradient, the age of (Arcadia) water is estimated to be 36,000 yr B.P. (3) Flow velocities derived from C-14 ages are in reasonable agreement with flow velocities estimated from hydrologic considerations and are approximately 2-10 m/yr. (4) The derived mass transfer reactions point to a complex

diagenetic history in central Florida. The position of the freshwater-seawater interface appears to determine whether dolomite will be a product of reactant mineral. Today, isotopically light diagenetic dolomites, which presumably formed when mixing zone stood at a higher stratigraphic level in central Florida, are reactants in the freshwater of the Floridan aquifer. (Woodard-USGS)
W78-03770

GROUND-WATER RESOURCES OF CENTRAL AND SOUTHERN YORK COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
O. B. Lloyd, Jr., and D. J. Growitz.
Pennsylvania Geological Survey, Harrisburg, Fourth Series, Water Resources Report 42, 1977. 93 p, 8 fig, 2 plates, 18 tab, 27 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, *Pennsylvania, Water wells, Well data, Hydrogeology, Pumping, Specific capacity, Maps, Water analysis, Chemical analysis, *York County(Pa).

The area of investigation is in the Conestoga Valley and Piedmont Uplands sections of the Piedmont province in Pennsylvania. From the specific capacities of wells in the bedrock aquifers it is estimated that 25 percent of the wells should produce 400 gpm, from the Ledger Formation; 140 gpm from the Conestoga Formation; about 50 to 100 gpm from the Chickies and Vintage Formations, the albite-chlorite schist and metavolcanics of the Wissahickon Formation, the Peters Creek Schist, and the shale of the Kinzers Formation; and less than 25 gpm from the Antietam and Harpers Formations, the Marburg Schist, and limestones of the Kinzers Formation. In general the water in the carbonate-rock aquifers has a hardness of about 220 mg/liter, and a pH of 7.0. Water in the noncarbonates has a hardness of about 50 mg/liter and pH of 5.9. The occurrence of nitrate is common in water from the albite-chlorite schist and metavolcanics of the Wissahickon Formation, Marburg Schist, Peach Bottom Slate, and Peters Creek Schist. Nitrate concentrations that exceed 45 mg/liter were found in water sampled from the Conestoga and Harpers Formations; the Marburg Schist and the albite-chlorite schist and metavolcanics of the Wissahickon Formation; and the limestones of the Kinzers Formation. (Woodard-USGS)
W78-03771

WATER RESOURCES OF OKALOOSA COUNTY AND ADJACENT AREAS, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-03774

PRELIMINARY EVALUATION OF GROUND WATER IN THE PRE-PENNSYLVANIAN CARBONATE ROCKS, MCCOY AREA, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-03776

GEOHYDROLOGICAL STUDIES IN SMALL AREAS WITHOUT SYSTEMATIC DATA,
For primary bibliographic entry see Field 4B.
W78-03787

PROSPECTS FOR GEOTHERMAL ENERGY APPLICATIONS AND UTILIZATION IN CANADA,
Toronto Univ. (Ontario). Inst. for Aerospace Studies.
For primary bibliographic entry see Field 4B.
W78-03845

SUITABILITY OF FLUOROCARBONS AS TRACERS IN GROUND WATER RESOURCES EVALUATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5A.
W78-03967

STUDIES OF SUBTERRANEAN WATERS: 25. METHODS OF COLLECTING INTERSITITIAL SUBTERRANEAN WATERS, (IN FRENCH),
Centre National de la Recherche Scientifique, Moulis (France). Lab. Souterrain.
For primary bibliographic entry see Field 7B.
W78-04024

GROUNDWATER ANALYSIS BY TRITIUM TECHNIQUE: A PRELIMINARY EVALUATION,
Guam Univ., Agana. Water Resources Research Center.
J. F. Mink, and L. S. Lau.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 806, Price codes: A03 in paper copy, A01 in microfiche. Publication No. 2, October 1977. 29 p, 4 fig, 3 tab, 5 ref, 2 append. OWRT A-002-GUAM(1), 14-34-0001-6054, 7023, 7024.

Descriptors: *Groundwater, *Radioactive dating, *Tritium, Water sampling, Water analysis, Analytical techniques, Pollutant identification, Water quality, Water yield, *Guam.

Water samples representing basal, parabasal, basal spring, and perched water in limestone in northern Guam and volcanic groundwater in southern Guam were collected, analyzed, evaluated, and interpreted in terms of tritium and selected geochemical water quality parameters in 1976. The groundwater age was very young, about 5 or less years old, and readily rechargeable by contemporary rain water. There was a discernible gradation in the tritium level and chemical quality of the water samples. The study findings agree well with and augment current groundwater hydrologic knowledge and suggest prospects for possible additional water yield for several locations.
W78-04100

2G. Water In Soils

CHEMICAL STABILIZATION OF SOFT SOILS,
Port and Harbour Research Inst., Kanagawa (Japan). Soil Stabilization Lab.
For primary bibliographic entry see Field 5G.
W78-03744

DRIP IRRIGATION OF SUGARCANE MEASURED BY HYDRAULIC LYSIMETERS, KUNIA, OAHU,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 3F.
W78-03753

A STUDY ON THE ENVIRONMENTAL FACTORS IN AN EEL POND: III. LOW REDOX POTENTIAL OF THE POND SOIL IN MARCH 1972, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
Y. Satomi, J. Toi, and T. Ito.
Bull Freshwater Fish Res Lab Tokyo. 23(1), p 1-4, 1973.

Descriptors: Bronchionephritis, *Eel ponds, Environmental factors, Ponds, *Redox potential, *Soils, Salts, *Pond soil.

In recent years salt has been used in eel ponds to prolong the life span of eels affected by bronchionephritis. Salt has had a good effect of reducing the loss of eels by bronchionephritis but has increased the salt content of the pond in general. The effect of salt on pond soil was studied in eel ponds of Shizuoka Prefecture, Japan in March 1972. The study revealed the extremely low redox potentials and increased pH values of the pond soil. This had no relationship to the levels of organic substances of the pond. It was presumed that the Ca ions of the soil were replaced by Na ions of water, deteriorating the physical properties of the soil. (See also W76-12275 and W74-02933) Copyright 1975, Biological Abstracts, Inc.
W78-03960

SOIL MOISTURE OF THE RIDGY-TAKYR COMPLEX IN CENTRAL KARA KUM, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
M. Nurberdiev.
Probl Osvoeniya Pustyn'. 1, p 70-73, 1974.

Descriptors: *Soil moisture, *Evaporation, Sands, Fedoseev's method, Humidity, *Central Kara Kum(USSR), Ridgy Takyr Complex(USSR), Soils.

The evaluation of evaporation rates depending on the relief forms was accomplished in accordance with Fedoseev's methods. A plot in a level sand area was taken as the standard, the humidity rate of the plot was accepted as 1. The humidity coefficient of the soil layer 0-50 cm in eastern and western slopes of sand ridge is 0.7 (as compared with the standard one), and in the takyr low areas-1.9. Copyright 1975, Biological Abstracts, Inc.
W78-04037

2H. Lakes

DISCHARGE AND WATER-QUALITY DATA FOR SELECTED STREAMS AT LOW FLOW INCLUDING SOME BOTTOM-MATERIAL ANALYSES, AND LIMNOLOGICAL STUDY OF SIX LAKES, WESTCHESTER COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-03758

PHYSICAL, CHEMICAL, AND BIOLOGICAL RELATIONS OF FOUR PONDS IN THE HIDDEN WATER CREEK STRIP-MINE AREA, POWDER RIVER BASIN, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-03763

PHYTOPLANKTON AND ENVIRONMENTAL FACTORS IN LAKE HJALMAREN, 1966-1973,
National Swedish Environment Protection Board, Uppsala. Limnological Survey.
For primary bibliographic entry see Field 5C.
W78-03816

LIMNOLOGICAL STUDIES IN A LARGE, DEEP, OLIGOTROPHIC LAKE (LAKE OHRID, YUGOSLAVIA): SEASONAL AND ANNUAL PRIMARY PRODUCTION DYNAMICS OF THE PELAGIAL PHYTOPLANKTON,
Hidrobioloski Zavod, Ochrida (Yugoslavia).
For primary bibliographic entry see Field 5C.
W78-03820

S190 INTERPRETATION TECHNIQUES DEVELOPMENT AND APPLICATION TO THE NEW YORK STATE WATER RESOURCES,
Calspan Corp., Buffalo, NY.

For primary bibliographic entry see Field 5A.
W78-03822

ALGAL NUTRIENT AVAILABILITY AND LIMITATION IN LAKE ONTARIO DURING IFYGL, PART I. AVAILABLE PHOSPHORUS IN URBAN RUNOFF AND LAKE ONTARIO TRIBUTARY WATERS,
Texas Univ. at Dallas, Richardson.
For primary bibliographic entry see Field 5C.
W78-03824

MICHIGAN TRIBUTARY LOADINGS TO THE UPPER GREAT LAKES,
Michigan Dept. of Natural Resources, Lansing.
For primary bibliographic entry see Field 5B.
W78-03825

CHLORIDE AND NITROGEN CONCENTRATIONS ALONG THE WEST SHORE OF LAKE ERIE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5B.
W78-03826

ACTINOMYCETE DISTRIBUTION IN NORTHERN GREEN BAY AND THE GREAT LAKES, TASTE AND ODOR RELATIONSHIPS IN EUTROPHICATION OF NEARSHORE WATERS AND EMBAYMENTS,
Michigan Dept. of Natural Resources, East Lansing.
For primary bibliographic entry see Field 5C.
W78-03827

ATMOSPHERIC INPUT OF PHOSPHORUS TO SOUTHERN LAKE HURON, APRIL-OCTOBER, 1975,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5B.
W78-03828

BACTERIAL COENOSES OF WATER AND BOTTOM SEDIMENTS OF THE FISHERY PONDS IN THE UKRAINIAN SSR, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
For primary bibliographic entry see Field 5C.
W78-03829

FLORA AND FAUNA IN FRESHWATER BODIES OF THE THALA HILLS OASIS (ENDERBY LAND, EASTERN ANTARCTICA),
Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology.
For primary bibliographic entry see Field 5C.
W78-03830

LIMNOLOGICAL STUDIES IN A LARGE, DEEP OLIGOTROPHIC LAKE (LAKE OHRID, YUGOSLAVIA). A SUMMARY OF NUTRITIONAL RADIOBIOASSAY RESPONSES OF THE PELAGIAL PHYTOPLANKTON,
Dartmouth Coll, Hanover, NH. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-03832

DISSOLVED ORGANIC MATTER IN LAKEWATER: CHARACTERISTICS OF MOLECULAR WEIGHT SIZE-FRACTIONS AND ECOLOGICAL IMPLICATIONS,
Dartmouth Coll., Hanover, NH. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-03833

RECENT SEDIMENTATION AND RESUSPENSION OF ORGANIC MATTER IN EUTROPHIC LAKE ESROM, DENMARK,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
For primary bibliographic entry see Field 5C.
W78-03834

THE PROFUNDAL BENTHIC ENVIRONMENT OF TWIN LAKES, COLORADO,
Bureau of Reclamation, Denver, CO.
For primary bibliographic entry see Field 5C.
W78-03838

AGING AND EVALUATION OF TWIN LAKES SEDIMENTS,
Colorado Cooperative Fishery Unit, Fort Collins.
For primary bibliographic entry see Field 2J.
W78-03839

BACTERIOLOGICAL SURVEY OF TWIN LAKES, COLORADO,
Bureau of Reclamation, Denver, CO.
For primary bibliographic entry see Field 5C.
W78-03840

IFYGL TEMPERATURE TRANSECTS: TEMPERATURE DISTRIBUTIONS ACROSS THREE SECTIONS OF LAKE ONTARIO CONTINUOUSLY TRANSVERSED OVER FOUR-DAY INTERVALS IN JULY, AUGUST, AND OCTOBER 1972,
Canada Centre for Inland Waters, Burlington (Ontario).
F. M. Boyce, and C. H. Mortimer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 003, Price codes: A06 in paper copy, A01 in microfiche. Working Draft of Final Report, 1976. 362 p, 114 fig, 8 tab, 13 ref, append. NOAA-2-35307 and NOAA-3-35468.

Descriptors: *Lake Ontario, *Water temperature, *Baseline studies, *Data collections, Depth, Research equipment, IFYGL, Great Lakes, Circulation, Monitoring, Equipment, Methodology, Lakes, Water quality, Seasonal.

Three cross-sections of Lake Ontario were scanned for temperature distributions by depth, using towed depth-undulating instruments, thermistor chains, and bathythermographs deployed or towed from research vessels as part of the IFYGL program. Cross-sections and dates of continuous scanning during 1972 were (1) Olcott to Oshawa (10-14 July, 9-12 August, 2-6 October); (2) Braddock Point to Presque'ile (24-28 July, 7-11 August, 2-6 October); and (3) Oswego to Prince Edward Island (same as section 2). For section 1, two measuring systems were used; one was an undulating towed body, the 'Batfish,' carrying an electronic bathythermograph (EBT) probe; the second was a towed thermistor chain. In section 2, a newly-developed undulating temperature/pressure sensor (described in an appendix) was towed. For section 3, mechanical thermographs were used. Each monitoring system is described in detail. Scanning results are presented in 126 transect diagrams showing depth, temperature, and date. These data are also compared with all available contemporary data from recording instruments moored in or near the transects, and from Coastal Chain surveys made for other purposes at the inshore ends of each transect. The data constitute a data base for the study of upwelling/downwelling events, quasi-geostrophic flow, and internal waves. (Lynch-Wisconsin)
W78-03841

LAKES AND PONDS,
Pennsylvania Univ., Philadelphia. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 6B.
W78-03842

CONCENTRATION OF TOTAL THIAMINE IN ORGANS AND TISSUES OF FISHES FROM THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
For primary bibliographic entry see Field 5C.
W78-03862

FLOW AND MAIN ELEMENTS OF BALANCE OF BIOGENIC SUBSTANCES AND MAIN IONS IN THE KIEV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk USRS, Kiev. Inst. Hidrobiologii.
For primary bibliographic entry see Field 5C.
W78-03878

METHODOLOGICAL CONSIDERATIONS IN WESTERN LAKE SUPERIOR WATER-SEDIMENT EXCHANGE STUDIES OF SOME TRACE ELEMENTS,
National Water Quality Lab., Duluth, MN.
For primary bibliographic entry see Field 5A.
W78-03985

LAGUNA DE BAY WATER RESOURCES DEVELOPMENT,
Bureau of Experts, Sogreah, Grenoble, France.
For primary bibliographic entry see Field 5G.
W78-03994

GROWTH, DEVELOPMENT AND PRODUCTION OF THE MAIN CLADOCERAN SPECIES OF LAKE SARTLAN, (IN RUSSIAN),
D. P. Pomerantseva.
Gidrobiol Zh. 10(6), p 66-70, 1974.

Descriptors: *Lake Sartlan(USSR), Growth rates, Productivity, Biomass, Water temperature, Ceriodaphnia reticulata, *Cladoceran, Cydrous sphaericus, Daphnia longispina, Diaphanosoma brachyurum, Lakes, Moina rectirostris, Russian SFSR.

Data are presented on the linear growth, duration and development in relation to water temperature, production (P), biomass (B) and P/B ratios of cladocera (Ceriodaphnia reticulata, Diaphanosoma brachyurum, Chydrous sphaericus, Daphnia longispina and Moina rectirostris) in Lake Sartlan, a large fishery lake located in the forest-steppe zone of western Siberia (Russian SFSR, USSR). Copyright 1975, Biological Abstracts, Inc.
W78-04038

HEAVY METAL CONCENTRATIONS IN ONTARIO FISH,
Toronto Univ. (Ontario). Inst. for Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-04039

BIOGEOGRAPHIC ANALYSIS OF ROTIFERS, CLADOCERANS AND COPEPODS OF ALPINE LAKES OF PAMIR AND TIEN SHAN, (IN RUSSIAN),
Tashkent Univ. (USSR).
V. F. Gurvich.
Gidrobiol Zh. 10(6), p 25-31, 1974.

Descriptors: *Biogeographic analysis, *Alpine lakes, Crustaceans, *Cladocerans, *Copepods, Lakes, *Pamir(USSR), *Rotifers, *Tien Shan(USSR).

A comparative analysis of Rotatoria, Cladocera and Copepoda was performed in Lakes Pamir and Tien Shan (USSR), where 108 spp. of these 3 groups were found: 49 spp. of rotifers, 42 spp. of cladocerans and 17 spp. of copepods. In Pamir 34, 35 and 14 spp. were found and in Tien Shan 30, 20

and 9 spp., respectively. There were 15 spp. of rotifers, 13 spp. of cladocerans and 6 spp. of copepods common to both regions. The similarities and differences of the fauna of both high-mountain regions are explained by the geography and geological history. Copyright 1975, Biological Abstracts, Inc.
W78-04040

ROLE OF MICROORGANISMS OF THE DIGESTIVE TRACT IN THE NUTRITION OF POND FISH: 13. QUANTITY AND SPECIES COMPOSITION OF DIGESTIVE TRACT MICROORGANISMS OF CARP DURING ARTIFICIAL FEEDING, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius. Inst. Zoologii i Parazitologii.
V. N. Lubyanskene, K. K. Yankyavichyus, O. P. Tryapshene, and L. A. Rachvunas.
Liet Tsr Mokslu Akad Darb Ser C Biol Mokslai 1, p 65-70, 1976.

Descriptors: *Fish diets, *Carp, Fish, *Microorganisms, Nutrition, Ponds, Pseudomonas denitrificans.

Carp living on artificial food had less microorganism diversity and more physiological biochemical activity than fish living on natural food. Pseudomonas denitrificans, notable for high activity in synthesis of physiologically active substances, was strikingly predominant in the intestine of carps living on artificial food. The amount of microorganisms in carp intestine was directly dependent on the age and feeding intensity of the fish. The most microorganisms and the greatest species diversity were found in the fore- and Mid-intestine. Copyright 1977, Biological Abstracts, Inc.
W78-04051

MICROBIOLOGICAL CHARACTERISTICS OF LAKES IN THE YAROSLAVL OBLAST, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W78-04058

RECLAMATION OF POLLUTED FARM PONDS,
Louisiana Tech Univ., Ruston. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-04098

LAKE AND PAN EVAPORATION VALUES FOR NORTHERN ARIZONA,
Northern Arizona Univ., Flagstaff. School of Forestry.
For primary bibliographic entry see Field 2D.
W78-04101

ASSESSMENT OF WATER QUALITY STATUS AND TRENDS IN MINNESOTA BY REMOTE SENSING TECHNIQUES,
Minnesota Univ., Minneapolis.
For primary bibliographic entry see Field 5A.
W78-04105

GREAT LAKES WATERS: RADIATION DOSE COMMITMENTS, POTENTIAL HEALTH EFFECTS, AND COST-BENEFIT CONSIDERATIONS,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5G.
W78-04109

ENVIRONMENTAL CONDITIONS OF PERCID WATERS IN CENTRAL EUROPE,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 5C.
W78-04121

LIMNOLOGICAL CHARACTERISTICS OF ONTARIO LAKES IN RELATION TO ASSOCIATIONS OF WALLEYE (STIZOSTEDION VITREUM VITREUM), NORTHERN PIKE (ESOX LUCIUS), LAKE TROUT (SALVELINUS NAMAYCUSH), AND SMALLMOUTH BASS (MICROPTERUS DOLOMIEUI),
Canada Centre for Inland Waters, Burlington (Ontario); and Fisheries and Marine Service, Ottawa (Ontario). Great Lakes Biolimnology.
For primary bibliographic entry see Field 5C.
W78-04122

FACTORS AFFECTING THE SHIFT IN PREDOMINANCE FROM EURASIAN PERCH (PERCA FLUVIATILIS) TO ROACH (RUTILUS RUTILUS) IN THE KLICAVA RESERVOIR, CZECHOSLOVAKIA,
Karlova Univ. Prague (Czechslovakia). Dept. of Systematic Zoology.
K. Pivnicka, and M. Svatora.
Journal of the Fisheries Research Board of Canada, Vol. 34, 1977, Part of the Proceedings of the Percid International Symposium convened at Quetico Centre, Ontario, September 24-October 5, 1976. p 1571-1575, 5 tab, 14 ref.

Descriptors: Environmental effects, *Limnology, Fish, Populations, Biological communities, Dominant organisms, Reservoirs, Fecundity, Reproduction, Czechoslovakia, *Perches, *Roach, Perca fluviatilis, Rutilus rutilus, Percids, Percidae.

Investigations into the factors considered responsible for the shift in predominance from Eurasian perch to roach was conducted ten years after the filling of the reservoir. It was concluded that the shift in predominance was primarily due to the decline in ratio of female to male perch spawners. The ratio was 1:4 for perch and unity for roach. Growth rate for roach in response to increasing abundance was greater than for perch. Under the same environmental conditions, the roach is theoretically capable of producing a more abundant population. (Chilton-ORNL)
W78-04123

TEMPERATURE REQUIREMENTS OF SOME PERCIDS AND ADAPTATIONS TO THE SEASONAL TEMPERATURE CYCLE,
Environmental Research Lab.-Duluth, Monticello, MN. Monticello Ecological Research Station.
K. E. F. Hokanson.
Journal of the Fisheries Research Board of Canada, Vol. 34, 1977, Part of the Proceedings of the Percid International Symposium convened at Quetico Centre, Ontario, September 24-October 5, 1976. p 1524-1550, 9 fig, 5 tab, 169 ref.

Descriptors: *Environmental effects, *Temperature, *Seasonal, Fish, Limnology, Adaptation, Review, Walleye, *Perches, Sauger, Management, Bibliographies, *Percids, Percidae.

Temperature requirements for some percids and cohabitat species are reviewed. Reflecting the intermediate temperature niche of percids in fish communities, percids are classified as temperate mesotherm. The present paper describes responses to temperature for each species in the areas of reproduction, growth, survival, and activity. It was concluded the percid life phases are uniquely adapted to the seasonal temperature cycle of a temperate climate. Implications for management are discussed. (Chilton-ORNL)
W78-04124

RESULTS OF AN EXPERIMENTAL FISHERY ON THE CRAYFISH ORCONECTES VIRILIS,
Michigan Dept. of Natural Resources, Lewiston. Hunt Creek Fisheries Research Station.
W. T. Momot, and H. Gowing.
Journal of the Fisheries Research Board of Canada, Vol 34, 1977, p 2056-2066, 3 fig, 7 tab, 16 ref. NSF Grant BMS-71-01540-A02.

Descriptors: *Environmental effects, Management, *Fish management, Population, *Crayfish, Reproduction, Experimental fishery, Maximum Sustained Yield.

The objectives of the study were to determine the effects of exploitation on a population of freshwater crayfish and to evaluate maximum sustained yield (MSY) as a possible method for managing crayfish populations. In one lake, yield was increased by overfishing in 1974 and 1975 (with the yield dropping in 1975 but still above average) but evidence of overfishing became noticeable when the age composition of the catch was examined. Increased stress on the population suppressed the normal growth response. This decrease in growth rates was reflected in the mean size of individuals at a given age and the poor production of recent cohorts. In another lake, a 300 trap-day effort was retained in 1974 and 1975 but, due to failing recruitment, a 20% over harvest occurred in 1974 and a drastic over harvest in 1975. It was concluded that changes in productivity during the period of exploitation (related to loss of microhabitat for hatchlings) offset the benefits of MSY management. (Chilton-ORNL)
W78-04125

ENERGY, WATER AND TRITIUM BUDGETS FOR PERCH LAKE: 1974,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
For primary bibliographic entry see Field 5C.
W78-04128

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES, THE KEWAUNEE NUCLEAR POWER PLANT SITE,
Argonne National Lab. IL.
For primary bibliographic entry see Field 5C.
W78-04132

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES, THE ZION NUCLEAR POWER STATION SITE,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5C.
W78-04134

FEEDING ECOLOGY OF THE BLUEGILL, LEPOMIS MACROCHIRUS, IN TWO HEATED RESERVOIRS OF TEXAS, III. TIME OF DAY AND PATTERNS OF FEEDING,
Bangladesh Agricultural Univ., Mymensingh. Faculty of Fisheries.
A. L. Sarker.
Transactions of the American Fisheries Society, Vol. 106, No. 6, p 596-601, 1977. 16 ref, 3 fig.

Descriptors: *Sunfishes, *Aquiculture, *Diurnal, *Biorhythms, *Feeding rates, *Heated water, *Environmental effects, *Aquatic insects, *Fish behavior, Distribution, Fish food organisms, Powerplants, Ecological distribution, Texas, Seasonal, Insects, Crustaceans, Effluent streams, Fish diets, Lepomis macrochirus.

The times and patterns of feeding of 1,366 bluegill in two heated reservoirs of Texas were studied by the 'points' method for over a year. Fish were collected on alternate hours from an electric power plant discharge canal and an open-water station in each reservoir over 24-hour periods. Both average index of fullness of the stomachs and average points per fish showed that a similar diet pattern of feeding. The fish were largely diurnal feeders with a nocturnal component. The stomachs contained least food during the period from 0200 h to 0800 h. Feeding increased after sunrise, and the fish showed a minor peak by 0900-1000 h and a major peak by 1800-1900 h. A gradual decline in food volume began after 1900 h and continued until

2200, h followed by a sharp decline at 2300 h. A diverse range of food organisms was consumed by the fish during the daylight hours. Planktonic crustaceans and nonaquatic organisms were rarely found in the stomachs of the fish taken at night. In the discharge-canal fish, 75% fullness of the stomachs occurred by 0900 h, but in fish from the open waters, comparable stomach fullness did not occur until 1400-1600 h. (Katz)
W78-04139

PALAEOECOLOGICAL STUDIES OF THE RECENT DEVELOPMENT OF LAKE VAXJOSJON II. SETTLEMENT AND LANDSCAPE DEVELOPMENT,
Kvartarbiologiska Labs, Lund (Sweden).
For primary bibliographic entry see Field 5C.
W78-04152

REPORT OF A WORKSHOP ON THE IMPACT OF THERMAL POWER PLANT COOLING SYSTEMS ON AQUATIC ENVIRONMENTS.
Sigma Research Inc., Richland, WA.
For primary bibliographic entry see Field 5C.
W78-04155

AQUATIC LIFE IN TEXAS RESERVOIRS,
Texas Electric Service Co., Fort Worth.
For primary bibliographic entry see Field 5C.
W78-04172

MERCURY IN WATERS AND BOTTOM SEDIMENTS OF SOME SELECTED MAZURIAN LAKES,
Akademia Rolniczo-Techniczna, Olsztyn-Kortowo (Poland). Inst. of Agrochemistry.
For primary bibliographic entry see Field 5A.
W78-04184

FISH POPULATION STRUCTURE IN ARCTIC LAKES,
Laval Univ., Quebec. Centre d'Etudes Nordiques.
G. Power.
Journal of the Fisheries Research Board of Canada, Vol. 35, No. 1, January 1978, p 53-59, 6 fig, 9 ref.

Descriptors: *Model studies, Fish population, Lakes, Growth rates, Aging(Biological), *Fish population, *Distribution patterns, *Arctic lakes, Salvelinus namaycush, Coregonus clupeaformis, *Lake trout, *Lake whitefish.

A model is developed to demonstrate an explanation of the observed structure of arctic lake fish populations. It is suggested that existing theories accounting for the predominance of older, larger individuals and the bimodal character of the length-frequency distribution of unexploited populations are in error due to problems in age determinatiorl of the populations. Growth rates of fish are seen to be rapid until first maturity after which time it becomes slow. Mortalities decline rapidly through early life and stabilize at a low level through most of the life span. These growth and mortality patterns produce a population of many small, few intermediate, and many large fish. This information is compared with observations from several lakes in northern Quebec. (Chilton-ORNL)
W78-04187

PHYTOPLANKTON SUMMER STANDING CROP AND ANNUAL PRODUCTIVITY AS FUNCTIONS OF PHOSPHORUS LOADING AND VARIOUS PHYSICAL FACTORS,
Cornell Univ., NY. Dept. of Natural Resources.
For primary bibliographic entry see Field 5C.
W78-04189

SEDIMENT CONTAMINATION AND BENTHIC MACROINVERTEBRATE DISTRIBUTION IN A METAL-IMPACTED LAKE,
Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5C.
W78-04193

2I. Water In Plants

FUNGI AS A COMPONENT OF FRESHWATER BIOCENOSES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Botaniki.
I. A. Dudka.
Mikol Fitopatol. 8(5), p 444-449, 1975.

Descriptors: *Aquatic fungi, *Food chains, Organic matter, *Trophic level, Aquatic plants, Biodegradation, *Decomposing organic matter, Ascomycete, Asterionella formosa, *Biocenoses(Freshwater), Deuteromycete, Fish, Hyphomycetes, Moniliales, Parasitism, Phycomycetes, Rhizophydium planktonicum.

The role of fungi in freshwater biocenoses is discussed with an emphasis on literature data. Both freshwater fungi and fungi which are 'active migrants,' are primary consumers in the trophic chain, participating in the decomposition of allochthonous and autochthonous organic substances. The typical freshwater fungi include lower fungi, Ascomycetes, Deuteromycetes and Hyphomycetes, developing on plant remains in water. Active migrants include Ascomycetes and Moniliales which usually develop on shore plants and in soil. Both types of fungi affect biocenoses by fungal parasitism of various aquatic organisms (development of Rhizophydium planktonicum on Asterionella formosa and of Saprolegniales (Oomycetes) on nekton, especially fish), in producing various physiologically active metabolites and in changing the intensity of abiogenic factors. The role of fungi in the formation of aquatic biocenoses and their role in the trophic chain and transformation of substances is determined by the type of body of water, i.e., all complex abiotic and biotic factors characteristic for a biotope. A tendency for fungal complexes to be specific for (characteristic of) planktonic, benthic and neuston communities was noted. Copyright 1975, Biological Abstracts, Inc.
W78-04042

2J. Erosion and Sedimentation

HYDRAULIC DREDGING AS A LAKE RESTORATION TECHNIQUE: PAST AND FUTURE,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5G.
W78-03747

FIELD GUIDE TO THE GEOLOGY OF THE DURHAM TRIASSIC BASIN, NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.; and Campbell Coll., Buie's Creek, NC.
G. L. Bain, and B. W. Harvey.
North Carolina Department of Natural Resources and Community Development, Raleigh, 1977. 83 p, 24 fig, 57 ref, 2 append.

Descriptors: *Geophysics, *Sedimentation, *Data collections, *North Carolina, *Geologic formations, Faults(Geologic), Playas, Chert, Coals, Hydrogeology, Fluvial sediments, Resistivity, Gravity, Seismic properties, *Durham Triassic basin(NC).

The geophysical data from the Durham basin in North Carolina, describe a fault graben more complex than previously thought. The fault that produced it probably was a deep crustal one expressed at the surface as a series of en echelon positive fault blocks which supplied sediment and negative ones which received that sediment. The irregular linear basin which resulted contains a spatial facies distribution controlled by the then existing combination of tectonic-climate elements. The Colon cross-structure was negative during Pekin time, and the locus of a restricted lacustrine-playa facies. In Cumnock time the area west of Sanford was alternately a vast bog and lake wherein the Cumnock coal and black shale accumulated. Still later, thin lacustrine shale, chert, and limy red beds accumulated in a lacustrine-playa environment in the Research Triangle Park area. All of these facies grade laterally into maroon, coarse, less sorted rock at the basin's margins and into a coarse, tan, arkosic, fluvial sandstone for which the tentative paleocurrent data indicate a major extra-basin source to the northeast for much of the Durham basin. The basin was sliced and rotated along northeast-trending fracture zones and cross-faulted along a north-to-northeast fracture set resulting in an intrabasin horst-and graben structural character. Individual horsts and grabens are triangular to diamond shaped and pitch to the east and southeast. A few pitch north. Diabase dikes intruded the rotated sediment pile and were in turn faulted and offset by later tectonic adjustments in the Piedmont. The step-faulted border is probably a post-depositional phenomenon. (Woodard-USGS)
W78-03760

ANALYSES OF NATIVE WATER AND DREDGED MATERIAL FROM SOUTHERN LOUISIANA WATERWAYS, 1975-76,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-03779

COMPUTATION OF RESERVOIRS SEDIMENTATION,
Gosudarstvennyi Gidrologicheskii Inst., Leningrad (USSR).
A. V. Karaushev, and I. V. Bogoliubova.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 199-205, 1974. 1 fig, 5 ref.

Descriptors: *Reservoir siltation, *Sediment load, *Estimating, *Mathematical models, Sedimentation, Bed load, Suspended load, Reservoirs, Equations, Methodology, Foreign research, Foreign countries, *USSR.

Methods for the computation of sedimentation by suspended sediments and bed load of the projected reservoirs were given. For the first year of the reservoir operation, computation was made according to the balance of sediments computed by the difference between the transport capacity and the hydraulic parameters of the current at the upper pool (transient region) and at the dam of the reservoir. The subsequent attenuation of the process, as well as the total duration of sedimentation, was evaluated by empirical relations obtained from the observational data on reservoirs under operation, (See also W78-03783) (Humphreys-ISWS)
W78-03792

ESTIMATION OF FLOODS BY MEANS OF THEIR SILT LOADS,
For primary bibliographic entry see Field 4A.
W78-03800

A METHOD FOR THE PREDICTION OF WASHLOAD IN CERTAIN SMALL WATERSHEDS,
For primary bibliographic entry see Field 4D.
W78-03810

RECENT SEDIMENTATION AND RESUSPENSION OF ORGANIC MATTER IN EUTROPHIC LAKE ESROM, DENMARK,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
For primary bibliographic entry see Field 5C.
W78-03834

AGING AND EVALUATION OF TWIN LAKES SEDIMENTS,
Colorado Cooperative Fishery Unit, Fort Collins.
E. P. Bergensen.
In: Studies of the Benthic Environment of Twin Lakes, Colorado, October 1976. p 29-39, 7 fig, 6 tab, 8 ref. REC-ERC-76-12.

Descriptors: *Sediments, *Deposition(Sediments), *Geologic history, *Twin Lakes(CO), Powerplants, Colorado, Lakes, Eutrophication, Shrimp, Lake trout, Environmental effects, Sedimentation rate, Suspended solids, Glacial sediments.

Construction of the Mt. Elbert Pumped-Storage Powerplant on the lower lake of Twin Lakes, Colorado may cause continuous resuspension of bottom sediments, with significant alteration of the biological community structure; opossum shrimp and lake trout in particular may be affected. To document these effects, recent sedimentation rates, sediment composition, and the biological history of recent sediments were studied through 24 bottom samples (seven from the upper lake and 17 from the lower) collected with a core freezer. A glacial flour covering the bottom is extremely sensitive to disturbance, and remains suspended for a considerable time. Sediment size is similar in the lakes, but mean total carbon (percent by weight) is significantly higher in the upper lake, especially in recent sediments, indicating that the upper lake has served as a nutrient trap. This premise is also supported by the fact that, of 48 elements surveyed, high concentrations are more often found in the upper lake than in the lower lake. Of copper, lead, zinc, and silver, only copper differs in concentration profile between the lakes, with concentrations in the upper lake increasing in recent sediments. About 49-96 mm sediments have been deposited since placer mining in the area began in 1859 (0.63 mm/yr). The arephidineae to centrale (A/C) diatom ratio, a measure of eutrophication, showed a sudden increase in the upper lake about the time mining activities began. (See also W77-07806) (Lynch-Wisconsin)
W78-03839

TRANSPORT OF GRANITIC SEDIMENT IN STREAMS AND ITS EFFECTS ON INSECTS AND FISH,
Cooperative Fisheries Research Unit, Moscow.
T. C. Bjornn, M. A. Brusven, M. P. Molnau, J. H. Milligan, and R. A. Klamt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 197, Price codes: A04 in paper copy, A01 in microfiche. University of Idaho, Forest, Wildlife and Range Experiment Station, Bulletin No 17, September 1977. 43 p, 64 fig, 17 tab, 40 ref. OWRT B-036-IDA(2). 14-31-0001-5069/4012.

Descriptors: *Sediment transport, *Sediment loads, *Benthos, *Idaho, Salmonids, *Aquatic insects, Seasonal, Stoneflies, Mayflies, Streams, Equations, Stream channels.

Assessment was made of the transport of granitic bedload sediment (< 6.35 mm diameter) in streams flowing through central Idaho mountain valleys and the effects of the sediment on juvenile salmonids and aquatic insects. Measurements were made of bedload sediment transported in the streams during the spring snowmelt runoff and the summer lowflow periods for 2 yrs., to test the applicability of the Meyer-Peter, Muller equation for estimating such transport. The modified Meyer-Peter, Muller equation was accurate in estimating the transport capacity of such streams using measurements of slope, hydraulic radius and mean diameter of streambed material. In artificial stream channels, benthic insect density in fully sedimented riffles (> 2/3 cobble imbeddedness) was one-half that in unsedimented riffles, but the abundance of drifting insects in the sedimented channels was not significantly smaller. In a natural stream riffle, benthic insects were 1.5 times more abundant in a plot cleaned of sediment, with mayflies and stoneflies 4 and 8 times more abundant, respectively. During both summer and winter, fewer fish remained in the artificial stream channels where sediment was added to the pools.
W78-03928

TURBIDITY AND SEDIMENT-RATING CURVES FOR STREAMS ON OAHU, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
P. C. Ekern.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 358, Price codes: A02 in paper copy, A01 in microfiche. Reprint from: Soil Erosion; Prediction and Control, (Soil Conservation Society of America) 1976, p 242-254. 6 fig, 4 tab, 62 ref. OWRT A-039-HI(1), 14-31-0001-5011.

Descriptors: *Turbidity, *Suspended load, *Optical density, Light transmissivity, Small watersheds, Runoff, Streams, *Sediment load, Suspended solids, Hawaii, *Sediment-rating curves, *Oahu(Hawii).

The sharp, short-duration peaks, of runoff from small Hawaiian watersheds make them particularly sensitive to sediment concentration and runoff discharge interrelationships. However, concentration of sediment in the streams is relatively low, despite high rainfall erosional hazard. This low concentration must stem in part from the low erosion susceptibility of the aggregated red clays that make up the watersheds. The low transmittance and high back scatter of these red clays preclude the measurement of turbidity as a field index of sediment concentration, though turbidity can serve as a laboratory index of sediment concentration in diluted samples. This low transmittance and high scatter make even low concentrations of sediment very detrimental to the optical properties that determine water quality.
W78-03931

METHODOLOGICAL CONSIDERATIONS IN WESTERN LAKE SUPERIOR WATER-SEDIMENT EXCHANGE STUDIES OF SOME TRACE ELEMENTS,
National Water Quality Lab., Duluth, MN.
For primary bibliographic entry see Field 5A.
W78-03985

ACCURACY IN DETERMINING TRACE ELEMENT CONCENTRATIONS IN MARINE SEDIMENTS,
Puerto Rico Nuclear Center, Mayaguez.
For primary bibliographic entry see Field 5A.
W78-03986

ECOLOGICAL LAND UNITS OF BEAR CREEK WATERSHED AND THEIR RELATIONSHIP TO WATER QUALITY,
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 4D.
W78-04099

THE EFFECTS OF WOOD DEBRIS AND DRIFT LOGS ON ESTUARINE BEACHES OF NORTHERN PUGET SOUND,
Western Washington State Coll., Bellingham. Dept. of Geography and Regional Planning.
For primary bibliographic entry see Field 2L.
W78-04103

MERCURY IN WATERS AND BOTTOM SEDIMENTS OF SOME SELECTED MAZURIAN LAKES,
Akademia Rolniczo-Techniczna, Olsztyn-Kortowo (Poland). Inst. of Agrochemistry.
For primary bibliographic entry see Field 5A.
W78-04184

2K. Chemical Processes

OCCURRENCE AND DISTRIBUTION OF COLOR AND HYDROGEN SULFIDE IN WATER FROM THE PRINCIPAL ARTESIAN AQUIFER IN THE VALDOSTA AREA, GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-03762

GROUND-WATER RESOURCES OF CENTRAL AND SOUTHERN YORK COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-03771

WATER RESOURCES OF OKALOOSA COUNTY AND ADJACENT AREAS, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-03774

PRELIMINARY EVALUATION OF GROUND WATER IN THE PRE-PENNSYLVANIAN CARBONATE ROCKS, MCCOY AREA, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-03776

ANALYSES OF NATIVE WATER AND DREDGED MATERIAL FROM SOUTHERN LOUISIANA WATERWAYS, 1975-76,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-03779

THE USE OF ION EXCHANGE METHODS FOR DETERMINING TRACE ELEMENTS IN NATURAL WATERS: VII. COPPER, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W78-03939

THE USE OF ION EXCHANGE METHODS FOR DETERMINING TRACE ELEMENTS IN NATURAL WATERS: VI. ZINC, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W78-03944

THE USE OF ION EXCHANGE METHODS FOR DETERMINING TRACE ELEMENTS IN NATURAL WATERS: V. LEAD, (IN GERMAN),
For primary bibliographic entry see Field 5A.
W78-03955

AN INVESTIGATION OF USING DERIVATION REACTION GAS CHROMATOGRAPHY TO MEASURE ANIONIC WATER QUALITY PARAMETERS,
Arkansas Univ. at Little Rock. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-03961

ACCURACY IN TRACE ANALYSIS: SAMPLING, SAMPLE HANDLING, ANALYSIS. VOLUME II.
National Bureau of Standards, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-03979

SAMPLING PROBLEMS AND THE DETERMINATION OF MERCURY IN SURFACE WATER, SEAWATER, AND AIR,
Reactor Centrum Nederland, Petten.
For primary bibliographic entry see Field 5A.
W78-03980

ANALYTICAL CHEMISTRY OF NATURAL WATERS,
Battelle-Pacific Northwest Lab., Richland, WA.
For primary bibliographic entry see Field 5A.
W78-03982

MONITORING DISSOLVED COPPER IN SEAWATER BY MEANS OF ION-SELECTIVE ELECTRODES,
Texas Instruments Inc., Dallas. Central Research Lab.
For primary bibliographic entry see Field 5A.
W78-03983

ELECTROANALYTICAL DETERMINATION AND CHARACTERIZATION OF SOME HEAVY METALS IN SEAWATER,
Institut Rudjer Boskovic, Zagreb (Yugoslavia). Center for Marine Research.
For primary bibliographic entry see Field 5A.
W78-03984

ORGANOMERCURY AND TOTAL MERCURY CONTENT OF ENVIRONMENTAL MATRICES AS DETERMINED BY NEUTRON ACTIVATION ANALYSIS,
Pavia Univ. (Italy). Centro di Radiochimica e Analisi per Attivazione.
For primary bibliographic entry see Field 5A.
W78-03987

GROUNDWATER ANALYSIS BY TRITIUM TECHNIQUE: A PRELIMINARY EVALUATION,
Guam Univ., Agana. Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W78-04100

WATER RESEARCH INSTRUMENTATION: 2.
For primary bibliographic entry see Field 5A.
W78-04153

2L. Estuaries

MERCURY IN BENTHIC INVERTEBRATES OF THE ELBE ESTUARY,
Hamburg Univ. (West Germany). Inst. fuer Hydrobiologie und Fishcherei-wissenschaft.
For primary bibliographic entry see Field 5B.
W78-03705

BASELINE STUDY OF TRACE HEAVY METALS IN BIOTA OF PUGET SOUND,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 5A.
W78-03719

FINAL REPORT: RESEARCH AND DEVELOPMENT ASSESSMENT ON SAFETY AND POLLUTION CONTROL FOR OUTER CONTINENTAL SHELF OPERATIONS,
Harry Diamond Labs., Adelphi, MD.
For primary bibliographic entry see Field 5G.
W78-03720

MANAGEMENT OF BOTTOM SEDIMENTS CONTAINING TOXIC SUBSTANCES, PROCEEDINGS OF THE SECOND U.S.-JAPAN EXPERTS MEETING, OCTOBER 1976--TOKYO, JAPAN.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5G.
W78-03735

COUNTERMEASURES FOR POLLUTION IN TOKYO BAY,
Ministry of Transport, Yokohama (Japan). Bureau of Port Construction.
For primary bibliographic entry see Field 5G.
W78-03737

DEVELOPMENT OF AN ASSESSMENT METHODOLOGY FOR GEOPRESSURED ZONES OF THE UPPER GULF COAST BASED ON A STUDY OF ABNORMALLY PRESSURED FIELDS IN SOUTH TEXAS,
Southwest Research Inst., San Antonio, TX.
For primary bibliographic entry see Field 8B.
W78-03863

PLANKTON OF COASTAL LAGOONS: VI. SEASONAL DISTRIBUTION OF PHYTOPLANKTON IN THE YAVAROS LAGOON, SONORA, MEXICO (1969-1970), (IN SPANISH),
Universidad Nacional Autonoma de Mexico City. Inst. de Biologia.
For primary bibliographic entry see Field 5B.
W78-03866

ANALYSIS OF MICROGRAM/KG (PPB) LEVEL HYDRICARBONS IN INTERTIDAL ZONE SEDIMENTS AND WATER BY GAS CHROMATOGRAPHY-MASS SPECTROMETRY,
National Bureau of Standards, Washington, DC. Bioorganic Standards Section.
For primary bibliographic entry see Field 5A.
W78-03869

THE STATE OF METAL IONS IN SEAWATER,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 5A.
W78-03870

SOLUTION CHEMISTRY, SOLUBILITY, AND ADSORPTION EQUILIBRIA OF IRON, COBALT, AND COPPER IN MARINE SYSTEMS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5A.
W78-03871

PERIODIC PHENOMENA AT THE MOUTH OF THE MISSISSIPPI RIVER,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 5B.
W78-03872

WASTE DISPERSION CHARACTERISTICS AND EFFECTS IN AN OCEANIC ENVIRONMENT,
Du Pont de Nemours (E.I.) and Co., Wilmington, DE. Engineering Dept.
For primary bibliographic entry see Field 5C.
W78-03874

DREDGE DISPOSAL STUDY. SAN FRANCISCO BAY AND ESTUARY. MAIN REPORT.
Army Engineer District, San Francisco.
For primary bibliographic entry see Field 5E.
W78-03875

NATURAL HAZARD MANAGEMENT IN COASTAL AREAS,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 5G.
W78-03879

MISSISSIPPI SOUND TEMPORAL AND SPACIAL DISTRIBUTION OF NUTRIENTS,
Gulf Coast Research Lab., Ocean Springs, MS.
For primary bibliographic entry see Field 5B.
W78-03880

REMOTE SENSING OPERATIONS (MULTISPECTRAL SCANNER AND PHOTOGRAPHIC) IN THE NEW YORK BIGHT, SEPTEMBER 22, 1975,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5B.
W78-03881

MARINE STUDIES OF SAN PEDRO, CALIFORNIA. PART II. POTENTIAL EFFECTS OF DREDGING ON THE BIOTA OF OUTER LOS ANGELES HARBOR. TOXICITY, BIOASSAY AND RECOLONIZATION STUDIES.
University of Southern California, Los Angeles. Allan Hancock Foundation; and University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
For primary bibliographic entry see Field 5C.
W78-03882

POTENTIAL BIOLOGICAL EFFECTS OF HYDRAULIC DREDGING IN LOS ANGELES HARBOR: AN OVERVIEW,
University of Southern California, Los Angeles.
For primary bibliographic entry see Field 5C.
W78-03883

EFFECTS OF POLLUTANTS ON SUBMARINE PLANT SYNECOLOGY,
Western Washington State Coll., Bellingham.
For primary bibliographic entry see Field 5C.
W78-03922

EFFECT OF HURRICANE ELOISE ON THE BENTHIC FAUNA OF PANAMA CITY BEACH, FLORIDA, USA,
National Marine Fisheries Service, Panama City, FL. Panama City Lab.
C. H. Saloman, and S. P. Naughton.
Marine Biology, Vol. 42, p. 357-363, 1977. 3 fig, 4 tab, 24 ref.

Descriptors: *Hurricanes, *Storms, *Benthic fauna, *Benthos, *Salinity, *Damages, *Erosion, *Turbulence, *Sediments, *Biological communities, *Dominant organisms, *Ecological distribution, Invertebrates, *Anomura, *Emerita, *Polychaetes.

The effect of the storm on the benthic invertebrates was not adverse, as the number of individuals occurring in the swash zone was about the same after the storm as before. The number of species increased after the strom, but later decreased to approximate numbers before the storm. The increase in the number of species was mainly due to the influx of species that normally occur farther offshore of the swash zone. The lack of heavy rainfall that usually accompanies a hurricane was probably a factor enabling benthic organisms that normally live in high salinities to survive. (Katz)
W78-03946

LAGUNA DE BAY WATER RESOURCES DEVELOPMENT,
Bureau of Experts, Sogreah, Grenoble, France.
For primary bibliographic entry see Field 5G.
W78-03994

PLANKTON STUDIES IN A MANGROVE ENVIRONMENT: VIII. FURTHER INVESTIGATIONS ON PRIMARY PRODUCTION, STANDING-STOCK OF PHYTO- AND ZOOPLANKTON AND SOME ENVIRONMENTAL FACTORS,
Universidade Federal Sao Carlos, Sao Paulo (Brazil). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-04017

STUDIES OF SUBTERRANEAN WATERS: 25. METHODS OF COLLECTING INTERSITITIAL SUBTERRANEAN WATERS, (IN FRENCH),
Centre National de la Recherche Scientifique, Moulis (France). Lab. Souterrain.
For primary bibliographic entry see Field 7B.
W78-04024

BIOLOGICAL STUDY OF THE SUBMARINE SHELF OF CATALONIA, (IN SPANISH),
Barcelona Univ. (Spain). Catedra Botany.
J. J. Seoane-Camba, and L. Polo.
An Inst Bot A J Cavanilles. 31, p 179-184, 1974.

Descriptors: *Biological balance(Algae-fish), Herbivores, Distribution, *Algae, *Catalonia(Spain), Crustaceans, Cystoseira, Fish, Lithophyllum, Mollusk, Perch, *Primary production, Sarpa-salpa, Sphacelaria, Submarine shelf.

Major changes in the biological balance between algae and fishes living in depths (Catalonia, Spain) from 0-10 m were examined in a study conducted in 1972 and compared to similar studies done in 1956. An increase in herbivorous fishes, especially Sarpa salpa, and a decrease in species of algae was related to the reduction in the number of predators (carnivorous fishes) of herbivores. This reduction was due to recent economic exploitation of the giant perch by local fishermen, creating a missing link in the food chain and directing the main energy of the ecosystem toward herbivorous fish. The effect on crustacean and molluscan forms living in algae and the impact on primary production were examined. The distribution of Cystoseira, Spacelaria and Lithophyllum and the selectiveness of fishes for certain algal forms were discussed.--Copyright 1975, Biological Abstracts, Inc.
W78-04043

EFFECTS OF CHEMICAL POLLUTION ON TELEMEDIATORS INTERVENING IN THE MICROBIOLOGICAL AND PLANKTONIC ECOLOGY IN A MARINE ENVIRONMENT, PART II, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
For primary bibliographic entry see Field 5C.
W78-04044

ON THE NUTRITION AND METABOLISM OF ZOOPLANKTON: IX. STUDIES RELATING TO THE NUTRITION OF OVER-WINTERING CALANUS,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5C.
W78-04045

COMPARATIVE ANALYSIS OF THE NUTRITION OF BRACKISH-WATER WHITE-FISH IN THE LAPTEV SEA: III. THE FEEDING OF WHITEFISH DURING THE SUMMER-AUTUMN PERIOD IN BUORKHAYA GULF AND GENERAL CONCLUSION OF THE THREE PARTS, (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Biology and Soil Science.
V. V. Kuznetsov.
Vestn Mosk Univ Ser Vi Biol Pochvoved 30(1), p 26-33, 1975.

Descriptors: *White-fish, Seasonal, Laptev Sea(USSR), Autumn, Brackish water, Coregonus-autumnalis, Coregonus-muksun, Coregonus-sardinella, Ecological distribution, *Nutrition, Summer, USSR.

The feeding of Coregonus autumnalis, C. sardinella and 3 brackish water forms of C. muksun (multispinatous, oligospinatous and macrostomatous forms) was studied. Substantial differences in the utilization of food resources by different forms is shown. The ecological niches of 5 brackish water whitefishes of the Laptev Sea (USSR) are described.--Copyright 1975, Biological Abstracts, Inc.
W78-04046

THE EFFECTS OF WOOD DEBRIS AND DRIFT LOGS ON ESTUARINE BEACHES OF NORTHERN PUGET SOUND,
Western Washington State Coll., Bellingham. Dept. of Geography and Regional Planning.
T. A. Terich, and S. Milne.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 736, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, December 1977. 67 p, 1 fig, 4 tab, 3 ref, 7 append. OWRT A-089-WASH(1).

Descriptors: *Wood debris, *Drift logs, Beaches, Erosion, *Puget Sound(Wash), Washington, Estuarine environment, Land clearing, Clear-cutting.

Large volumes of wood debris and logs are washed from forested slopes and clear cut sites into Pacific Northwest streams and rivers. Their concentrations often significantly alter stream physiography and flow. Similar effects may occur along the shorelines of Puget Sound, the depository for much river-borne debris. This study has been designed to investigate the effects wood debris have on beaches, particularly erosion and deposition. Drift logs exhibit seasonal profile changes. Log masses are 'packed' in greater densities and higher on the beach berm in the winter than in the summer, reflecting higher wave energies. Concentrations of drift logs help to stabilize beaches by capturing beach sediment and shielding the shore from wave attack.
W78-04103

POWER PRODUCTION ON ESTUARIES AND TIDAL RIVERS,
Virginia Electric and Power Co., Richmond.
For primary bibliographic entry see Field 5C.
W78-04158

RELEASE OF MERCURY AND ORGANICS FROM RESUSPENDED NEAR-SHORE SEDIMENTS,
Florida State Univ., Tallahassee.
For primary bibliographic entry see Field 5C.
W78-04192

OCCURRENCE OF METHYL MERCURY IN PIKE AND BALTIC HERRING FROM THE TURKU ARCHIPELAGO,
Turku Univ. (Finland). Inst. of Biochemistry.
For primary bibliographic entry see Field 5C.
W78-04194

WATER QUALITY IN THE FORTH ESTUARY: A DISCRIMINANT FUNCTIONAL ANALYSIS,
Napier Coll. of Commerce and Technology, Edinburgh (Scotland).
For primary bibliographic entry see Field 5A.
W78-04199

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3C. Use Of Water Of Impaired Quality

IMPACT OF GROUNDWATER DEVELOPMENT IN ARID LANDS: A LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 4B.
W78-03757

3D. Conservation In Domestic and Municipal Use

CLASSIFICATION OF AMERICAN CITIES FOR CASE STUDY ANALYSIS: VOLUME I. SUMMARY REPORT,
Urban Systems Research and Engineering, Inc., Cambridge, MA.
For primary bibliographic entry see Field 6A.
W78-03918

COMMERCIAL AND INSTITUTIONAL WATER USE IN PUERTO RICO,
Puerto Rico Univ., Mayaguez. School of Engineering.
For primary bibliographic entry see Field 6B.
W78-04097

RUNOFF POLLUTION FROM MULTIPLE FAMILY HOUSING,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W78-04102

3E. Conservation In Industry

THE PHASED CLEAN-UP PROGRAM, KANAWHA RIVER,
For primary bibliographic entry see Field 5G.
W78-03821

1977 REVIEW, 1978 PREVIEW.
For primary bibliographic entry see Field 4B.
W78-03848

WATER CONSERVATION: DRAMATIC CHANGES TAKING PLACE,
Eutek, Inc., San Francisco, CA.
G. E. Wilson, and J. Y. Huang.
Food Engineering, Vol. 49, No. 6, p 79-81, June, 1977. 1 fig.

Descriptors: *Water conservation, *Foods, *Canneries, *Industrial water, Industrial wastes, Water pollution control, Cooling water, Water reuse, Flumes, *Food processing industry.

With the advent of the 1976/77 drought in the United States, there has been a growing awareness that potable water is a limited valuable resource which cannot be wasted. This awareness, coupled with the pressures of federal pollution controls and restructured water rates, has led to dramatic shifts in the water use patterns of the food processing industry. To date, the major cost-effective water conservation measures undertaken can be generally classified under the areas of: (1) use

consciousness; (2) cooling water conservation; (3) counter-current reuse of process flume water. Efforts of food processing firms to comply with the best Practical Technology requirements of the 1972 Water Pollution Control Act have brought about overwhelming reductions in water waste throughout the industry. There are, in fact, a number of published case studies describing how certain firms have achieved the ultimate objective of zero wastewater discharge. Such changes is use patterns are expected to continue in the near future as rapidly as during the past half decade. (Eberle-NWWA)
W78-03851

ENVIRONMENTAL ASSESSMENT OF GEOPRESSURED WATERS AND THEIR PROJECTED USES,
Dow Chemical U. S. A., Freeport, TX. Texas Div.
For primary bibliographic entry see Field 4B.
W78-03857

ENERGY DEVELOPMENT AND LAND USE IN TEXAS,
Texas Transportation Inst., College Station.
E. K. Smith, W. F. McFarland, and A. Gonzales.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 328, Price codes: A07 in paper copy, A01 in microfiche. Prepared for Governor's Energy Advisory Council of Texas, Austin, January 1975, 122 p, 7 tab, 12 fig.

Descriptors: *Energy, *Land use, *Legal aspects, *Electric power production, *Texas, Value, Oil, Natural gas, Coals, Uranium, Environmental effects, Distribution patterns.

This report provides an overview of the relationships between the development of different energy sources and land use and land value. A brief review of the legal aspects of land use in Texas is presented as a basis for understanding present land use patterns in Texas and possible land use patterns of the future that may result from alternative energy policies. The land use impacts of primary energy sources in Texas are examined, including oil, natural gas, coal, and uranium. These impacts are viewed from the levels of the land use requirements of the production, distribution and utilization of the alternative energy sources, and the effect of these activities on surrounding land use and land values. The land use related impacts of electrical power generation and transmission in Texas are discussed. Alternative energy development scenarios for Texas are evaluated. Land use requirements of the different scenarios are presented and the impacts on land use of the scenarios are compared. The critical concerns surrounding development of the different energy sources are summarized. Possible policy strategies are presented that would insure that the land resources of Texas continue to be used in the most beneficial manner. (Nessa-NC)
W78-03900

WATER CONSERVATION IN INDUSTRIAL FILTRATION OPERATIONS,
Arkansas Univ., Fayetteville. Coll. of Engineering.
For primary bibliographic entry see Field 5D.
W78-03932

ABITIBI (PAPER COMPANY LTD.) IN SMOOTH ROCK FALLS (ONTARIO) REAPS THE BENEFITS OF IMPROVED WASTE TREATMENT,
L. Armstrong.
Canadian Pulp and Paper Industry, Vol. 30, No. 13, p 22-25, September 5, 1977. 10 illus.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Foreign countries, Canada, *Boilers, Generators, Pulp and paper industry, Effluents, Electric power, Water reuse, *Water conservation, *Recycling, Water consumption(Except consumptive use), *Kraft mills, Clarifiers.

The $10,000,000 energy and environment improvement program at Abitibi's bleached kraft pulp and stud mill in Smooth Rock Falls, Ontario, includes startup of a Babcock-Wilcox refuse boiler, a Westinghouse (steam-driven) turbine generator, and an Eimco Envirotech effluent clarifier. Effluent from the pulp mill's screening operation plus the fines from the bark screen room are processed by the clarifier. The sludge (45% consistency) and wood waste from the stud mill are burned in the refuse boiler. Power generation by the steam- and two water-driven turbine generators is sufficient to meet Abitibi's needs. Recycling water from the clarifier and countercurrent washing in the bleach plant have cut water consumption to 44,000 gal/ton of pulp. (Swichtenberg-IPC)
W78-04069

MEMBRANE FILTRATION OF SSL (SPENT SULFITE LIQUOR) FOR RECOVERY OF BY-PRODUCTS AND POLLUTION CONTROL,
DDS RO Div. (Denmark). Dept. of Pulp and Paper.
For primary bibliographic entry see Field 5D.
W78-04074

PULP AND PAPER MANUFACTURE: ENERGY CONSERVATION AND POLLUTION PREVENTION,
Noyes Data Corp., Park Ridge, NJ.
For primary bibliographic entry see Field 5D.
W78-04084

AN ANALYSIS OF BOD AND COD IN THE STONE GROUNDWOOD PROCESS,
Technische Univ. Darmstadt (West Germany). Inst. fuer Paper-fabrikation.
For primary bibliographic entry see Field 5A.
W78-04089

IN-PLANT TECHNOLOGY FOR THE PREVENTION OF AIR AND WATER POLLUTION (ZAKLADOWE TECHNOLOGIE ZAPOBIEGANIA ZANIECZYSZCZANIU POWIETRZA I WODY),
IVL-Consulting Ltd., Goeteborg (Sweden).
For primary bibliographic entry see Field 5G.
W78-04093

COMMERCIAL AND INSTITUTIONAL WATER USE IN PUERTO RICO,
Puerto Rico Univ., Mayaguez. School of Engineering.
For primary bibliographic entry see Field 6B.
W78-04097

3F. Conservation In Agriculture

DRIP IRRIGATION OF SUGARCANE MEASURED BY HYDRAULIC LYSIMETERS, KUNIA, OAHU,
Hawaii Univ., Honolulu. Water Resources Research Center.
P. C. Ekern.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 122, Price codes: A06 in paper copy, A01 in microfiche. Technical Report No. 109, June 1977. 99 p, 14 fig, 14 tab, 37 ref, 7 append. OWRT A-031-HI (1), 14-31-0001-3811, 14-31-0001-4011.

Descriptors: *Lysimeters, *Evapotranspiration, *Soil moisture, *Consumptive use(Water), *Deep percolation, Irrigation programs, Infiltration, Tensiometers, Drip irrigation, *Sugarcane, Measurement, Water budget, *Oxisol, Molokai soil, Kunia, Oahu, *Hawaii.

The daily water budget of drip-irrigation sugarcane at Kunia, Oahu, was measured in large hydraulic load cell lysimeters. The 10-mo plant crop period was extrapolated to 109 cm (43 in.)/12-mo water use. Extrapolation from the full-canopied period (leaf area index 4) gave only 99 cm (39 in.)/12-mo of water use. The initial 12 mo of the second ratoon had 128 cm (50.5 in.) of evapotranspiration - a 2-yr cycle of water use would be 278 cm (109.5 in.) or 140 cm (55 in.)/12 mo. Drip irrigated cane used an average 79% of the 173 cm (70 in.) of annual class A surface pan evaporation or 70% of the evaporation from a pan elevated to 1.52 m (5 ft) or one kept at can canopy height. This lower ratio between cane use and pan evaporation would make water use 15% less from drip irrigated as compared to sprinkler irrigated fully canopied cane. The average portion of sunlight energy equivalent to cane evapotranspiration was 45%, but ranged from 25% immediately after planting to as great as 60% during periods of strong positive advection with full cane canopy. Further economies in water use with drip irrigation resulted from the much greater uniformity of distribution of water with drip as opposed to sprinkler irrigation. During rainy periods, percolate was not curtailed and evapotranspiration was as little as 20% of the applied rainfall and irrigation. However, during the dry summer months, evapotranspiration was essentially equal to the combined rainfall and drip irrigation. Salt rings formed at the perimeter of the 0.61-m (2-ft) diameter surface zone wetted around each Submatic dripper. The maximum percolate rates through the 1.52-m Molokai Oxisol profile were 5 cm/day (2 in./day), even with water ponded on the surface. Essentially none of the 356.73 kg/ha (318 lb/acre) of nitrogen applied as fertilizer was removed in the deep percolate. Chloride content of the percolate which had increased from 150 mg/l to over 700 mg/l during the period of sprinkler irrigation underwent a parallel increase under drip irrigation after the initial flush from the heavy rainfall in January 1971. Silica levels of 65 mg/l in the irrigation water were reduced to 20 mg/l in the percolate.
W78-03753

ARTIFICIAL-RECHARG EXPERIMENTS NEAR LAKIN, WESTERN KANSAS,
Geological Survey, Lawrence, KS. Water Resources Div.; and Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 4B.
W78-03775

WATER SHORTAGE IN ISRAEL: LONG-RUN POLICY FOR THE FARM SECTOR,
New Mexico Univ., Albuquerque. Dept. of Economics.
M. Gisser, and S. Pohoryles.
Water Resources Research, Vol 13, No 6, p 865-872, December 1977. 1 fig, 5 tab, 4 ref.

Descriptors: *Israel, *Water shortage, Agriculture, *Income loss, *Linear programming, *Estimating, *Water allocation(Policy), Water supply, Data, Farm sector, Water quota, Technological changes, Economic efficiency, Constraints, Regions, Mathematical models, Systems analysis.

In the year 1985, it is expected that Israel will suffer a significant deficit in its water balance; this country faces a situation of limited water supply and increasing demands. Since agriculture uses a large fraction of the available water, one potential policy is to reduce allocations of water to agriculture in order to permit the growth of its use in other sectors. A linear programming model is used to estimate the total loss in income to agriculture from reduction in current allocations; these estimates are to be taken as guideline estimates only. Results show that a 10%, 20%, or 30% reduction in

water quotas will give rise to roughly a 6%, 12%, or 18% reduction in farm income if no technological change is assumed. If technological changes are supposed, then the reductions in agricultural income will be 1%, 7%, and 12%, respectively. Policy recommendations are given: (1) use the extension services to help farmers in the moshavim to switch from the moshav dairy farm to a large-scale water-efficient kibbutz-type farm; (2) provide the loans that would be needed for the above transformation; (3) to enhance intrasector efficiency, encourage farmers to trade in water quotas on the margin, and this would work only if the practice were to (4) charge the real marginal cost on the margin (the margin should cover 15%-21%). (Bell-Cornell)
W78-03990

CONTROL OF NONPOINT WATER POLLUTION FROM AGRICULTURE: SOME CONCEPTS,
Agricultural Research Service, Chickasha, OK. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 5G.
W78-04200

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

WATER-RESOURCES INVESTIGATIONS IN NORTH DAKOTA, 1976.
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03764

WATER-RESOURCES INVESTIGATIONS IN ARIZONA, 1977.
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03765

SEEPAGE TESTS ON NO NAME CREEK, COLVILLE INDIAN RESERVATION, WASHINGTON, MAY 12-13, 1977,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-03777

WATER RESOURCES DATA FOR IDAHO, WATER YEAR 1976.
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03780

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1976--VOLUME 2. EASTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03781

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1976--VOLUME 1. WESTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03782

DESIGN OF WATER RESOURCES PROJECTS WITH INADEQUATE DATA, VOLUME 2.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), 1974. 696 p.

Descriptors: *Water resources development, *Conferences, *Methodology, *Design criteria, *Economics, *Hydrologic aspects, Design data, Rainfall-runoff relationships, Evaluation, Evaporation, Water resources, Project planning, Projects, Optimization, Water quality, Management, Groundwater, Hydrology, Precipitation(Atmospheric), Sedimentation, Reservoir silting, Floods, Flood frequency, Unit hydrographs, *Inadequate data, Analytical techniques, Design flood, Suspended load, Watersheds(Basins), Discharge(Water), Runoff, Snowmelt, Foreign countries, Foreign research, Hydrologic data.

This symposium foucused on: (1) the methodology for hydrologic studies for water resources projects with inadequate data; (2) current practices for the assessment of design parameters in different countries; and (3) relation between project economics and hydrological data. (See W78-03784 thru W78-03813) (Humphreys-ISWS)
W78-03783

WATER RESOURCES PROJECTS IN NIGERIA AND THE HYDROLOGICAL DATA EMPLOYED IN THEIR PLANNING AND DEVELOPMENT,
Ife Univ. (Nigeria). Dept. of Agricultural Engineering.
A. A. Abiodun.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 21-32, 1974. 3 fig, 9 ref.

Descriptors: *Water resources development, *Projects, *Rainfall-runoff relationships, *Africa, Planning, Water supply, Flood control, Lakes, Equations, Groundwater, Surface waters, Foreign countries, Foreign research, *Nigeria, *Lake Chad Basin(Nigeria).

The need for adequate water supply to meet the demands of Nigeria's growing population is well known. However, the technical adviser is seriously handicapped in planning efforts by the lack of sufficient information. Within the past decade, a number of water resources schemes have been developed, and in general, these schemes have been planned with very limited hydrological data that were often extended through the application of statistical techniques to provide rational design parameters. In others, 'educated guess' technique was substituted. The net result of such methods has been the failure of many water supply schemes to meet demands, especially during the dry season, and the location of unproductive boreholes which had to be abandoned. These schemes were reviewed, and the hydrologic information employed in designing them was appraised. This study showed that Nigeria must intensify efforts to provide extensive basic data on surface and groundwater resources if costly mistakes are to be avoided in the future. (See also W78-03783) (Humphreys-ISWS)
W78-03784

AN EXAMPLE OF REGIONAL CO-OPERATION FOR IMPROVING THE HYDROLOGICAL AND METEOROLOGICAL INFORMATION,
World Meteorological Organization, Managua (Nicaragua). Central American Hydrometeorological Project.
For primary bibliographic entry see Field 7A.
W78-03785

METHODOLOGY EXISTING FOR ESTIMATING FREE SURFACE WATER EVAPORATION,
For primary bibliographic entry see Field 2D.
W78-03786

GEOHYDROLOGICAL STUDIES IN SMALL AREAS WITHOUT SYSTEMATIC DATA,
For primary bibliographic entry see Field 4B.
W78-03787

METHODS OF ANALYSING DEFICIENT DISCHARGE DATA IN ARID AND SEMI-ARID ZONES FOR THE DESIGN OF SURFACE WATER UTILIZATION,
Tahal Water Planning for Asrael Ltd., Tel Aviv.
J. S. Dalinsky.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 95-119, 1974. 6 fig, 3 ref, 2 append.

Descriptors: *Water resources development, *Planning, *Streamflow, *Hydrograph analysis, Annual flood, Hydrographs, Frequency, Surface waters, Reservoir storage, Flow duration, Analytical techniques, Arid climates, Semiarid climates, Hydrologic aspects, Discharge(Water), Hydrology, Sediment discharge, Diversion, Foreign research, Foreign countries, *Israel, Inadequate data.

This paper surveyed various methods of analysing stream flow: frequency of annual volumes, discharge-volume relationship with horizontal, vertical and double hydrograph cutting, and calculation of the storage volumes available as a function of reservoir capacity. Application of the methods can generate data for the design of surface water utilization schemes when flow records are available for only a few years. The understanding and aplication of the general design aspects, even if only qualitative, enables the planning engineer to reduce his basic hydrological requirements to less than 10 years duration. It was proposed that applied hydrological research be directed towards evaluation of a number of important hydrological design parameters on a regional basis to enable nondimensional curves to be established. (See also W78-03783) (Humphreys-ISWS)
W78-03788

APPLICATION OF COUTAGNE'S AND TURC FORMULAS TO THE SOUTHERN MOZAMBIQUE RIVERS,
E. E. D'Oliveira, and J. J. Mimoso.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 121-140, 1974. 2 fig, 6 tab.

Descriptors: *Rainfall-runoff relationships, *Watersheds(Basins), *Africa, Estimating, Hydrologic aspects, Hydrology, Rainfall, Air temperature, Analytical techniques, Humidity, Evaporation, Runoff, Streamflow, Discharge(Water), Rivers, Hydrologic data, Sediment discharge, Foreign research, Foreign countries, *Mozambique, Inadequate data.

One of the base elements necessary for the planning of an economical development program is the knowledge of the value and distribution of hydrological resources. In Mozambique, registration of the water resources has been facing great difficulty because of the lack of observations of hydrologic phenomena, namely the runoff and flow discharges of rivers and water-sources. Coutagne's and Turc general rules, which require that rainfall and temperature be known, were applied to obtain approximate annual mean runoff values for several rivers in Southern Mozambique where

few gauging stations exist. It was concluded from the results obtained that these rules give annual mean runoff values with deviations of less than 10%. (See also W78-03783) (Humphreys-ISWS)
W78-03789

MAPAI HYDROLOGICAL STUDY (LIMPOPO'S RIVER),
E. E. D'Oliveira, and J. J. Mimoso.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 141-154, 1974. 3 fig, 1 tab.

Descriptors: *Watersheds(Basins), *Africa, *Runoff, *Estimating, Water resources, Streamflow, Climates, Hydrologic aspects, Floods, Hydrologic data, Analytical techniques, Discharge(Water), Rainfall, Hydrographs, Annual, *Mozambique, *Limpopo River(Mozambique), Inadequate data.

The Limpopo is one of the most important rivers of South Africa and Mozambique, and it is contained in the lower part of the great drainage area, which includes more than half of the Transvaal and a considerable part of South Rhodesia. Flow discharge observations are not available for the future location of Mapai Dam, and therefore estimates of runoff were made. The analytical techniques were indicated and results were summarized. (See also W78-03783) (Humphreys-ISWS)
W78-03790

RELATION OF HYDROLOGICAL PROGRAMS OF THE CENTER OF HYDROGRAPHIC STUDIES FOR COMPLETE STUDIES OF HYDRAULIC RESOURCES WITH INSUFFICIENT DATA,
For primary bibliographic entry see Field 2A.
W78-03791

COMPUTATION OF RESERVOIRS SEDIMENTATION,
Gosudarstvennyi Gidrologicheskii Inst., Leningrad (USSR).
For primary bibliographic entry see Field 2J.
W78-03792

CALCULATION OF RUNOFF IN IRAQ,
R. K. Kligue, and M. E. Sachob.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 207-215, 1974.

Descriptors: *Runoff, *Equations, *Streamflow, *Foreign countries, Variability, Floods, Discharge(Water), Annual, Seasonal, Monthly, Wet seasons, Dry seasons, Low flow, Average flow, Foreign research, *Iraq, Inadequate data.

The general characteristic of runoff and its distribution in Iraq were given. Results of correlation analysis studies of runoff with elevation, river basin area, flood duration period, and low-water period were given. It was concluded that the given relationships of different flow characteristics, despite their approximate nature and need for more precision, permit the evaluation of a number of flow parameters for insufficiently studied regions of Iraq. (See also W78-03783) (Humphreys-ISWS)
W78-03793

DETERMINATION OF EVAPORATION IN CASE OF THE ABSENCE OR INADEQUACY OF DATA,
Gosudarstvennyi Gidrologicheskii Inst., Leningrad (USSR).
For primary bibliographic entry see Field 2D.
W78-03794

OBJECTIVE CRITERIA TO DECLARE A SERIES OF DATA SUFFICIENT FOR TECHNICAL PURPOSES,
For primary bibliographic entry see Field 2A.
W78-03795

SOME CRITERIA USED IN HYDROLOGIC STUDIES WITH INADEQUATE DATA,
For primary bibliographic entry see Field 2A.
W78-03796

DETERMINATION OF HYDROLOGICAL CHARACTERISTICS IN POINTS WITHOUT DIRECT HYDROMETRIC DATA,
World Meteorological Organization, Bogota (Columbia); and United Nations Development Program, Bogota (Columbia).
S. Stanescu.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 265-285, 1974. 18 fig, 7 ref.

Descriptors: *Surveys, Programs, *Water resources, *South America, *Hydrologic data, Estimation, Surface waters, Mapping, Water quality, Runoff, Rivers, On-site investigations, Discharge(Water), Sediment discharge, Foreign countries, Foreign research, *Colombia, Inadequate data.

In Columbia, hydrological information is very scarce. Consequently, no direct hydrometric data are available for most of the sites of projected hydrotechnical works and exploitation of water. Therefore, one must generally apply methods of generalization, transfer of direct information from observed points to points of interest, and indirect estimation of the hydrological characteristics. In relation with this, there are several proceedings of indirect determination of mean, maximum, and minimum runoff, as well as of other characteristics of the hydrological regime which are applied to the concrete conditions of Columbia. The examples, included to illustrate the application of the methods pointed out, were selected from complex hydrological studies, elaborated or in the process of elaboration, within the frame of the activities of interpretation and hydrolgical calculations worked out in the Colombian Service of Meteorology and Hydrology. (See also W78-03783) (Humphreys-ISWS)
W78-03797

NEW MODELS OF FREQUENCY LAW OF RUNOFF STARTING FROM PRECIPITATIONS,
I.T.O.P. Coll., Madrid (Spain).
J. R. Temez.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 287-300, 1974. 9 fig.

Descriptors: *Rainfall-runoff relationships, *Watersheds(Basins), *Runoff forecasting, Water balance, Evapotranspiration, Rainfall, Frequency analysis, Frequency, Correlation analysis, Runoff, Estimating, Floods, Discharge(Water), Foreign research, Foreign countries, *Spain, Inadequate data.

The frequency law of annual precipitation was used to determine the frequency law of the annual runoff relationship applicable to drainage basins which do not have discharge data. The procedure included the following steps: (1) calculate frequency law of precipitation; (2) determine the potential evapotranspiration value of the basin from evaporation data or charts; (3) estimate the minimum effective precipitation; and (4) apply proposed equation to transform frequency law of precipitation to frequency law of runoff. The proposed method was developed for rainy areas and has not been studied for adaptation to snowfall. (See also W78-03783) (Humphreys-ISWS)
W78-03798

DESIGNING PROJECTS FOR THE DEVELOPMENT OF GROUND WATER RESOURCES IN THE ALLUVIAL PLAINS OF NORTHERN INDIA ON THE BASIS OF INADEQUATE DATA,
For primary bibliographic entry see Field 4B.
W78-03799

ESTIMATION OF FLOODS BY MEANS OF THEIR SILT LOADS,
M. B. Girona.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 439-457, 1974.

Descriptors: *Floods, *Estimating, *Europe, *Sediment discharge, Silts, Sediments, Watersheds(Basins), On-site investigations, Streambeds, Bed load, Flood discharge, Alluvial channels, Analysis, Analytical techniques, Foreign research, Foreign countries, *Spain, Inadequate data.

An empirical and experimental formula of very simple structure was studied to obtain the flows of maximum floods in relation to the sediment loads that the floods produce, depending only on the maximum size of particles of the channel. This formula can be useful for studying the behavior of the river bed, alluvial volume, and so on. Verification tests indicated that maximum error is 13% when using the proposed formula for estimating the historic flood discharge. (See also W78-03783) (Humphreys-ISWS)
W78-03800

ESTIMATION OF DESIGN FLOODS AND THE PROBLEM OF EQUATING THE PROBABILITY OF RAINFALL AND RUNOFF,
Institute of Hydrology, Wallingford (England).
M. A. Beran.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 459-471, 1974. 4 fig, 1 tab, 6 ref, 1 append.

Descriptors: *Design flood, *Estimating, *Statistical methods, *Hydrologic aspects, Floods, Simulation analysis, Hydrographs, Runoff, Rainfall, Frequency, Analytical techniques, Time, Frequency curves, Probability, Annual peak discharge, Rainfall-runoff relationships, Flood recurrence interval, Base flow, Analysis, Stochastic processes, Inadequate data.

Where data on river discharge are scarce, it is a common engineering design practice to concoct a design flood with the aid of rainfall depth-duration-frequency information and a catchment response model. Two major weaknesses of this approach are: (1) the problem of the sensitivity of the design of legitimate changes in the design assumptions, and (2) the uncertainty of preserving the nominal rainfall return period in the design flood. A solution to these problems was proposed which makes use of a computer simulation investigating the sensitivity of flood magnitude to variations in return period, storm duration, temporal rainfall intensity pattern, infiltration loss rate, base flow, and unit hydrograph shape. An extension to the sensitivity analysis allows an estimate to be made of any quantile of the distribution of flood magnitude based on sampling across all causative rainfall and antecedent conditions. While attention was concentrated on peak discharge as the measure of flooding, it should be emphasized that the technique is suited to more complex design

criteria. The hydrograph may be treated as an inflow and routed through the scheme, and so the actual design criteria of interest may be calculated. (See also W78-03783) (Humphreys-ISWS)
W78-03801

SYNTHETIC UNIT HYDROGRAPH TECHNIQUE FOR THE DESIGN OF FLOOD ALLEVIATION WORKS IN URBAN AREAS,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
M. J. Hall.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 485-500, 1974. 4 fig, 2 tab, 15 ref.

Descriptors: *Hydrograph analysis, *Unit hydrographs, *Cities, *Urban hydrology, Floods, Watersheds(Basins), Analytical techniques, Rainfall, Flood control, Runoff, Base flow, Time lag, Foreign research, Foreign countries, *England, Inadequate data.

The development of rural land for urban, suburban, or industrial purposes can alter radically the flow regime of the catchment area within which such changes take place. The volume of surface runoff tends to increase, the lag time of the flood hydrograph to decrease, and the peak rate of flow to increase. These changes should be anticipated in the design of flood alleviation works for catchment areas undergoing urbanization. But in general, little quantitative information is available on the magnitude of the effect at different stages of urban development. If flow records are available from several catchment areas, each of which has reached a different stage of urban development, the finiteperiod unit hydrographs derived from these data can be used as an index to the influence of urbanization. The application of a synthetic unit hydrograph technique to flow records from both urban and rural catchment areas within the headwaters of the River Mole near Crawley, United Kingdom, has confirmed the feasibility of the approach but has shown that more thought is necessary in choosing catchment characteristics which reflect the character of the urban development. (See also W78-03783) (Humphreys-ISWS)
W78-03802

A DIMENSIONLESS UNITGRAPH FOR HONG KONG,
Southampton Univ. (England). Dept. of Civil Engineering.
P. R. Helliwell, and T. Y. Chen.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 501-516, 1974. 6 fig, 2 tab, 7 ref.

Descriptors: *Unit hydrographs, *Hydrograph analysis, *Watersheds(Basins), *Cities, Discharge(Water), Runoff forecasting, Measurement, Time lag, Streamflow, Forecasting, Runoff, Foreign countries, Foreign research, *Hong Kong, Inadequate data.

The large number of individual catchments in Hong Kong makes it impracticable to measure streamflows on all but a small proportion of streams. Rainfall characteristics and topography are similar over much of the area. Using data for several storms at each of the 7 stream gauging stations, a mean dimensionless unitgraph was derived. Basin lag was used in the conversion of both time and discharge scales. For ungauged catchments, basin lag can be estimated either as a simple function of catchment size or as shape and slope. This work was based on records collected in 1964 and 1965. (See also W78-3783) (Humphreys-ISWS)
W78-03803

STUDY OF MAXIMUM FLOODS IN SMALL BASINS OF TORRENTIAL TYPE,
R. Heras, and A. Lara.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 517-539, 1974. 16 fig, 4 tab.

Descriptors: *Small watersheds, *Hydrograph analysis, *Floods, *Methodology, Meteorology, Analytical techniques, Forecasting, Runoff, Geology, Foreign countries, Foreign research, Geology, Watersheds(Basins), *Grand Canary Island, Inadequate data.

The methodology of study was summarized for small basins of torrential character and was applied to the Tirajana Gully of the Gran Canaria Island, considering the geological and geomorphological conditions of the basin and also the principal physical characteristics of the gully. Considering the physical characteristics and a complete statistical study of intensities, the hydrograph was established for different hypotheses, and the type of hydrograph was studied in relation to the duration-intensity-frequency curves of maximum precipitation in 24 hours. (See also W78-03783) (Humphreys-ISWS)
W78-03804

FLOOD ESTIMATION BY DETERMINATION OF REGIONAL PARAMETERS FROM LIMITED DATA,
P. H. Herbst, S. Van BilJon, J. P. J. Olivier, and J. M. Hall.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.) p 541-552, 1974. 3 fig, 2 tab, 13 ref.

Descriptors: *Floods, *Forecasting, *Peak discharge, *Statistical methods, *Africa, Hydrograph analysis, Watersheds(Basins), Regression analysis, Statistical models, Flood frequency, Runoff, Annual peak discharge, Hydrographs, Annual flood, Methodology, Estimating, Flow duration, Foreign countries, Foreign research, *South Africa, Inadequate data.

A regionalized study of maximum annual flows of different short durations (including peaks) was carried out. In view of the limited length of record available at most of the gauging stations in the region, an attempt was made to develop a technique to strengthen the data available at any particular point of interest by using all pertinent flow data in the region. Having chosen the extremal distribution best suited to the region, the moments of the sample (after adjustment) were correlated with various catchment characteristics. This allowed estimation of flood magnitude frequency curves, at any site of interest within the region with associated confidence bands. Such frequency curves were determined for various suitable time intervals which then allows the synthesis of characteristic flow hydrographs, with a specific probability of occurrence attached to each, along with associated envelopes corresponding to specific confidence limits. Comparison with hydrographs derived from rainfall input depths with specified probabilities, substracting losses and then using unitgraph methods, lead to the conclusion that a better relation between probability of occurrence of a specific hydrograph, and its magnitude, usually can be obtained by direct statistical methods than by more indirect deterministic techniques. (See also W78-03783) (Humphreys-ISWS)
W78-03805

PRACTICES OF DESIGN FLOOD FREQUENCY FOR SMALL WATERSHEDS IN THAILAND,
Royal Irrigation Dept., Bangkok (Thailand). Hydrology Div.
D. Jaraswathana, and S. Pinkayan.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 553-556, 1974. 2 ref.

Descriptors: *Design, *Small watersheds, *Hydrologic aspects, *Water resources, Flood frequency, Rainfall-runoff relationships, Hydrographs, Design storm, Frequency, Rational formula, Watersheds(Basins), Foreign countries, *Thailand, Inadequate data.

It is true that adequate hydrologic data do not exist and that development of water resources projects cannot be kept waiting until data are made available. Thailand shares these conditions with the other developing countries. The hydrologic data conditions in Thailand can be categorized as follows: (1) No data are available in the catchment area; (2) some data are available within neighboring areas; (3) some data with short period of record do exist; and (4) considerable data are low with low reliability and accuracy available. The purpose of this paper was to present the general practices of hydrologic analyses in Thailand, particularly on design flood frequency in small watersheds. The method, which is the common practice for assessing design floods, was based on the concept of rational formula, the unit distribution graph, and the design storm obtained by the conventional procedures of frequency analysis. It was concluded that new concepts and statistical techniques which give more reliability are needed for the design of small water resources projects in Thailand. (See also W78-03783) (Humphreys-ISWS)
W78-03806

DESIGN DISCHARGE DERIVED FROM DESIGN RAINFALL,
Public Works Research Inst., Tokyo (Japan).
For primary bibliographic entry see Field 2A.
W78-03807

THE USE OF CENSORED DATA IN ESTIMATING T-YEAR FLOODS,
Institute of Hydrology, Wallingford (England).
M. N. Leese.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 563-575, 1974. 3 tab, 8 ref.

Descriptors: *Flood forecasting, *Statistical methods, *Sampling, *Floods, Forecasting, Hydrologic data, Flood recurrence interval, Probability, Data processing, Annual peak discharge, Peak discharge, Discharge(Water), Annual flood, Statistical models, Time series analysis, Analytical techniques, Watersheds(Basins), Foreign countries, Foreign research, *United Kingdom, Inadequate data.

Types of incomplete data to be found in connection with flood series were described, and it was shown how samples containing such data may be used to estimate the parameters of a distribution describing annual maximum flows. Formulas for the standard errors of the resulting estimates also were given. Examples were taken from a river for which censored data exist. Preparatory data standardization was described, and the parameters estimated using this data were compared with the data estimated using the complete sample only. The marginal value of using censored data in this context was assessed by means of the subsequent reduction in the standard errors of the estimates of T-year floods for various values of T, and this was related to the effort required to collect and standardize the data. (See also W78-03783) (Humphreys-ISWS)
W78-03808

ASSESSMENT OF DESIGN FLOODS IN BRAZIL,
P. Poggi Pereira.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 577-587, 1974. 1 fig, 1 tab, 7 ref.

Descriptors: *Design flood, *Methodology, *Design criteria, *Watersheds(Basins), Discharge(Water), Floods, Runoff, Rational formula, Flood recurrence interval, Runoff coefficient, Rural areas, Cities, Design flow, Rainfall, Probable maximum precipitation, Foreign countries, *Brazil, Inadequate data.

The techniques utilized by the Departamento Nacional de Obras de Saneamiento for computing the characteristics of flood to be used for designing works against inundations were described. Very seldom trustworthy river flood discharge measurements are obtained. In most cases, design flood discharges are estimated with a basis on topographic data which can be gathered quickly. Until thirty years ago the contributing basin area was multiplied by a standard unit discharge in order to get the design flood discharge. Later on, the rational method was adopted, mainly for designing small canals. This system was improved considerably by the execution of a statistical study of heavy rains observed in the country. The choice of the height of some dikes was based on the high water levels attained during ancient floods observed and still remembered by local people. It has been found necessary to perform more elaborate and time-consuming hydrological observations and studies for designing dams. The use of mathematical models is still incipient but promising. Design floods of different standard periods of recurrence are adopted according to the type of the work, the size of the river, and the utilization given to the area to be protected. (See also W78-03783) (Humphreys-ISWS)
W78-03809

A METHOD FOR THE PREDICTION OF WASHLOAD IN CERTAIN SMALL WATERSHEDS,
For primary bibliographic entry see Field 4D.
W78-03810

METHODS FOR THE ESTIMATION OF MAXIMUM DISCHARGES OF SNOW MELT AND RAINFALL WATER WITH INADEQUATE OBSERVATIONAL DATA,
Gosudarstvennyi Gidrologicheski Inst., Leningrad (USSR).
For primary bibliographic entry see Field 2E.
W78-03811

COMPUTATION OF PROBABILISTIC VALUES OF LOW FLOW FOR UNGAUGED RIVERS,
Gosudarstvennyi Gidrologicheskii Inst., Leningrad (USSR).
A. M. Vladimirov, and A. I. Chebotarev.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 625-633, 1974. 6 ref.

Descriptors: *Low flow, *Forecasting, *Streamflow, Rivers, Base flow, Methodology, Equations, Seasonal, Monthly, Discharge(Water), Low-flow frequency, Design flow, Design flow, Design criteria, Foreign countries, *USSR, Inadequate data.

The main characteristics of low flow (minimum daily, monthly, and seasonal flows) were investigated. The presented computation methods are based on a combined use of geographical interpolation and probability analysis and the consideration of the main factors affecting the volume and regime of low flow. Principal characteristics of low flow for medium-size rivers are determined by maps of flow isolines, and those characteristic for small rivers are determined by regional empirical correlation. Design flow is established by means of transition coefficients. The principal computation methods discussed were developed for USSR rivers. (See also W78-03783) (Humphreys-ISWS)
W78-03812

A STUDY OF MAXIMUM FLOOD DISCHARGE FORMULAS,
Seoul National Univ. (Republic of Korea). Dept. of Civil Engineering.
T. S. Won.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 635-647, 1974, 17 fig, 4 tab, 1 ref.

Descriptors: *Maximum probable flood, *Flood discharge, *Flood forecasting, *Asia, *Watersheds(Basins), Design flood, Flood routing, Rainfall-runoff relationships, Equations, Analytical techniques, Methodology, Stochastic processes, Statistical methods, Rainfall, Rainfall intensity, Peak discharge, Time of concentration, Hydrology, Foreign countries, Foreign research, *Korea, *Manchuria, Inadequate data.

This paper described a new formula for the calculation of approaching velocity of rain water and a number of new formulas for the estimation of maximum flood discharge. Many empirical formulas exist which have limited application. However, in devising his formulas, the author derived theoretically the form of the basic maximum discharge formula for the case of rivers with no tributaries and determined stochastically the value of the coefficients using the records of observed measurements. The author derived theoretically formulas for the case of rivers with tributaries to fit in the actual localities of the site under consideration. The formulas should be widely applicable for rivers or sewer nets and also for any regions or countries. The author's formulas may be used not only for estimating the design flood but also in flood routing. The author's formulas may be used not only for estimating the design flood but also in flood routing. The author believes that his formulas would be very helpful in the planning of water resources development projects, especially for those with inadequate data. (See also W78-03783) (Humphreys-ISWS)
W78-03813

SOME ASPECTS OF THE PERSISTENCE AND FATE OF ACROLEIN HERBICIDE IN WATER,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
For primary bibliographic entry see Field 5B.
W78-03817

LAKES AND PONDS,
Pennsylvania Univ., Philadelphia. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 6B.
W78-03842

AN APPLICATION OF THE INTERREGIONAL I/O MODEL FOR THE STUDY OF THE IMPACT OF THE MCCLELLAN-KERR ARKANSAS RIVER MULTIPLE PURPOSE PROJECT,
Catholic Univ. of America, Washington, DC. Inst. of Social and Behavioral Research.
U. Kim, C. Park, and S. K. Kwak.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-040 216, Price codes: A10 in paper copy, A01 in microfiche. Prepared for Army Engineer Institute for Water Resources, Fort Belvoir, VA, March 1977, 209 p, 19 tab, 4 append. DACW31-74-C-0047.

Descriptors: *Input-output analysis, *Mathematical models, *Evaluation, *Project planning, *Economic impact, Economics, Construction costs, Transportation, Flood control, Water supply, Electric power, Recreation, Sediment control, *McClellan-Kerr Arkansas River Navigation System, *Interregional input-output model, *Impact study.

This study applies the Interregional Input-Output Model of the United States to the assessment of the impacts of constructing the McClellan-Kerr project. The report describes the model used, the assumptions adopted, the procedures for adapting the national Input-Output Model to project evaluation, and the programs and data summaries for all major steps of analysis. The model is operational on Corps of Engineers computer equipment and available for adaptation to other project studies with relatively modest investment. The gross direct and indirect construction impact of the project was estimated by the I/O Model to be $6.4 billion in output and $2.1 billion in household income in 1963 dollars. Of this amount, 35.8 percent of the output and 52 percent of the income are estimated to be shared by the project region. This assessment is based on short term construction impacts and does not represent net increments of national income. Other more enduring benefits and costs will be obtained through the functional outputs of the McClellan-Kerr Arkansas River Navigation System. These outputs include transportation, flood control, water supply, electric power, sediment control and channel stabilization, and the enhancement of recreation, fish, and wildlife. The report is one of a series examining the impacts of the McClellan-Kerr Arkansas River Navigation System. (Nessa-NC)
W78-03899

FLOOD PLAIN INFORMATION: PAMUNKEY RIVER, HANOVER COUNTY, VIRGINIA.
Army Engineer District, Norfolk, VA.
Prepared for Hanover County, VA, February 1975, 25 p, 6 fig, 25 plates, 6 tab.

Descriptors: *Virginia, *Flood profiles, *Flood data, *Peak discharge, Floods, Indirect flood measurement, Flood forecasting, Historic floods, Flood stages, Flow duration, Stage-discharge relations, Flood damage, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Control structure, *Pamunkey River(VA), Hanover County(VA), Intermediate Regional Flood.

The study area includes the main stream and flood plain on either side of the Pamunkey River in New Hanover County, Virginia. The flood plain is undeveloped and mostly wooded. The projected county population growth rate of 4.5 percent will generate increasing land development pressures on the flood plain. Flood data were obtained from topographic maps, field studies, precipitation records and U.S. Geological Survey stream gage data. Flooding may occur at any time of year and results from heavy general rainfall or intense local thunderstorms. The worst known flood occurred in August 1928. On this date, flood waters are estimated to have crested 32.6 feet above flood stage. In another flood in August 1969, the flood waters crested at 31.1 feet above flood stage, discharging 40,300 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood is expected to crest 17.2 feet above flood stage and to discharge 42,000 cfs, while the Standard Project Flood will crest 21.7 feet above flood stage and will discharge 63,000 cfs. These floods would affect some farmland, roads, and utilities. Considerable damage to these facilities is anticipated. The data contained in this report are intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)

W78-03902

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, ARMSTRONG COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Armstrong County Planning Commission, PA, December 1973, 47 p, 37 fig, 19 plates, 8 tab.

Descriptors: *Pennsylvania, *Historic floods, *Flood data, *Peak discharge, Floods, Flood flow, Indirect flood measurement, Streamflow forecasting, Flood profiles, Storms, Flood stages, Flow duration, Stage-discharge relations, Flood plains, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Floodwalls, Dams, Reservoirs, Standard Project Flood, Armstrong County(PA), *Allegheny River(PA), Freeport(PA), Ford City(PA), Kittanning(PA), Parker(PA), Intermediate Regional Flood.

The study area involves the Allegheny River and its flood plain in Armstrong County, Pennsylvania. Included are the major communities of Freeport, Ford City, Kittanning and Parker. The flood plain is largely developed with residential, commercial, and industrial land uses. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs from December through April and results from heavy rains and snowmelt. Intense thunderstorms may cause severe floods at other times. There are 9 upstream flood control dams and reservoirs that act to reduce flood levels in the Allegheny River within Armstrong County by 4 to 10 feet. The worst flood recorded at Lock and Dam 7 occurred on March 26, 1913, discharging 270,000 cubic feet per second (cfs) and cresting at 802.0 feet mean sea level (msl). Another large flood in June 1972 discharged 189,300 cfs at the same location, cresting at 796.8 feet msl. At the same location, the Intermediate Regional Flood (IRF) would discharge 215,000 cfs and would crest at 798.2 feet msl, while the Standard Project Flood would discharge 261,000 cfs and would crest at 800.6 feet msl. The 1913 flood elevation would have been lower if present structural flood controls had been in place. This report is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-03903

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, NEW KENSINGTON, ARNOLD, LOWER BURRELL AND ALLEGHENY TOWNSHIP, WESTMORELAND COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Westmoreland County, PA and Pennsylvania Department of Environmental Resources, June 1973, 26 p, 6 fig, 8 plates, 6 tab.

Descriptors: *Pennsylvania, *Flood forecasting, *Flood profiles, *Historic floods, *Flood data, Floods, Indirect flood measurement, Storms, Flood frequency, Flood stages, Peak discharge, Flow duration, Flow characteristics, Stage-discharge relations, Flood damage, Rivers, Flood plains, Standard Project Flood, Flood protection, Warning systems, Land use, Planning, Control structures, Floodwalls, Dams, Reservoirs, *Allegheny River(PA), Westmoreland County(PA), New Kensington(PA), Arnold(PA), Lower Burrell(PA), Allegheny Township(PA), Intermediate Regional Flood.

The study area involves the Allegheny River and its flood plain in Westmoreland County, Pennsylvania, including the Town of New Kensington, the Borough of Arnold, and the Townships of Lower Burrell and Allegheny. There are no developments in the flood plain that would be significantly affected by flooding due to structural flood control measures and the naturally high, steep river banks. There are 8 upstream flood control dams and reservoirs, with one more under construction. Flood data were obtained from topographic maps, historical sources, field studies, and stream gage records. The main flood season is December through April and results from heavy rain and snowmelt. Intense local thunderstorms may cause flooding at other times. The worst flood of record occurred on March 18, 1936, cresting at 770.7 feet mean sea level (msl) and discharging 360,500 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood (IRF) would crest at 763.4 feet msl and would discharge 233,000 cfs, while the Standard Project Flood (SPF) would crest at 766.7 feet msl, and would discharge 290,000 cfs. This report is intended for use in making land use planning and management decisions regarding flood plain utilization. (Nessa-NC)
W78-03904

FLOOD PLAIN INFORMATION: OHIO, ALLEGHENY, MONONGAHELA AND YOUGHIOGHENY RIVER, ALLEGHENY COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Allegheny County Board of Commissioners, PA, March 1973, 62 p, 24 fig, 36 plates, 16 tab.

Descriptors: *Pennsylvania, *Streamflow forecasting, *Flood forecasting, *Flood profiles, Historic floods, *Flood data, Floods, Indirect flood measurement, Storms, Flood frequency, Flood stages, Peak discharge, Flow duration, Stage-discharge relations, Rivers, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Dams, Reservoirs, *Allegheny River(PA), *Ohio River(PA), *Monongahela River(PA), *Youghiogheny River(PA), Allegheny County(PA), Pittsburgh(PA), Intermediate Regional Flood.

The study area involves the portions of Allegheny County, Pennsylvania, including the City of Pittsburgh, that are subject to flooding from the Ohio, Allegheny, Monongahela and Youghiogheny Rivers. Flood plain developments in urban areas are industrial, commercial, and residential, comprising the supporting components for the total urban industrial complex. Developable lands are not available; however, urban areas prime for redevelopment are continually identified and may fall within the flood plain. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. There are 10 upstream flood control dams and reservoirs that help reduce flood levels in Pittsburgh. The main flood season occurs from December through April, resulting from heavy rain and snowmelt. Intense rainfall may cause flooding at other times. The worst flood recorded on the Ohio River at Pittsburgh occurred on March 18, 1936, cresting at 740.2 feet mean sea level (msl) and discharging 557,000 cubic feet per second (cfs). This flood is used in lieu of a Standard Project Flood determination. At the same location, the Intermediate Regional Flood would crest at 729.5 feet msl and would discharge 375,000 cfs. Historic and future flood profiles are provided for the entire study area. This study is intended for use in making land use planning and management decisions regarding flood plain utilization. (Nessa-NC)
W78-03905

FLOOD PLAIN INFORMATION: CONEMAUGH AND LITTLE CONEMAUGH RIVERS, STONY AND BENS CREEKS, CITY OF JOHNSTOWN AND VICINITY, CAMBRIA AND SOMERSET COUNTIES, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Counties of Cambria and Somerset, PA, December 1974, 54 p, 49 fig, 13 plates, 10 tab.

Descriptors: *Pennsylvania, *Indirect flood measurement, *Flood forecasting, *Flood profiles, *Flood data, *Peak discharge, Floods, Flood flow, Storms, Historic floods, Flood stages, Stage-discharge relations, Rivers, Flood plains, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, Standard Project Flood, *Conemaugh River(PA), *Little Conemaugh River(PA), Johnstown(PA), Cambria County(PA), Somerset County(PA), Stony Creek(PA), Bens Creek(PA), Intermediate Regional Flood.

The study area involves the Conemaugh River and its tributaries in the vicinity of the City of Johnstown in Cambria and Somerset Counties, Pennsylvania. Most of the study area is densely developed with residential, commercial and industrial land uses. Bens Creek, a tributary to the Conemaugh in the study area, is sparsely developed. Flood data were obtained from topographic maps, field studies, historical sources, and intermittent and permanent stream gage records. The main flood season is December through April, and results from rainfall combined with snowmelt. Intense local thunderstorms may cause flooding at other times. The worst known flood was the famous Johnstown flood of May 31, 1889, which resulted from a collapsed dam. The worst flood without unnatural augmentation occurred on March 18, 1936, cresting at 22.8 feet above flood stage and discharging 90,000 cubic feet per second (cfs). Structural flood prevention measures completed in November 1943 protect much of the developed area from floods as large as the Intermediate Regional Flood (IRF). At stream mile 52.06 on the Conemaugh River, the IRF will crest 28.25 feet above flood stage and discharge 83,000 cfs while the Standard Project Flood (SPF) will crest 35.5 feet above flood stage and discharge 128,000 cfs. The IRF is larger than the 1936 flood. There are 13 bridges in the study area that are obstructive to major flood flows; 9 of these are obstructive to the IRF. This report will facilitate land use planning and management decisions. (Nessa-NC)
W78-03906

FLOOD PLAIN INFORMATION: PETERS CREEK, JEFFERSON BOROUGH, ALLEGHENY COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Jefferson Borough and South Park Township, PA, June 1971, 29 p, 7 fig, 8 plates, 5 tab.

Descriptors: *Pennsylvania, *Indirect flood measurement, *Flood forecasting, *Flood profiles, *Flood data, Floods, Flood flow, Storms, Historic floods, Flood stages, Peak discharge, Flow duration, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, *Peters Creek(PA), Jefferson Borough(PA), Allegheny County(PA), South Park Township(PA), Intermediate Regional Flood.

The study area includes Peters Creek and its flood plain in Jefferson Borough and part of South Park Township in Allegheny County, Pennsylvania. Except for a single commercial development, the flood plain is brush or tree covered and undeveloped. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season is from spring through fall and results from intense local thunderstorms or heavy general rains. Serious flooding may occur at other times. The worst flood of record occurred on August 19, 1969, cresting at 767.7 feet mean sea level (msl) and discharging 4,400 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood (IRF) would crest at 769.3 feet msl, discharging 9,300 cfs, while the Standard Project Flood would crest at 771.0 feet msl, discharging 14,000 cfs. Several bridges across Peters Creek would block the flow of the IRF. Flood damage

will not be significant. This report is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-03907

FLOOD PLAIN INFORMATION: FRENCH CREEK, COCHRANTON, CRAWFORD COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Town of Cochranton, September 1971, 42 p, 10 fig, 10 plates, 10 tab.

Descriptors: *Pennsylvania, *Indirect flood measurement, *Flood forecasting, *Flood profiles, *Flood data, Floods, Storms, Historic floods, Flood stages, Peak discharge, Stage-discharge relations, Rivers, Flood plains, Ice jams, Flood protection, Standard Project Flood, Non-structural alternatives, Land use, Planning, Control structures, Dikes, Dams, Reservoirs, Cochranton(PA), *French Creek(PA), Crawford County(PA), Intermediate Regional Flood, Little Sugar Creek(PA).

The study area includes the flood plain of French Creek and Little Sugar Creek in the vicinity of Cochranton Borough, Pennsylvania, and parts of Wayne, Fairfield, East Fairfield and Union Townships. The flood plain is largely undeveloped, with scattered residential, commercial, and seasonal structures. Flood data were obtained from topographic maps, field studies, aerial photographs, precipitation records, and stream gages. The main flood season occurs from December through April, usually resulting from heavy rains. The worst known flood on French Creek occurred in March 1913. Other serious recent floods occurred in January 1959 and April 1960. In April 1960, flood waters at the Corps of Engineers stream gage crested at 1059.9 feet mean sea level (msl), discharging 25,000 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood (IRF) is expected to crest at 1063.2 feet msl, and discharge 35,000 cfs, while the Standard Project Flood (SPF) will crest at 1065.2 feet msl and discharge 45,000 cfs. The 1959 flood heights were more serious due to ice jams. The SPF and IRF would cause some damage to residential and commercial properties. Future flooding will be modified by the construction of three proposed reservoirs upstream of Cochranton; it is expected that major flood heights will be reduced by 2 feet with all three projects completed. This report will be useful in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-03908

FLOOD PLAIN INFORMATION: CLARION RIVER AND SILVER CREEK, JOHNSONBURG, ELK COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Borough of Johnsonburg, PA, December 1971, 41 p, 10 fig, 9 plates, 8 tab.

Descriptors: *Pennsylvania, *Flood forecasting, *Flood data, *Peak discharge, Floods, Flood flow, Indirect flood measurement, Flood profiles, Storms, Historic floods, Flood frequency, Flood stages, Flow duration, Flood damage, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Zoning, Control structures, Dikes, Channel improvement, Standard Project Flood, *Clarion River(PA), *Silver Creek(PA), Elk County(PA), Johnsonburg(PA), Intermediate Regional Flood.

The study area includes Silver Creek, the Clarion River and its two branches within the limits of the Borough of Johnsonburg in Elk County, Pennsylvania. Some residential, industrial and commercial developments exist on these flood plains. Flood data were obtained from topographic maps, field studies, historical sources and stream gage records. The main flood season occurs from January through May and results from heavy rain and snowmelt. Intense local thunderstorms may cause flooding at other times. The worst flood of record occurred on July 18, 1942. A dam constructed on the East Branch will affect future flooding. The Intermediate Regional Flood (IRF) is expected to be 6.0, 10.0, and 0.5 feet lower than the July 1942 flood on the Clarion River, East Branch, and Silver Creek, respectively. The West Branch, which is not affected by the dam, would experience an IRF exceeding the 1942 flood by one foot. The Standard Project Flood (SPF) would be 2.0 and 5.0 feet lower than the 1942 flood on the Clarion River and East Branch, respectively. The SPF would be 6.0 and 0.5 feet higher than the 1942 flood on the West Branch and Silver Creek, respectively. This report will facilitate land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-03909

FLOOD PLAIN INFORMATION: HARE AND BEAR CREEKS, CORRY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for City of Corry, PA, September 1967, 31 p, 8 fig, 5 plates, 3 tab.

Descriptors: *Pennsylvania, *Flood forecasting, *Flood data, *Peak discharge, Floods, Indirect flood measurement, Flood profiles, Storms, Historic floods, Flood stages, Flow duration, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, Corry(PA), *Hare Creek(PA), *Bear Creek(PA), Erie County(PA), Intermediate Regional Flood.

The study area includes the flood plains of Hare and Bear Creeks in the vicinity of Corry in Erie County, Pennsylvania. Development on the flood plain is limited, consisting of a public utility and some residential and commercial structures. Flood data were obtained from topographic maps, profiles, and field studies. Little historical data were available. The main flood season extends from January through April and results from either rainfall alone or in combination with snowmelt. The greatest known flood occurred in April 1947. At the downstream limit of the study area, the Intermediate Regional Flood (IRF) is expected to discharge 5,300 cubic feet per second (cfs), while the Standard Project Flood (SPF) will discharge 20,000 cfs. The IRF flood height would vary from two to six feet above flood stage, while the SPF would vary from 2.5 to 12.5 feet above flood stage. Two bridges on Hare Creek would significantly affect SPF and IRF heights. This report is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-03910

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, CALIFORNIA, COAL CENTER, AND WEST BROWNSVILLE, WASHINGTON COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Washington County Planning Commission, PA, June 1970, 41 p, 7 fig, 21 plates, 6 tab.

Descriptors: *Pennsylvania, *Flood forecasting, *Flood profiles, Historic floods, *Flood data, Floods, Flood flow, Indirect flood measurement, Storms, Flood frequency, Flood stages, Peak discharge, Flow duration, Flow characteristics, Stage-discharge relations, Flood damage, Rivers, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, Dams, Reservoirs, *Monongahela River(PA), California(PA), Coal Center(PA), West Brownsville(PA), Washington County(PA), Intermediate Regional Flood.

The study area involves a 6.5 mile reach of the Monongahela River located in the Washington County Boroughs of California, Coal Center, and West Brownsville, Pennsylvania. The flood plain is largely developed with residential and commercial land uses. Most residential sections are located on high ground, outside of the flood zone. Flood data were obtained from topographic maps, field studies, historical sources, and intermittent and permanent stream gage records. The main flood season occurs from December through March and results from rainfall combined with snowmelt. Intense thunderstorms may cause flooding at other times. The worst flood of record occurred on March 7, 1967. At the Brownsville Lock and Dam, this flood crested at 770.9 feet mean sea level (msl) and discharged 158,000 cubic feet per second (cfs). Another large flood occurred in March 1963 and was about 2 feet lower than the 1967 flood. At the same location, the Intermediate Regional Flood (IRF) would crest at 771.0 feet msl and discharge 181,000 cfs, while the Standard Project Flood (SPF) would crest at 774.5 feet msl and would discharge 213,500 cfs. Historic and future flood profiles are also provided for other locations in the study area. Tygart Dam and Reservoir, WV, operated since 1938 by the U.S. Corps of Engineers, has been effective in reducing major flood peaks by an average of 4 feet. Two additional dams have been authorized and they will further reduce flood peaks on the Monongahela River. This report will facilitate land use planning and management decisions regarding future flood plain utilization. (Nessa-NC)
W78-03911

FLOOD PLAIN INFORMATION: BLACKSTONE RIVER, CUMBERLAND, LINCOLN, CENTRAL FALLS, AND PAWTUCKET, RHODE ISLAND.
Army Engineer District, Waltham, MA.
Prepared for Towns of Cumberland, Lincoln, Central Falls, and Pawtucket, RI, June 1971, 48 p, 10 fig, 15 plates, 7 tab.

Descriptors: *Rhode Island, *Flood forecasting, *Flood profiles, Historic floods, *Flood data, Floods, Flood flow, Indirect flood measurement, Storms, Flood stages, Peak discharge, Flood frequency, Flow duration, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Dams, Cumberland(RI), Lincoln(RI), Central Falls(RI), *Pawtucket(RI), *Blackstone River(RI), Intermediate Regional Flood.

The study area involves the portions of Cumberland, Lincoln, Central Falls, and Pawtucket, Rhode Island, that are subject to flooding from the Blackstone River, a stretch of 10.6 miles. The flood plain contains residential, commercial, and industrial land uses. Four bridges would obstruct the Intermediate Regional Flood (IRF) flow, while 13 bridges obstruct the Standard Project Flood (SPF) flow. The main flood seasons are spring and fall, resulting from heavy rains accompanying tropical hurricanes. A flood control dam and reservoir has been in operation since 1961 and this reduces flood flows on the Blackstone River. Flood data were obtained from topographic maps, historical sources, field studies, stream gage records, and hydrologic analysis of similar watersheds in the area. The worst flood recorded at Woonsocket occurred on August 19, 1955, discharging 32,900 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood is expected to discharge 22,000 cfs, while the Standard Project Flood (SPF) would discharge 40,000 cfs. The IRF would be one foot lower than the 1955 flood, while the SPF would be four feet higher. The 1955 flood would have been less severe if the existing structural flood controls had been in place, with a modified discharge of 26,100 cfs. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-03912

FLOOD PLAIN INFORMATION: WEST BRANCH SUSQUEHANNA RIVER (EAST), LYCOMING COUNTY, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
Prepared for Lycoming County Planning Commission, PA, April 1974, 39 p, 3 fig, 13 plates, 7 tab.

Descriptors: *Pennsylvania, Historic floods, *Flood data, *Peak discharge, Floods, Flood flow, Indirect flood measurement, Streamflow forecasting, Flood forecasting, Flood profiles, Storms, Flood frequency, Flood stages, Flow duration, Stage-discharge relations, Flood damage, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Reservoirs, Lycoming County(PA), *West Branch Susquehanna River(East) (PA), Muncy(PA), Montgomery(PA), Brady Township(PA), Clinton Township(PA), Fairfield Township(PA), Muncy Township(PA), Muncy Creek Township(PA), Intermediate Regional Flood.

The study area involves the portions of Lycoming County, Pennsylvania that are subject to flooding from the West Branch Susquehanna River, a reach of about 13 miles. Included are the Boroughs of Muncy and Montgomery and the Townships of Brady, Clinton, Fairfield, Muncy and Muncy Creek. The flood plain contains residential, commercial, and light industrial developments in Muncy and Montgomery. Elsewhere, the flood plain contains only scattered residential sites and transportation routes. Flood data were obtained from topographic maps, historical sources, field studies and stream gage records. Four upstream reservoirs help reduce flood heights in the study area. Most floods occur in the late winter and early spring and result from heavy rain combined with snowmelt. Intense rainfall at other times of year have caused some of the worst known floods. The largest flood of record occurred on June 23, 1972 as a result of tropical storm Agnes. At the upstream study limit, the Intermediate Regional Flood (IRF) will discharge 300,000 cubic feet per second (cfs) compared to the 1972 flood volume of 295,000 cfs. At the upstream study limit the IRF will crest two feet below the 1972 crest, while at the downstream study limit, the IRF crest will be 1 foot higher. The upstream Standard Project Flood (SPF) volume will be 415,000 cfs. Compared to the 1972 flood, upstream crests will be three feet higher while downstream crests will be six feet higher. This report is intended for use in land use planning and management concerning flood plain utilization. (Nessa-NC)
W78-03913

FLOOD PLAIN INFORMATION: FRANKSTOWN BRANCH JUNIATA RIVER, WILLIAMSBURG, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
Prepared for Blair County Planning Commission, PA, June 1974, 23 p, 8 fig, 10 plates, 6 tab.

Descriptors: *Pennsylvania, Historic floods, *Flood data, *Peak discharge, Floods, Indirect flood measurement, Flood forecasting, Flood profiles, Storms, Flood stages, Flow duration, Stage-discharge relations, Flood damage, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, *Frankstown Branch Juniata River(PA), Williamsburg(PA), Catherine Township(PA), Blair County(PA), Woodbury Township(PA), Intermediate Regional Flood.

The study area includes the portions of the Borough of Williamsburg and the Townships of Catherine and Woodbury that are subject to flooding from the Frankstown Branch of the Juniata River. The flood plain consists primarily of commercial, residential and industrial properties. Flood data were obtained from topographic maps, field studies, historical records, and a U.S. Geological Survey stream gage. Flooding occurs at any time of year and results from heavy general rainfall, hurricane induced rains, and snowmelt. The worst known flood occurred on March 18, 1936, cresting at 850.4 feet mean sea level (msl) and discharging 47,600 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood (IRF) will discharge 35,000 cfs and crest at 855.58 feet msl, while the Standard Project Flood (SPF) will discharge 96,000 cfs and crest at 868.93 feet msl. These floods would cover a substantial portion of the flood plain in the Borough of Williamsburg. All five of the bridges in the study area are obstructive to SPF or IRF flood flows. Less severe floods will affect approaches to these structures. This report is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-03914

FLOOD HAZARD REPORT: SHICKSHINNY CREEK, LUZERNE COUNTY, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
Prepared for Luzerne County Planning Commission, PA, April 1974, 8 p, 2 plates, 1 tab.

Descriptors: *Pennsylvania, *Streamflow forecasting, *Flood data, Floods, Indirect flood measurement, Flood forecasting, Flood profiles, Historic floods, Flood stages, Peak discharge, Flood damage, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Luzerne County(PA), *Shickshinny Creek(PA), Shickshinny Borough(PA), Intermediate Regional Flood.

The study area includes Shickshinny Creek and its flood plain in Luzerne County, Pennyslvania, from the creek's confluence with the Susquehanna River to Koonsville. Most of the flood plain is wooded and undeveloped, with residential and commercial land uses concentrated in the downstream portion of the study area. Flood data were obtained from topographic maps, historical sources and hydrologic data from nearby watersheds. No Shickshinny Creek gage records were available. Flooding occurs at any time of year, resulting from heavy rains, snowmelt, or backwater flooding from the Susquehanna River. The worst known flood occurred in 1972, and caused $12.6 million dollars damage in the Borough of Shickshinny. Damage upstream was not significant. At the mouth of the creek, and Intermediate Regional Flood is expected to discharge 4,300 cubic feet per second (cfs), while the Standard Project Flood will discharge 14,000 cfs. There are no existing, authorized, or proposed structural flood control measures either within or upstream from the study area. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-03915

FLOOD PLAIN INFORMATION: BIG SANDY RIVER, WAYNE COUNTY, WEST VIRGINIA.
Army Engineer District, Huntington, WV.
Prepared for State of West Virginia, Department of Natural Resources, June 1972, 43 p, 7 fig, 18 plates, 12 tab.

Descriptors: *West Virginia, *Flood forecasting, *Flood profiles, Historic floods, *Flood data, Floods, Flood flow, Indirect flood measurement, Storms, Flood frequency, Flood stages, Peak discharge, Flow duration, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Levee, Floodwalls, *Big Sandy River(WV), Wayne County(WV), Intermediate Regional Flood.

The study area involves the West Virginia bank of the Big Sandy River in Wayne County. Residential, commercial, industrial, and public utility land uses within the Standard Project Flood plain are sparse. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs from January through April and results from heavy general rainfall over the entire upstream drainage area. The worst known flood recorded at the confluence of the Big Sandy and Ohio Rivers occurred on January 27, 1937, and crested 29.5 feet above flood stage. At the same location, the Intermediate Regional Flood (IRF) would crest 22.5 feet above flood stage, and the Standard Project Flood (SPF) would crest 26.0 feet above flood stage. Flood control structures built since the 1937 flood should prevent the recurrence of such a large flood, and they also reduce the potential magnitude of the IFR and SPF. These structures consist of levees and floodwalls constructed by the Corps of Engineers, with a gradient of 3 feet above the level of the 1937 flood. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-03916

FLOOD HAZARD INFORMATION: BUFFALO CREEK, LOGAN COUNTY, WEST VIRGINIA--POST DISASTER CONDITIONS.
Army Engineer District, Huntington, WV.
April 1972, 9 p, 4 fig, 39 plates, 1 tab.

Descriptors: *West Virginia, *Flood data, *Flood damage, Floods, Flash flood, Regional Flood, Flood flow, Indirect flood measurement, Streamflow forecasting, Maximum probable flood, Flood profiles, Flood frequency, Flood recurrence interval, Flow characteristics, Erosion, Stream erosion, Deposition(Sediments), Frail lands, Bank erosion, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, *Logan County(WV), *Buffalo Creek(WV), Post disaster conditions, Intermediate Regional Flood.

The study area involves the portions of Logan County, West Virginia that are subject to flooding by Buffalo Creek. The study's purpose is to evaluate the changes in the flood carrying capacity of the stream and its flood plain that resulted from a disastrous impoundment failure on February 26, 1972, when extensive damage was done to natural and manmade obstructions and impediments. The flood plain is almost completely developed, especially with residential land uses. Thirty-nine bridges cross the creek. Flood data were obtained from aerial photos, topographic maps, and field studies. Flood plain and stream channel changes resulting from the 1972 flood include the elimination of manmade impediments to flood flow, the deposition of upstream debris at downstream locations, and realignment of the stream channel. At the mouth of Buffalo Creek, the Intermediate Regional Flood is expected to crest at 737.8 feet mean sea level, while the Standard Project Flood would crest at 755.4 feet mean sea level. These projections reflect changes in the hydraulic characteristics of the stream that will result from the elimination of flood debris. This study is intended for use in making land use plannig and management decisions concerning flood plain utilization. (Nessa-NC)
W78-03917

AN ECONOMIC OVERVIEW OF HAWAII'S WATER INSTITUTIONS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6E.
W78-03930

MODELS FOR ASSESSING THE ECONOMIC VALUE OF HYDROPOWER FOR PEAKING PURPOSES AND THE PRICING OF PEAKING ALTERNATIVES,
Washington State Water Research Center, Pullman.

For primary bibliographic entry see Field 6D.
W78-03964

URBAN FLOOD WATER MANAGEMENT SYSTEMS IN SEMIARID REGIONS: MODEL EXTENSION, DESIGN AND APPLICATION,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 6A.
W78-03965

DESIGN OF OPTIMAL WATER DISTRIBUTION SYSTEMS,
Technion-Israel Inst. of Tech., Haifa. Faculty of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-03997

SNOW CONTROL BY MODEL TECHNIQUES,
Guelph Univ. (Ontario). School of Engineering.
For primary bibliographic entry see Field 2C.
W78-04030

WATER RESOURCES MANAGEMENT AND PLANNING: OPTIMIZATION MODELING OF MULTIPLE RESERVOIR SYSTEMS,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 6A.
W78-04106

REPORT OF THE SOUTHEASTERN NEW ENGLAND STUDY--A STRATEGY FOR BALANCED DEVELOPMENT AND PROTECTION OF WATER AND RELATED LAND RESOURCES IN EASTERN MASSACHUSETTS AND RHODE ISLAND.
New England River Basins Commission, Boston, MA.
For primary bibliographic entry see Field 6B.
W78-04146

TRIAL APPLICATION OF REVISED EVALUATION PROCEDURES AT KINGSPORT, TENNESSEE.
Tennessee Valley Authority, Kingsport.
For primary bibliographic entry see Field 6B.
W78-04148

4B. Groundwater Management

LANDSAT LINEAR TREND ANALYSIS: A TOOL FOR GROUNDWATER EXPLORATION IN NORTHERN ARKANSAS,
Arkansas Univ., Fayetteville. Water Resources Research Center.
H. C. MacDonald, K. F. Steele, and E. Gaines.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 121, Price codes: A06 in paper copy, A01 in microfiche. Publication No. 49, June 1977. 108 p, 24 fig, 3 tab, 55 ref, 5 append. OWRT A-034-ARK (1), 14-34-0001-6004.

Descriptors: *Remote sensing, *Groundwater exploration, *Arkansas, Aquifer characteristics, *Linear trend analysis, Landsat data, Aerial photography.

In northern Arkansas, knowledge of deep aquifers is farily limited. The development of these deeper aquifers to their fullest potential as reliable water sources depends upon the delineation of high yield areas, a process that may be facilitated by linear trend analysis. Satellite and photolineament maps of the 13 counties were prepared by use of LANDSAT images and Agricultural Stabilization and Conservation Service photo indexes. The lineaments and fracture traces on aerial photographs and LANDSAT images are natural linear features such as aligned stream segments, soil tonal and vegetal alignments, and topographic sags. These features are the surface manifestations of subsurface fracture zones of undermined origin, which are areas where increased solution of carbonate rocks has taken place. The results of statistical testing of well yields in the study area show that the fracture trace-lineament method of well location can result in improved well yields. Linear trends interpreted from LANDSAT can be useful in the search for more reliable groundwater sources. (Smiley-Arkansas)
W78-03752

RECHARGE AND NITROGEN TRANSPORT MODELS FOR NASSAU AND SUFFOLK COUNTIES, N. Y.,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 5B.
W78-03756

IMPACT OF GROUNDWATER DEVELOPMENT IN ARID LANDS: A LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
S. Jo Keith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 908, Price codes: A08 in paper copy, A01 in microfiche. Arid Lands Resource Information Paper, No 10, 1977, 139 p. 34 fig, 13 tab, 318 ref. OWRT W-197(5254)(2).

Descriptors: *Groundwater, *Water resources development, *Land subsidence, *Arizona, Wells, Springs, Streamflow, Pumping, Environmental effects, Social aspects, Salinity, Water quality, Subsidence, Saline water intrusion, Vegetation, Economic impact, Arid lands, Technology, Water management(Applied), *Bibliographies, Agriculture, *Pakistan, Tubewells, Papago Indians, Industrial linkages, Institutional aspects, Developing countries, Economic development, Appropriate technology.

As groundwater comes increasingly under development, it is imperative, for economic, ecological, and political reasons, to anticipate the impact of its development. The literature is reviewed on this impact in arid lands in terms of two general categories: physical environment impacts and socioeconomic impacts. Two case studies are presented: one focuses on the impact of groundwater development on the Papago Indians, illustrating the cultural and subsequent environmental changes occurring when an assured groundwater supply is developed within an area of previous water scarcity inhabited by a seminomadic people; the second, through a discussion of groundwater development in Pakistan, demonstrates the role groundwater development can play in the economic development process in developing arid countries. The impact of groundwater development is not simply the result of the withdrawal of water. Technology, through its growth and appropriateness, and institutions influence very much the type and magnitude of the impact of groundwater development. It is through an understanding of these roles that desirable impacts can be promoted and undesirable impacts mitigated. (Keith-Arizona)
W78-03757

LEACHATE PLUMES IN GROUND WATER FROM BABYLON AND ISLIP LANDFILLS, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-03759

DIGITAL MODEL OF THE ARIKAREE AQUIFER NEAR WHEATLAND, SOUTHEASTERN WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-03761

OCCURRENCE AND DISTRIBUTION OF COLOR AND HYDROGEN SULFIDE IN WATER FROM THE PRINCIPAL ARTESIAN AQUIFER IN THE VALDOSTA AREA, GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-03762

WATER-RESOURCES INVESTIGATIONS IN NORTH DAKOTA, 1976.
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03764

WATER-RESOURCES INVESTIGATIONS IN ARIZONA, 1977.
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03765

GROUND-WATER LEVELS IN WYOMING, 1976,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03768

CHANGES IN AQUIFER-SYSTEM PROPERTIES WITH GROUND-WATER DEPLETION,
Geological Survey, Sacramento, CA. Water Resources Div.
B. E. Lofgren.
Paper presented at the 11th Biennial Ground Conference, held in Fresno, California, September 15-16, 1977. 34 p, 12 fig, 11 ref. Published as USGS report.

Descriptors: *Groundwater, *Drawdown, *Land subsidence, *Withdrawal, *California, Forecasting, Analytical techniques, Aquitards, Data collections, Aquifer characteristics, Groundwater recharge, Imported water, Water supply, Water demand, Droughts, Water management(Applied), *San Joaquin Valley(Calif).

After three decades of pumping overdraft, water-level decline, and widespread subsidence, water levels in half of the San Joaquin Valley, California, rose rapidly due to the importation of canal waters. By late 1975, artesian heads had recovered to their late 1940 levels. Then followed the drought years of 1976 and 1977, and renewed pumping overdraft. The stress-strain characteristics and storage parameters of the confined aquifer system have been calculated using the results of 20 years of precise field research. From these characteristics and parameters the close interrelationship between future ground-water depletion, water-level decline, and subsedence can be predicted. (Woodard-USGS)
W78-03769

DEFINING REACTIONS AND MASS TRANSFER IN PART OF THE FLORIDAN AQUIFER,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-03770

GROUND-WATER RESOURCES OF CENTRAL AND SOUTHERN YORK COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-03771

SOURCES OF EMERGENCY WATER SUPPLIES IN SANTA CLARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-03772

WATER RESOURCES OF OKALOOSA COUNTY AND ADJACENT AREAS, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
H. Trapp, Jr., C. A. Pascale, and J. B. Foster.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 042, Price codes: A05 in paper copy, A01 in microfiche.
Water-Resources Investigations 77-9, August 1977. 83 p, 32 fig, 4 tab, 35 ref.

Descriptors: *Water supply, *Available water, *Groundwater, *Surface waters, *Florida, Aquifer characteristics, Water wells, Pumping, Drawdown, Specific capacity, Transmissivity, Hydrogeology, Saline water intrusion, Groundwater recharge, Streamflow, Flow rates, Water quality, Evaluation, Okaloosa County(Fla).

Okaloosa County, in the northwest Florida panhandle, uses the Floridan aquifer for water supply, although it also has abundant surface water and ground water in the surficial sand-and-gravel aquifer. Water levels have declined locally more than 90 feet in the upper limestone of the Floridan aquifer. The Floridan aquifer is overlain by the Pensacola clay confining bed, and the Bucatunna Clay subdivides it into two limestone units. Water in the upper limestone is generally of good quality. The lower limestone probably contains saline water. Average daily stream discharge is about 2,500 million gallons. Stream discharge does not diminish excessively during droughts, owing to high base runoff. Water levels in the Floridan aquifer will decline as long as pumping increases in the present areas of withdrawal. The decline could be alleviated by redistribution of pumping, artificial recharge, and the use of the sand-and-gravel aquifer or streams. (Woodard-USGS)
W78-03774

ARTIFICIAL-RECHARG EXPERIMENTS NEAR LAKIN, WESTERN KANSAS,
Geological Survey, Lawrence, KS. Water Resources Div.; and Kansas Water Resources Board, Topeka.
J. B. Gillespie, G. D. Hargadine, and M. J. Stough.
Kansas Water Resources Board, Bulletin No 20, 1977. 91 p, 58 fig, 5 tab, 17 ref, append.

Descriptors: *Artificial recharge, *Groundwater recharge, *Water spreading, *Kansas, *Irrigation wells, Pit recharge, Infiltration, Water quality, Leaching, Ion exchange, Loess, Moisture content, Analytical techniques, Demonstration watersheds, Evaluation, *Lakin area(Kans), Kearny County, Arkansas River.

The irrigation economy of the High Plains of Kansas probably will decline if the depletion of ground water from storage in the major aquifers continues to accelerate. Experiments have been made in western Kansas to investigate artificial recharge as a possible means of alleviating the problem. Possible sources of water for artificial recharge are storm runoff, irrigation tail water, and imported surface water. The artificial-recharge experimental site near Lakin, Kansas, is underlain by about 1.5 feet of loessial soil, 12 feet of loess, and 170 feet of undifferentiated Pliocene (Ogallala Formation) and Pleistocene deposits overlying shale of the Dakota Formation. Depth to the water table is about 65 feet. The unconsolidated material in the unsaturated zone consists mainly of silt and clayey silt with some layers of sand and gravel. Unconsolidated material in the upper part of the saturated zone consists mostly of fine sand. Artificial-recharge experiments were conducted in three small ponds using ground water and one small pond using surface water from the Arkansas River. As the infiltrated water percolated to the water table, changes in chemical quality were monitored by sampling through porous cups installed at various depths in the unsaturated zone. After infiltration of 120 feet of water, leaching had nearly stabilized and the chemical quality of water reaching the water table was similar to that of the input water. The data collected indicate that artificial recharge of alluvial aquifers by water spreading could be accomplished on most of the High Plains of Kansas, provided that water for recharge were available. (Woodard-USGS)
W78-03775

PRELIMINARY EVALUATION OF GROUND WATER IN THE PRE-PENNSYLVANIAN CARBONATE ROCKS, MCCOY AREA, COLORADO,
Geological Survey, Lakewood, CO. Water Resources Div.
E. R. Hampton.
Open-file report, 1974. 11 p, 1 fig, 1 plate, 2 tab, 11 ref.

Descriptors: *Groundwater resources, *Observation wells, *Water yield, *Water quality, *Colorado, Carbonate rocks, Aquifer characteristics, Groundwater availability, Water analysis, Chemical analysis, *McCoy area(Colo).

Oil-test drilling in 1953 and 1962 suggested the presence of a substantial ground-water reservoir in the pre-Pennsylvanian carbonate rocks in the McCoy, Colo., area. Four water wells drilled in 1971 confirmed the presence of such a reservoir. In the 17 square-mile area near McCoy, an estimated 43,000 acre-feet of recoverable ground water is stored in the pre-Pennsylvanian carbonate aquifer. Dissolved-solids concentration of water from four wells range from 755 to 4,670 milligrams per liter, and fluoride ranges from 3.9 to 5.6 milligrams per liter. The measured flow from one of the wells drilled in 1971 was 3,200 gallons per minute. (Woodard-USGS)
W78-03776

SEEPAGE TESTS ON NO NAME CREEK, COLVILLE INDIAN RESERVATION, WASHINGTON, MAY 12-13, 1977,
Geological Survey, Tacoma, WA. Water Resources Div.
R. D. Mac Nish.
Open-file report 77-618, 1977. 8 p, 2 fig, 1 tab.

Descriptors: *Seepage, *Surface-groundwater relationships, *Watershed management, *Infiltration rates, *Chlorides, Gravitational water, Analytical techniques, Data collection, *Indian reservations, *Washington, *Colville Indian Reservation(Wash), *No Name Creek(Wash).

To gain information for a water-management situation, a seepage test was performed on May 12-14, 1977, on a reach of No Name Creek on the Colville Indian Reservation in north-central Washington. On May 13, injection of a concentrated brine at the head of the test reach permitted chloride-concentration data to be combined with the discharge measurements made to define the pattern of gain and loss along the reach. Equations describing discharge and chloride mass balance were used to determine this pattern of gain and loss. The seepage tests showed that the streamflow gain of at least 0.58 cfs from springflow contributions was offset by losses of at least 0.59 cfs over the same reach. (Woodard-USGS)
W78-03777

WATER RESOURCES DATA FOR IDAHO WATER YEAR 1976.
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03780

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1976--VOLUME 2. EASTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03781

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1976--VOLUME WESTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03782

GEOHYDROLOGICAL STUDIES IN SMALL AREAS WITHOUT SYSTEMATIC DATA,
E. C. Gimena.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 77-93, 1974. 3 fig, 15 ref.

Descriptors: *Water resources development, *Groundwater resources, *Evaluation, *Analytical techniques, Water balance, Groundwater movement, Geochemistry, Water quality, Rainfall, Infiltration, Evapotranspiration, Methodology, Meteorology, Model studies, Sa balance, Foreign research, Foreign countries, Groundwater recharge, *Spain, Inadequate data.

Frequently studies are needed to derive benefi from groundwater resources by means of wells galleries in areas with non existing data on riv and spring flows and on recharge, but in whic damages may be imposed on pre-existing wat uses. Results of groundwater recharge calculation were presented for three case studies. Th recharge calculations were based upon modifie hydrometeorological balance, groundwater flo using hydrodynamics based on existing or est mated data, and geohydrochemical method. areas with small infiltration in relation to the pl viometry, the geohydrochemical method applie with precautions was a very useful tool which ca improve the hydrometeorological balance metho In more humid areas, the results were not so clea The hydrodynamic balance was the best metho but in some cases it needs appropriate condition for application. In any case, the method require numerous field tests to determine th hydrodynamic characteristics of the aquifer. (Se also W78-03783) (Humphreys-ISWS)
W78-03787

DESIGNING PROJECTS FOR THE DEVELOPMENT OF GROUND WATER RESOURCES I THE ALLUVIAL PLAINS OF NORTHERN INDIA ON THE BASIS OF INADEQUAT DATA,
B. K. Sabherwal.
In: Design of Water Resources Projects With In adequate Data, Volume 2; Proceedings of th Madrid Symposium, June 1973: International As sociation of Hydrological Sciences Publicatio No. 108 (2 Vol.), p 365-381, 1974. 2 tab, 16 ref, map.

Descriptors: *Groundwater resources, *Wate resources development, *Water balance, Foreig countries, Hydrologic aspects, Water utilizatio

Groundwater recharge, Seepage, Planning, Aquifers, Alluvial aquifers, *India, Inadequate data.

Preparation and execution of plans and schemes for the exploitation of groundwater cannot be held over till the completion of studies which may take four to five years. Therefore, it has become necessary to adopt some reasonably accurate methodology to evaluate the groundwater potential with the help of the available data and to plan groundwater exploitation projects on its basis, keeping margin for subsequent adjustments when better data become available. Appraisal techniques and adopted criteria for an approximate evaluation of groundwater balance in water table aquifers were described, with particular reference to the Bist Doab Tract of the State of Punjab-India which has an area of 9,000 sq km and where 90% of annual rainfall occurs July to September. A significant part of the assessment study is the recharge to groundwater from the annual flow of about 1.25 million acre feet of surface water through a network of unlined and lined irrigation canals and its ultimate spillage in the cropped fields. On the discharge side is the withdrawal by approximately 0.1 million existing shallow and deep water wells. (See also W78-03783) (Humphreys-ISWS)
W78-03799

PROSPECTS FOR GEOTHERMAL ENERGY APPLICATIONS AND UTILIZATION IN CANADA,
Toronto Univ. (Ontario). Inst. for Aerospace Studies.
I. I. Glass.
Energy, Vol. 2, No. 4, p 407-428, December, 1977. 11 fig, 5 tab, 94 ref, 2 append.

Descriptors: *Thermal power, *Geothermal studies, Thermal waters, Hot springs, Steam, Nuclear explosions, Fractures(Geology), Electric power production, Exploration, Economics, Environmental effects, *Canada, Hot dry rock, Hydraulic fracturing, Explosive fracturing, Nuclear fracturing.

The utilization of the vast reserves of geothermal energy is still in its infancy, however, future technology may well lead to greater access of this resource. Although significant geothermal installations are already in operation throughout the world, Canadian development in this area has been relatively dormant. The problem areas are not of technological nature but rather of an institutional type in passing a geothermal act that would provide the incentives for exploration and economical development. A small number of thermal spring sites with potential for geothermal utilization have been located in British Columbia, the Yukon, and the Northwest Territories. Other provinces may have possible hot-water and hot-dry-rock sites that could be used, but a great deal of exploration and analysis need to be done to locate these resources. Some detailed and worthwhile investigations are presently under way at a low key. It is hoped that 5 to 10 percent of the total Canadian energy need could be supplied by geothermal sources by the year 2000. (Eberle-NWWA)
W78-03845

1977 REVIEW, 1978 PREVIEW.
Ground Water Age, Vol. 12, No. 4, p 24-25, December, 1977. 1 tab.

Descriptors: *Water wells, *Drilling, *Economic prediction, Capital costs, Expenditures, Employment, Profits, Personnel, Inflation(Economic).

The results of a national survey of well drilling contractors recently completed by Ground Water Age reflect moderate optimism that 1978 will be a good year for the well industry in most economic respects. The three hundred respondents were selected on a random sample, population-weighted basis from twelve key states. Their opinions on fourteen key economic factors are presented in tabular form. Although the majority of contractors expect little or no improvement in national economy problems such as inflation and unemployment, some increase is predicted for gross sales, net sales, gross and net profits, and capital expenditures. Despite a continued high rate of business booking cancellations and bad debts over the past two years, the market for new wells is favorable. Better cost control systems throughout the well industry also are helping to offset miscellaneous losses. (Eberle-NWWA)
W78-03848

PRELIMINARY ASSESSMENT OF A GEOTHERMAL ENERGY RESERVOIR FORMED BY HYDRAULIC FRACTURING,
Los Alamos Scientific Lab., NM.
For primary bibliographic entry see Field 8B.
W78-03853

GROUND-WATER POLLUTION PROBLEMS IN THE SOUTHEASTERN UNITED STATES,
Geraghty and Miller, Inc., Port Washington, NY.
For primary bibliographic entry see Field 5B.
W78-03856

ENVIRONMENTAL ASSESSMENT OF GEOPRESSURED WATERS AND THEIR PROJECTED USES,
Dow Chemical U. S. A., Freeport, TX. Texas Div.
J. S. Wilson, J. R. Hamilton, J. A. Manning, and P. E. Muehlberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 289, Price codes: A05 in paper copy, A01 in microfiche. Report No EPA-600/7-77-039, April, 1977. 97 p, 11 fig, 10 tab, 59 ref.

Descriptors: *Geothermal studies, *Thermal power, Thermal water, Natural gas, Faults(Geology), Environmental effects, Economics, Electric power production, Water pollution sources, Air pollution, Land subsidence, Injection wells, Waste water disposal, Equipment, Cooling towers, Heating, Earthquakes, Texas, Louisiana, *Geopressured zones, Gulf Coast.

This report considers the potential uses of the geopressured geothermal resources of Texas and Louisiana and the environmental aspects of those uses. Principal environmental impacts of any of the proposed uses will result from the waste fluid streams and from possible subsidence of the wellfield. Though waste water of very low salinity may possibly have agricultural applications, reinjection of spent brine or canaling to a saline water body will be required in most cases. Development of the Gulf Coast geothermal resource appears to be from 5 to 15 years in the future, depending upon energy priorities assigned to the area by the U. S. Government; private development, because of the risk involved, must await government proving of the resource. Exhaustive environmental surveys to assess the present environmental quality of the Texas-Louisiana geopressured area will eventually need to be performed as well as thorough study of the potential for pollution from various phases of energy production and the possibilities of accelerated subsidence and increased seismic activity. In view of the uncertainty about such energy development and the long time frame involved, only moderate emphasis on environmental research is required at this time. (Eberle-NWWA)
W78-03857

EVALUATION OF SCINTILLATION PROBE PROFILES FROM 200 AREA CRIB MONITORING WELLS,
Atlantic Richfield Hanford Co., Richland, WA. Research Dept.
For primary bibliographic entry see Field 5B.
W78-03860

DRILLING FOR ENERGY RESOURCES.
National Research Council, Washington, DC. Ad Hoc Committee on Technology of Drilling for Energy Resources.
For primary bibliographic entry see Field 8C.
W78-03861

DEVELOPMENT OF AN ASSESSMENT METHODOLOGY FOR GEOPRESSURED ZONES OF THE UPPER GULF COAST BASED ON A STUDY OF ABNORMALLY PRESSURED FIELDS IN SOUTH TEXAS,
Southwest Research Inst., San Antonio, TX.
For primary bibliographic entry see Field 8B.
W78-03863

THE REPORT TO CONGRESS: WASTE DISPOSAL PRACTICES AND THEIR EFFECTS ON GROUND WATER: EXECUTIVE SUMMARY.
Environmental Protection Agency, Washington, DC. Office of Water Supply.
For primary bibliographic entry see Field 5B.
W78-03864

SUITABILITY OF FLUOROCARBONS AS TRACERS IN GROUND WATER RESOURCES EVALUATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5A.
W78-03967

THE SELF-PURIFICATION OF UNDERGROUND WATERS, (IN RUSSIAN),
Belorussian Sanitary-Hygienic Research Inst., Minsk (USSR).
For primary bibliographic entry see Field 5B.
W78-04076

GROUNDWATER ANALYSIS BY TRITIUM TECHNIQUE: A PRELIMINARY EVALUATION,
Guam Univ., Agana. Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W78-04100

4C. Effects On Water Of Man's Non-Water Activities

EFFECTS OF URBANIZATION ON FLOOD CHARACTERISTICS IN NASHVILLE-DAVIDSON COUNTY, TENNESSEE,
Geological Survey, Nashville, TN. Water Resources Div.
H. C. Wibben.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 654, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 76-121, 1976. 33 p, 12 fig, 4 tab, 14 ref.

Descriptors: *Urbanization, Effects, *Rainfall-runoff relationships, *Flood discharge, *Peak discharge, Flood forecasting, *Tennessee, Streamflow, Flow rates, Analytical techniques, Regression analysis, Estimating equations, Model studies, Davidson County(Tenn), *Nashville(Tenn).

Streamflow data from 14 basins in Davidson County, Tenn., were extended in time by use of a digital model of the hydrologic system. The basins ranged in size from 1.58 to 64.0 square miles and ranged in extent of manmade impervious cover from 3 to 37 percent. The flood-frequency characteristics were defined by weighting frequency curves based on simulated discharges with those

based on observed discharges. The average record length of the three rain gages used in simulation was 72 years, and the average record length of observed discharges was 11 years. Discharges corresponding to 2-, 5-, 10-, 25-, 50-, 100-year floods from the modeled basins were compared with discharges from regional equations for estimating peak discharge rates from rural basins. Basin lag times of the urban basins were compared with those of nearby rural basins. The analyses indicated that in a fully-developed residential area, the flood peaks and the basin lag times will not be significantly different from those expected from an undeveloped area. Data were not sufficient to determine if an increase in flood peaks would occur from extremely small basins with extremely intensive development. (Woodard-USGS)
W78-03766

PLAN FORMULATION AND EVALUATION STUDIES--RECREATION. VOLUME I. EVALUATION OF RECREATION USE SURVEY PROCEDURES,
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 6B.
W78-03891

PLAN FORMULATION AND EVALUATION STUDIES--RECREATION. VOLUME III. A PRELIMINARY ANALYSIS OF DAY USE RECREATION AND BENEFIT ESTIMATION MODELS FOR SELECTED RESERVOIRS,
Army Engineer District, Sacramento, CA.
R. E. Brown, and W. J. Hansen.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-000 650, Price codes: A05 in paper copy, A01 in microfiche. Prepared for Institute for Water Resources (Army), Washington, D.C., June 1974. 69 p, 6 tab, 21 fig, 3 append.

Descriptors: *Recreation, *Recreation demand, *Reservoirs, *Regression analysis, *Methodology, Economics, Recreation facilities, Cost-benefit analysis, Model studies, Estimating, Analytical techniques, Approximation method, Estimating equations, Projections, Statistical methods, *Fort Worth Army Engineer District, *Sacramento Army Engineer District, *Travel cost model, Travel costs.

This report presents a methodology for estimating recreation use and recreation benefits at existing and proposed Corps of Engineers reservoirs. It is the outgrowth of recreation use studies instituted by the Office of the Chief of Engineers. Multiple linear regression analysis is employed to develop two regional day use estimating models from recreation use survey data collected at 19 Corps reservoirs in the Fort Worth and Sacramento Army Engineer Districts. The estimators developed should be applicable for estimating day use at most existing or proposed Corps reservoirs within these regions. A number of studies have reported techniques for estimating recreation benefits; the majority of these endorse a general approach known as the travel cost model. This approach uses variable or out-of-pocket travel costs as the proxy for price to construct demand schedules for estimating recreation benefits. Although these studies have demonstrated the technique and produced demand schedules for existing sites, they do not yield a general model from which a planner can estimate benefits for a wide range of proposed projects within a region. The methodology presented in this study is of considerably greater scope and intensity than other estimating procedures in current use and yields reasonable and useful results. There should be further improvements and refinements to the technique as additional recreation use data are collected and analyzed. This report is one of five volumes in this series of studies. (See also W78-03891) (Nessa-NC)
W78-03893

SNOW MECHANICS SYMPOSIUM.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 2C.
W78-03998

THE EFFECTS OF WOOD DEBRIS AND DRIFT LOGS ON ESTUARINE BEACHES OF NORTHERN PUGET SOUND,
Western Washington State Coll., Bellingham. Dept. of Geography and Regional Planning.
For primary bibliographic entry see Field 2L.
W78-04103

PALAEOECOLOGICAL STUDIES OF THE RECENT DEVELOPMENT OF LAKE VAXJOSJON II. SETTLEMENT AND LANDSCAPE DEVELOPMENT,
Kvartarbiologiska Labs, Lund (Sweden).
For primary bibliographic entry see Field 5C.
W78-04152

THE EFFECT OF ROAD DEICING SALT ON THE DRIFT OF STREAM BENTHOS,
Waterloo Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-04196

4D. Watershed Protection

APPLICATION OF COUTAGNE'S AND TURC FORMULAS TO THE SOUTHERN MOZAMBIQUE RIVERS,
For primary bibliographic entry see Field 4A.
W78-03789

PRACTICES OF DESIGN FLOOD FREQUENCY FOR SMALL WATERSHEDS IN THAILAND,
Royal Irrigation Dept., Bangkok (Thailand). Hydrology Div.
For primary bibliographic entry see Field 4A.
W78-03806

A METHOD FOR THE PREDICTION OF WASHLOAD IN CERTAIN SMALL WATERSHEDS,
O. Rendon-Herrero.
In: Design of Water Resources Projects with Inadequate Data, Volume 2; Proceedings of the Madrid Symposium June 1973; International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 589-602, 1974. 6 fig, 1 tab, 9 ref.

Descriptors: *Suspended load, *Sediment discharge, *Forecasting, *Small watersheds, *Pennsylvania, Hydrographs, Analytical techniques, Methodology, Analysis, Sediments, Runoff, Sediment transport, Hydrograph analysis, Discharge(Water), Erosion, Unit hydrographs, *Bixler Run Watershed(PA), Sedimentgraph.

Present knowledge on the prediction of washload reveals that with the exception of the universal soil loss equation and sediment-rating techniques, a rational method does not exist that can accomplish the task. A method was presented that is analogous to Sherman's unit-hydrograph method of hydrograph analysis. The method was described as follows: The ordinates of a sediment discharge graph are divided by the excess runoff that mobilized it, producing a unit sediment discharge graph. When this is done for many storm events, unit sediment discharge graphs are generated that vary considerably in peak value and shape. The ordinates of the latter graphs are then plotted logarithmically against their respective excess runoff, yielding data points that can be fitted by straight lines. Predictions of sediment discharge or the generation of a sediment discharge graph for a given excess runoff can be accomplished using the resulting graph. Bixler Run Watershed, Pennsylvania, having a drainage area of 15 square miles, was selected as a data source. Granulometric tests and other related information desclosed that the suspended sediment in Bixler Run is predominantly washload. Prediction of washload utilizing the proposed method yielded errors that were considerably less than the method reported using available sediment transport formulas and techniques. (See also W78-03783) (Humphreys-ISWS)
W78-03810

TURBIDITY AND SEDIMENT-RATING CURVES FOR STREAMS ON OAHU, HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 2J.
W78-03931

URBAN FLOOD WATER MANAGEMENT SYSTEMS IN SEMIARID REGIONS: MODEL EXTENSION, DESIGN AND APPLICATION,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 6A.
W78-03965

ECOLOGICAL LAND UNITS OF BEAR CREEK WATERSHED AND THEIR RELATIONSHIP TO WATER QUALITY,
Oregon State Univ., Corvallis. Water Resources Research Inst.
J. L. Mattison, and J. C. Buckhouse.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 823, Price codes: A07 in paper copy, A01 in microfiche. Report No. WRRI-53, September 1977. 122 p, 16 fig, 6 tab, 88 ref, 3 append. OWRT A-032-ORE(1), 14-34-0001-7078.

Descriptors: *Sedimentation, *Watershed management, Runoff, *Water quality, Soils data, Oregon, *Bear Creek watershed(Ore), *Ecology, Land management, *Terrestrial habitats, Factor analysis, Clear-cutting, *Sediment transport.

During 1975 and 1976 a sedimentation study was conducted in the Bear Creek watershed, located in the southeastern corner of central Oregon's Crook County. A Rocky Mountain infiltrometer was used to simulate high intensity rainfall over 468 sedimentation plots. Rainfall and runoff were measured and a sample of the runoff was collected to determine the sediment potentials. The Bear Creek watershed was divided into eight ecological land units which were further refined into 14 tentative habitat types and four unclassified communities. These divisions are based upon an association table developed from vegetation and soil field data. One- and two-factor analysis of variance was used to analyze the differences within habitat types, between habitat types within a unit, and when appropriate, between treatments or ecological condition within the habitat type or unit. Tractor logging in the mixed forest unit caused a significant increase in soil loss. Non-forest units exhibited a high natural variability in sediment production within the site which tended to override any differences that may have resulted from a management treatment. Significant differences that did occur appeared to be closely related to differences in soils or ecological condition. Wildland watershed managerical implications are explored in a summary section.
W78-04099

ANALYSIS OF INFORMATION SYSTEMS FOR HYDROPOWER OPERATIONS, - EXECUTIVE SUMMARY,
Jet Propulsion Lab., Pasadena, CA.
For primary bibliographic entry see Field 8C.
W78-04107

REPORT OF THE SOUTHEASTERN NEW ENGLAND STUDYs-A STRATEGY FOR BALANCED DEVELOPMENT AND PROTECTION OF WATER AND RELATED LAND RESOURCES IN EASTERN MASSACHUSETTS AND RHODE ISLAND.
New England River Basins Commission, Boston, MA.
For primary bibliographic entry see Field 6B.
W78-04146

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

ARSENIC CONTENT AND ITS SEASONAL VARIATION IN SEAWEED, (IN JAPANESE),
Shimonoseki Univ. of Fisheries (Japan).
S. Tagawa, and Y. Kojima.
The Journal of the Shimonoseki University of Fisheries, Vol 25, No 1, p 67-74, 1976. 6 tab, 21 ref.

Descriptors: *Pollutant identification, Aquatic plants, *Aquatic weeds, *Seasonal, *Marine plants, *Arsenic compounds, *Colorimetry, Analytical techniques, Distribution, Chemical analysis, Sampling, Productivity, Growth rates, Public health, *Seaweed, Bioaccumulation, Tissue analysis, Sargassum thunbergii, Hijikia fusiforme, Green seaweed, Red seaweed.

Seaweeds were analyzed colorimetrically for arsenic by arsine-silver diethyldithiocarbamate-brucine-chloroform system, after being digested with a mixture of nitric and sulfuric acids. The range of arsenic content was from below 1 to 8 microg/g for green seaweed, from below 1 to 12 microg/g for red seaweed. The brown seaweed contained more arsenic than green and red seaweeds. The seaweeds of Sargassaceae concentrated arsenic highly and the average content of arsenic in 7 species of the family was 61 plus or minus 19 microg/g. The arsenic content of 11 specimens of Sargassum thunbergii collected from the same place on the same day varied respectively with an average value of 142 plus or minus 48 microg/g. The arsenic content of upper, middle and lower parts of the following two species was determined. Significant differences were detectable in the parts in Hijikia fusiforme but not in S. thunbergii. A greater amount of arsenic was contained in leaves than in stems of H. fusiforme. Specimens of the above two species were analysed, which were collected from the same place approximately biweekly from October to July. The arsenic content of H. fusiforme did not vary so much from Oct. to May with an average value of 60 plus or minus 11 microg/g, but subsequently increased with maturation, reaching a maximum value of 141 microg/g in July. With S. thunbergii, the arsenic content was on a level similar to that of H. fusiforme in Oct., and increased with growth, keeping a higher level of 154 plus or minus 30 microg/g from Jan. to July. (Klein)
W78-03712

HEAVY METALS, SELENIUM AND ARSENIC IN NINE SPECIES OF AUSTRALIAN COMMERCIAL FISH,
New South Wales Dept. of Fisheries, Sydney (Australia).
G. N. Bebbington, N. J. MacKay, R. Chovjka, R. J. Williams, and A. Dunn.
Australian Journal of Marine and Freshwater Research, Vol 28, p 277-286, 1977. 2 tab, 23 ref.

Descriptors: *Metals, *Heavy metals, *Fish physiology, *Arsenic compounds, *Path of pollutants, *Marine fish, Metabolism, Cadmium, *Mercury, Lead, Copper, Zinc, Toxicity, Safety, Sampling, Analytical techniques, Salmon, Mullets, Australia, Commercial fishing, Public health, *Selenium, Tissue analysis, Bioaccumulation, Bream, Snapper, Mulloway, Kingfish, Australian salmon, Yellowfin tuna, Sea mullet, Flathead, Tailor.

Of the 232 fish analysed, 231 had concentrations of cadmium, lead, copper, and zinc below the National Health and Medical Research Council (NHMRC) standards for these elements in foodstuffs. Several specimens of bream, snapper, mulloway, kingfish, Australian salmon, and yellowfin tuna had total mercury concentrations in excess of the NHMRC standard of 0.5 ppm. These fish accounted for approximately 7% of the total number sampled. None of the sea mullet, flathead, and tailor sampled exceeded the standard for mercury. The mercury in all species sampled occurred almost entirely as methyl mercury. Of the 95 fish analysed for arsenic and selenium, 20 fish (21%) had arsenic concentrations equal to or greater than the NHMRC standard for selenium. The health risks associated with the presence of mercury and arsenic in these species were discussed. (Klein)
W78-03713

RAPID BIOASSAY FOR WATER SOLUBLE FUNGITOXICANTS,
Army Mobility Equipment Research and Development Command, Fort Belvoir, VA.
G. E. Ernst.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 521, Price codes: A02 in paper copy, A01 in microfiche. Army Mobility Equipment, Report 2182, June 1976, 12p, 4 tab, 5 ref.

Descriptors: *Toxicity, *Bioassay, *Laboratory tests, Fungi, Aquatic plants, Fungicides, Biochemistry, Physiology, *Phenols, Organic compounds, Water pollution effects, Methodology, *Phenols, Pollutant identification, *Candida, Dowicide, *Chlorinated phenols, *Pentachlorophenol.

A screening method for water soluble fungitoxicants was developed which gives results within a workday. The test method is based on the faulty of Candida albicans to form germination tubes within 3 to 6 hours' incubation in certain growth promoting media. (Katz)
W78-03716

ACUTE AND CHRONIC PARATHION TOXICITY TO FISH AND INVERTEBRATES,
Environmental Research Lab., Duluth, MN.
For primary bibliographic entry see Field 5C.
W78-03718

BASELINE STUDY OF TRACE HEAVY METALS IN BIOTA OF PUGET SOUND,
Washington Univ., Seattle. Coll. of Fisheries.
S. J. Olsen, and W. R. Schell.
Municipality of Metropolitan Seattle, Puget Sound Research, April 1977, 66 p, 27 fig, 7 tab, 94 ref. CR-2164.

Descriptors: *Metals, *Baseline studies, *Heavy metals, *Trace elements, Analytical techniques, Mussels, Marine fish, Phaeophyta, Sampling, Water quality, Demersal fish, Mercury, Lead, Cadmium, Cobalt, Copper, Chromium, Zinc, Arsenic compounds, Bioindicators, Water pollution sources, Municipal wastes, Washington, *Puget Sound, Cerium, Silver, Antimony, Selenium, Mytilus edulis, Parophrys vetulus, English sole, Fucus sp., Bioaccumulation, Tissue analysis.

Forty-six species of biological organisms (plankton, molluscs, echinoderms, crustacea, algae, and fish) were collected from Puget Sound and analyzed for as many as twelve trace heavy metals: Mercury, lead, cadmium, cobalt, copper, cerium, selenium, chromium, silver, zinc, arsenic, and antimony. Discussions of the sampling program, analytical procedures, special techniques to minimize contamination, and quality control were detailed. Included in the results of this study were accumulation patterns, concentration factors, possible biological pathwats, and identification of indicator species. Correlations were found between concentrations of several metals in samples and Metro's sewage outfalls, from which these metals came. The sources of heavy metals were indicated by the concentrations found in Fucus sp. (brown algae) for Cu, Co, and Zn; in Mytilus edulis (bay mussel) for Pb, Zn, Cr, Cu, Se, Ce, and As; and in the organs of Parophrys vetulus (English sole) for Pb, Cd, and Cu. All trace heavy metal concentrations in the biota of Puget Sound were below accepted toxicity guidelines. (Klein).
W78-03719

THE DIFFERENTIAL EFFECTS OF FREE AND COMBINED CHLORINE ON JUVENILE MARINE FISH,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5C.
W78-03729

CHRONIC ORAL TOXICITY OF 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD) TO RAINBOW TROUT,
Pacific Northwest Forest and Range Experiment Station, Corvallis, OR. Forest Services Lab.
For primary bibliographic entry see Field 5C.
W78-03733

DETERMINATION OF TRACE AMOUNTS OF METHYLMERCURY IN SEA WATER,
Kumamoto Univ., (Japan). Dept. of Industrial Chemistry.
H. Egawa, and S. Tajima.
In: Management of Bottom Sediments Containing Toxic Substances: Proceedings of the Second U.S.-Japan Experts' Meeting-October 1976, Tokyo, Japan, EPA-600/3-77-083, July 1977, p 96-106. 4 ref, 8 fig, 2 tab.

Descriptors: *Methodology, *Pollutant identification, *Mercury, *Water analysis, *Chelation, *Chemical analysis, *Separation techniques, Adsorption, Water pollution sources, Pollutants, Toxins, Organic compounds, Measurements, *Methylmercury, *Macroreticular chelating resin.

The use of chelating resins for determining the concentration of methylmercury in seawater is investigated. Macroreticular chelating resin containing episulfide groups was excellant for both adsorption or methylmercury and the elution of it with hydrochloric acid. The adsorption of methylmercury on the resin attained equilibrium after shaking for 12 hours at 30C. The calibration curve of methylmercury added to deionized water; synthetic seawater and natural sea water had excellent linearity in the concentration range of 0.005 microg/liter to 0.05 microg/l and it was only slightly affected by mercuric ions and other various ions in seawater. (See also W78-03735) (Katz)
W78-03740

ROTIFER SENSITIVITY TO COMBINATIONS OF INORGANIC WATER POLLUTANTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-03754

DISCHARGE AND WATER-QUALITY DATA FOR SELECTED STREAMS AT LOW FLOW INCLUDING SOME BOTTOM-MATERIAL ANALYSES, AND LIMNOLOGICAL STUDY OF SIX LAKES, WESTCHESTER COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.

W78-03758

PHYSICAL, CHEMICAL, AND BIOLOGICAL RELATIONS OF FOUR PONDS IN THE HIDDEN WATER CREEK STRIP-MINE AREA, POWDER RIVER BASIN, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-03763

DISTRIBUTION AND ABUNDANCE OF BENTHIC ORGANISMS IN THE SACRAMENTO RIVER, CALIFORNIA.
Geological Survey, Menlo Park, CA. Water Resources Div.
R. F. Ferreira, and D. B. Green.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 744, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-60, October 1977. 24 p, 3 fig, 5 tab, 13 ref.

Descriptors: *Water quality, *Data collections, *Analytical techniques, *Benthos, *Rivers, *California, Bottom sampling, Ecological distribution, Biological communities, *Sacramento River(Calif), Sacramento Valley.

General comparisons were made between benthic organism samples collected in 1960-61 and 1972-73 from five sites in the Sacramento River between Red Bluff and Knights Landing, Calif. The composition of benthic organisms from both collection periods was similar. The 1972-73 data showed variable patterns in monthly changes at each site and downstream changes each month with number of organisms per square meter, number of taxa per square meter, and diversity index. Generally, the mean number of taxa per square meter and diversity index for all sampling periods were higher in the upper reach than the lower reach of the Sacramento River. (Woodard-USGS)
W78-03773

ANALYSES OF NATIVE WATER AND DREDGED MATERIAL FROM SOUTHERN LOUISIANA WATERWAYS, 1975-76,
Geological Survey, Baton Rouge, LA. Water Resources Div.
C. R. Demas, and P. C. Higgins.
Open-file report 77-503, June 1977. 180 p, 18 plates, 17 tab, 9 ref.

Descriptors: *Chemical analysis, *Water analysis, *Bottom sediments, *Dredging, *Inland waterways, Louisiana, Water quality, Basic data collections, Navigable waters, Dissolved solids, Metals, Pesticides, Nutrients, Organic compounds, *Southern Louisiana waterways.

From June 1975 to July 1976 the U.S. Geological Survey conducted nine dredging and seven postdredging studies related to water quality in selected reaches of major navigable waterways of southern Louisiana. Samples were collected from the Mississippi River-Gulf Outlet, Mississippi River at Southwest Pass, Mississippi River at New Orleans, Bayou Rigaud near Grand Isle, Barataria Bay and Waterway, Bayou La Carpe near Houma, Atchafalaya Bay (Ship Channel), Lower Atchafalaya River area, Intracoastal Waterway near Calumet, Intracoastal Waterway (Port Allen to Morgan City), Petite Anse area, and Calcasieu River and Ship Channel. These studies were conductd to determine potential environmental effects of dredging activities in the waterways. The Geological survey collected, treated, and analyzed 383 water and water-sediment mixture samples from 85 dredging sites and 142 postdredging samples (72 sites). Water samples were collected 100 yards upstream and downstream from the dredge effluent, from the disposal area, and from the effluent outfall during the dredge phase of the study; samples were collected at former dredge sites during the postdredging phase Samples were analyzed for selected metals, pesticides, nutrients, and organic constituents. The analytical data are presented in tables. Sampling sites are shown on maps. (Woodard-USGS)
W78-03779

WATER RESOURCES DATA FOR IDAHO, WATER YEAR 1976.
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03780

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1976--VOLUME 2. EASTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03781

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1976--VOLUME 1. WESTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03782

DISSOLVED ORGANIC CARBON IN SOME DARK VENEZUELAN WATERS AND A REVISED EQUATION FOR SPECTROPHOTOMETRIC DETERMINATION OF DISSOLVED ORGANIC CARBON,
Colorado Univ., Boulder. Dept. of Environmental, Population, and Organismic Biology.
W. M. Lewis, Jr, and D. Canfield.
Archiv fur Hydrobiologie, Vol. 79, No. 4, p 441-445, 1977. 1 fig, 1 tab, 13 ref.

Descriptors: *Chromotography, *Spectrophotometry, *Venezuela, *Carrao River(Venezuela), *Guri Reservoir(Venezuela), *Dissolved organic carbon, Electrolytes, Tropical regions, Southeast U.S., *Pollutant identification.

Water samples from the Carrao River and the Guri Reservoir in Venezuela were analyzed for dissolved organic carbon by means of combustion/chromotography. Both waterbodies were dark in color and very poor in electrolytes. The relation between absorbance of light at 360 mn and amount of dissolved organic carbon was found to be the same as for some dark waters in the Southeastern United States that were tested in an earlier study. A simple equation predicts dissolved organic carbon from absorbance and has equal validity for the temperate and tropical dark waters. The dark tropical waters thus seem to be qualitatively similar to dark waters of the temperate zone. Further study of the dark electrolyte-poor tropical waters should therefore be possible on the basis of spectrophotometry alone by use of the equation outlined in this study. (Coyle-Wisconsin)
W78-03819

S190 INTERPRETATION TECHNIQUES DEVELOPMENT AND APPLICATION TO THE NEW YORK STATE WATER RESOURCES,
Calspan Corp., Buffalo, NY.
K. R. Piech, J. R. Schott, and K. M. Stewart.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-14564, Price codes: A03 in paper copy, A01 in microfiche. Calspan Corporation Report No. YB-5298-M-2, June 1975. 44 p, 12 fig, 4 tab, 14 ref. NAS9-13336.

Descriptors: *Pollutant identification, S190 system, *Skylab, *Lake Ontario, *Remote sensing, *Water quality indices, *Eutrophication, New York, Lakes, Conesus Lake(NY), Great Lakes, Satellites(Artificial), Reflectance, Aerial photography, Infrared radiation, IFYGL.

Blue and green lake reflectances determined from Skylab S190A color images of Lake Ontario and Conesus Lake, New York were successfully correlated with key water quality indices, such as photic zone depth, Secchi disk transparency, attenuation coefficient, and chlorophyll concentration. Satellite, aircraft, and surface vessel data were used in this study The blue to green reflectance ratio is inversely proportional to chlorophyll concentration, does not vary with humic acid, and is directly proportional to the amount of liginin. Green and red reflectances are directly proportional to both chlorophyll and lignin, the green reflectance is inversely proportional to humic acid, and the red reflectance is unchanged by humic acid. Increased resolution of the S190 system would greatly enhance the accuracy of data processing; at present the resolution enabled removal of atmospheric effects which account for about two-thirds of the radiance at the spacecraft. Increased resolution would permit use of the shadow calibration process used in aircraft eutrophication studies, which is not only more accurate, but can be applied to a larger number of areas surrounding the lake. Data from infrared spectral imagery was used to detect atmospheric variations and account for them in processing data from key visible spectral regions related to the eutrophication indices. (Lynch-Wisconsin)
W78-03822

INSECTICIDE AND NUTRIENT TRANSPORT IN WATER, RELATED TO AGRICULTURAL LAND USE OF A STREAM BASIN IN ONTARIO, CANADA,
Department of Agriculture, London (Ontario). Research Inst.
For primary bibliographic entry see Field 5B.
W78-03823

CHLORIDE AND NITROGEN CONCENTRATIONS ALONG THE WEST SHORE OF LAKE ERIE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5B.
W78-03826

ATMOSPHERIC INPUT OF PHOSPHORUS TO SOUTHERN LAKE HURON, APRIL-OCTOBER, 1975,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5B.
W78-03828

THE CHEMICAL COMPOSITION OF CENTRAL AMAZONIAN AQUATIC MACROPHYTES WITH SPECIAL REFERENCE TO THEIR ROLE IN THE ECOSYSTEM,
Max-Planck-Inst. fuer Limnologie zu Ploen (West Germany).
For primary bibliographic entry see Field 5C.
W78-03831

DISSOLVED ORGANIC MATTER IN LAKEWATER: CHARACTERISTICS OF MOLECULAR WEIGHT SIZE-FRACTIONS AND ECOLOGICAL IMPLICATIONS,
Dartmouth Coll., Hanover, NH. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-03833

INFLUENCE OF LOW TEMPERATURES ON THE SURVIVABILITY OF SELECTED SPECIES OF ALGAE,
Instytut Zootechniki, Zator (Poland).
For primary bibliographic entry see Field 5C.
W78-03835

EVALUATION BY BIOASSAYS OF THE TOXICITY TO FISH OF SUGAR FACTORY AFFLUENTS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Zoology-Entomology.
For primary bibliographic entry see Field 5C.
W78-03836

BACTERIOLOGICAL SURVEY OF TWIN LAKES, COLORADO,
Bureau of Reclamation, Denver, CO.
For primary bibliographic entry see Field 5C.
W78-03840

REMOVING H2S FROM GEOTHERMAL STEAM,
Coury and Associates, Inc., Lakewood, CO.
For primary bibliographic entry see Field 5G.
W78-03855

A PROCEDURE FOR DETECTION AND MEASUREMENT OF INTERFACES IN REMOTELY ACQUIRED DATA USING A DIGITAL COMPUTER,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7B.
W78-03865

REMOTE SENSING OF OIL POLLUTION AT THE SEA SURFACE I. REVIEW OF REMOTE SENSING METHODS EMPHASIZING RADAR,
Netherlands Interdepartmental Working Group on the Application of Remote Sensing, Delft.
J. van Kuilenburg.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-23582, Price codes: A03 in paper copy, A01 in microfiche. NIWARS Report, July 1975. 30 p, 18 fig, 12 tab, 45 ref.

Descriptors: *Remote sensing, *Oil pollution, *Radar, Monitoring, *Pollutant identification, *Outer Continental Shelf, Sea surface, Oil slicks.

The problem of monitoring oil pollution is stated and the remote sensing methods applicable for that purpose are reviewed. A more detailed discussion is presented on radar observations of oil slicks and of the surrounding sea surface. A selected bibliography is presented. (See also W78-03868) (Sinha-OEIS)
W78-03867

REMOTE SENSING OF OIL POLLUTION AT THE SEA SURFACE II. DAMPING OF WATER WAVES BY AN OIL LAYER AS A POSSIBLE INDICATOR FOR SOLAR OBSERVATIONS,
Netherlands Interdepartmental Working Group for the Application of Remote Sensing Techniques, Delft.
A. C. Pronk.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-23583, Price codes: A02 in paper copy, A01 in microfiche. NIWARS Publication No. 22, July 1975. 13 p, 7 fig, 21 ref.

Descriptors: *Remote sensing, *Oil pollution, *Waves(Water), Water pollution, *Pollutant identification, *Outer Continental Shelf, Damping.

The damping action of oil pollution on sea-waves is discussed in view of observation from the air. It is found that oil layers of all thicknesses damp a part of the wave-spectrum. Only in case of thicker layers is the damping related to the nature of the oil. The distance over which the sea-waves damp out after an oil slick has entered seems a useful indicator for the oil properties. (See also W78-03867) (Sinha-OEIS)
W78-03868

ANALYSIS OF MICROGRAM/KG (PPB) LEVEL HYDRICARBONS IN INTERTIDAL ZONE SEDIMENTS AND WATER BY GAS CHROMATOGRAPHY-MASS SPECTROMETRY,
National Bureau of Standards, Washington, DC. Bioorganic Standards Section.
H. S. Hertz, W. E. May, S. N. Chesler, and B. H. Gump.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 922, Price codes: A02 in paper copy, A01 in microfiche. Reprinted from: Proceedings of 23rd Annual Conference on Mass Spectrometry and Allied Topics, held Houston, TX on May 25-30, 1975, p 663-665, 1975. 2 fig, 1 ref.

Descriptors: *Pollutant identification, *Gas chromatography, Intertidal areas, Water pollution sources, *Baseline studies, Oil pollution, Analytical techniques, *Sediments, *Mass spectrometry, Hydrocarbons.

The low concentration of hydrocarbons anticipated in pollution baseline studies necessitates the development of analytical techniques sensitive at the sub-microgram/kilogram level. Techniques which involve dynamic headspace sampling and subsequent GC/GC-MS analysis have been developed in the laboratory. Sample components are separated from the matrix in a closed system and concentrated on a porous polymer precolumn, free from large amounts of solvent and ready for GC-MS analysis. Applications of this methodology to the indentification of microgram/kilogram level hydrocarbons in a baseline study are discussed. (Sinha - OEIS)
W78-03869

THE STATE OF METAL IONS IN SEAWATER,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
F. J. Millero.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 703, Price codes: A03 in paper copy, A01 in microfiche. Reprinted from: Thalassia Jugoslavica, Vol 11, No 1/2, p 53-84, 1975. 14 fig, 9 tab, 75 ref.

Descriptors: Pollutant identification, Metal ions, *Heavy metals, *Ions, Metals, Sea water, Thermodynamics, Ion exchange.

The methods of determining the state or structure of metal ions in seawater are examined in terms of ion-water and ion-ion interactions. The ion-water interactions are related to the changes that occur when an ion is transferred from the gas to the infinite dilution solution state. The experimental thermodynamic properties at infinite dilution solution state. The experimental thermodynamic properties at infinite dilution are compared to the values determined using the continuum model and a structural hydration model. The hydration model considers the ion-water interactions in terms of ion-dipole, ion-quadrupole interactions and water structure effects. By combining partial molal volume and compressibility data a method is developed to determine hydration numbers for the major sea salts and some trace metal ions. The ion-ion interactions that occur as the concentrations is increased are examined by using three methods: (1) the ion pairing model, (2) the specific interaction model, and (3) the cluster (or non-specific interaction) model. For the major sea salts all the methods yield reasonable estimates for total or stoichiometric activity coefficients. The use of the ion pairing model for determining the speciation of heavy metals in seawater are examined and briefly discussed. Methods of studying the structure of ion paired speices are developed and applied. (Sinha - OEIS)
W78-03870

SOLUTION CHEMISTRY, SOLUBILITY, AND ADSORPTION EQUILIBRIA OF IRON, COBALT, AND COPPER IN MARINE SYSTEMS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
D. R. Kester, T. P. O'Connor, and R. H. Byrne, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 834, Price codes: A02 in paper copy, A01 in microfiche. Reprinted from: Thalassia Jugoslavica, Vol 11, No 1/2, p 121-134, 1975. 7 fig, 1 tab, 17 ref. ONR-N00014-68-A-0215-0003.

Descriptors: *Iron, *Cobalt, *Copper, *Pollutant identification, Metals, Water pollution, Sea water, Outer Continental Shelf.

The stability constants for the formation of $FeOH2+$ complexes have been determined at an ionic strength of 0.68, and measurements in natural seawater verify the application of these constants to marine systems. The solubility of freshly precipitated hydrous ferric oxide was determined in natural seawater over the pH range 4.0 to 9.5. The results of this work were applied to consideration of the chemical forms of iron over the range of Eh and pH found in natural systems. The adsorption of $Cu2+$ and $Co2+$ onto illite and other substrates has been investigated and a model was developed to account for the adsorption equilibria of these metals as a function of pH for natural systems ranging from river water to oceanic waters. The application of these results to man-induced chemical changes in the marine environment is frequently limited by the lack of necessary information such as redox conditions, distinction between soluble and particulate phases, and the presence of complexing ligands. (Sinha - OEIS)
W78-03871

DEVELOPMENT OF A NEW DETECTOR FOR OIL IN WATER,
Naval Air Propulsion Test Center, Trenton, NJ. Fuels Div.
P. T. Thyrum.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 367, Price codes: A02 in paper copy, A01 in microfiche. Report No. NAPTC-PE-51, February 1975. 15 p, 3 fig, 1 tab, 7 ref.

Descriptors: *Monitoring, *Pollutant identification, *Oil pollution, Water pollution sources, Testing procedures, Filters, Equipment, Outer Continental Shelf.

A need for a sensitive, rapid and simple method for the determination of oil in water resulted in a research effort which led to the development of a new approach to the analysis of oil in water. A new detector, designed for shipboard use, was developed. The detector can be used for the quantitative analysis of undissolved particulate oil present in water over a zero to 30 parts per million concentration range. The method is not sensitive to dissolved oils and the measurements are not influenced by the presence of surfactants which are often found in bilge water. The method is rapid and can be performed by non-technical personnel. The final readout may be obtained either by simple visual color intensity matching or by means of a reflectance meter. The details of the material, apparatus and operations of the test procedure are described. (Sinha - OEIS)
W78-03876

PRELIMINARY REPORT ON IN SITU MEASUREMENTS OF THE EFFECTS OF SEWAGE DISCHARGE FROM NAVY SHIPS OPERATING WITHIN THE 12-MILE LIMIT,
Naval Ship Research and Development Center Bethesda, MD.
For primary bibliographic entry see Field 5E.
W78-03877

RESUSPENDED SEDIMENT ELUTRIATE STUDIES ON THE NORTHERN ANCHOVY,
University of Southern California, Los Angeles. Allan Hancock Foundation.
G. D. Brewer.
In: 'Marine Studies of San Pedro Bay, California, Part II', June 1976. p. 15-32, 1 fig, 6 tab, 15 ref.

Descriptors: *Water pollution, *Heavy metals, *Pesticides, *Toxicity, Pollutant identification, Dredging, Mortality, Anchovy, Engraulis mordax.

Samples of sediment from three locations in the Los Angeles-Long Beach Harbors and elutriates resulting from resuspension were assayed for heavy metals, pesticides, and other pollutants. Juvenile and adult northern anchovy (Engraulis mordax) were exposed to sediment elutriates prepared from seawater-sediment ratios between 4:1 and 100:1 for periods up to fourteen days. Toxicity varied between the three sediment samples; acute oxygen depletion was suspected as the cause of mortality. Analyses of muscle, gonad, gill, and liver tissues for silver, cadmium, chromium, copper, iron, manganese, nickel, lead and zinc from control and elutriate-exposed fish showed high levels of cadmium and zinc in fish exposed to the resuspended sediments. However, the small sample size precludes any conclusions regarding the rapid uptake of heavy metals. Sediment elutriate which had been stored for two weeks was not toxic to anchovy embryos and larvae. (See also W78-03882) (Sinha-OEIS)
W78-03884

BIOASSAY AND HEAVY METAL UPTAKE INVESTIGATIONS OF RESUSPENDED SEDIMENT ON TWO SPECIES OF POLYCHAETOUS ANNELIDS,
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 5C.
W78-03887

EFFECTS OF HYDROGEN SULFIDE ON FISH AND INVERTEBRATES PART I-ACUTE AND CHRONIC TOXICITY STUDIES,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries, and Wildlife.
For primary bibliographic entry see Field 5C.
W78-03920

A CONTROLLED BIOASSAY SYSTEM FOR MEASURING TOXICITY OF HEAVY METALS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
K. H. Mancy, and H. E. Allen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 973, Price codes: A06 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-77-037, April 1977. 110 p, 8 tab, 19 fig, 95 ref.

Descriptors: *Methodology, *Laboratory tests, Laboratory equipment, *Bioassay, *Metals, *Toxicity, Copper, Fishes, Hydrogen ion concentration, Temperature, Conductivity, Calcium, *Alkalinity, Dissolved oxygen, Trace elements, *Pollutant identification, *Copper species, Metal micronutrients, *Metal toxicity, Metal oxidation state, Complexation, Design criteria, Fish bioassays, Anodic stripping, Voltammetry, Potentiometric membrane electrodes.

Biological availability of metal micronutrients and metal toxicity are believed to be dependent on metal oxidation state, complexation, and solubility as well as the physicochemical characteristics of the aqueous phase. Basic design criteria for fish bioassays which are capable of elucidating the dependency of toxicity on the type and concentration of various copper species were developed utilizing equilibrium chemical concepts and appropriate analytical techniques. In order to maintain a desired copper species in the bioassay medium, synthetic waters were used under well-defined physical and chemical conditions. These solutions were synthesized in accordance with equilibrium models, which define the distribution of various copper species as a function of the solution physical and chemical characteristics. An experimental system was developed which permitted large volumes of the bioassay waters to be maintained at the desired chemical equilibria for the duration of the experiment. Monitoring of the bioassay system included measurements of (1) pH, (2) temperature, (3) flow, (4) specific conductance, (5) calcium, (6) total alkalinity, (7) dissolved oxygen, and (8) copper species. Novel analytical procedures were applied for the measurement and the differentiation of copper species. This included the use of anodic stripping voltammetry and potentiometric membrane electrodes. (Katz)
W78-03926

DISSOLVED OXYGEN TEMPERATURE, SURVIVAL OF YOUNG FISH AT FISH SPAWNING SITES,
North Dakota State Univ., Fargo. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-03927

IDENTIFICATION OF ASBESTOS-MATERIALS IN SUSPENDED SOLIDS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
W. P. Bonner, R. B. Bustamante, H. W. Leimer, and J. T. Scardina.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 349, Price codes: A05 in paper copy, A01 in microfiche. College of Engineering, Completion Report No. 61, December 1977. 84 p, 27 fig, 9 tab, 21 ref. OWRT A-042-TENN(1), 14-34-0001-7089.

Descriptors: *Asbestos, *Asbestiform particles, Density gradient separations, Pollutant identification, Suspended solids, Separation techniques, Water pollution sources, Centrifugation, Scanning electron microscopy.

Objectives were to: (1) develop a method for the determination of asbestos in water using density gradient zonal centrifugation and scanning electron microscopy and (2) apply this technique to environmental samples collected in Tennessee. Evaluation of the technique included the use of clay minerals, quartz and several asbestos minerals in a density gradient having a density range of 2.0 to 2.9 g/cm3. Environmental samples (water) were collected upstream and downstream from known deposits of asbestos, entering and leaving water treatment plants, and upstream and downstream from major industrial areas. The data show that: (1) asbestiform particles can be separated from most of the masking materials found in natural waters by density zonal centrifugation, (2) chrysotile and amphibole type asbestos can be separated from each other by density gradient zonal centrifugation, (3) asbestos was found in water downstream from known deposits of asbestos, and (4) asbestiform particles which were probably introduced from man-made sources were found in the effluent of a sewage treatment plant.
W78-03934

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON VINYL CHLORIDE AND POLYVINYL CHLORIDE,
Environmental Protection Agency, Research Triangle Park, NC. Office of Research and Development.
F. G. Hueter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 461, Price codes: A06 in paper copy, A01 in microfiche. Environmental Protection Agency, Report No. EPA-600/6-75-004, December 1975. 115 p, 2 fig, 55 tab, 205 ref.

Descriptors: *Toxicity, *Public health, *Air pollution, Pathology, *Toxins, Mortality, *Water pollution, Human pathology, *Human diseases, *Lethal limit, Chemical industry, *Chlorides, Path of pollutants, Water pollution sources, Industrial wastes, *Polyvinyl chloride, Carcinogens, Angiosarcoma, Mutagens, *Vinyl chloride, Teratogens.

Vinyl chloride (VC) is a chemical of widespread industrial and commercial use. Occupational experience and experimental evidence strongly indicate that it is a carcinogen. Additionally, there is experimental evidence that indicates that it may be a teratogen and mutagen. An increased incidence of liver angiosarcoma, excessive liver damage, and acroosterolysis has been reported among VC workers, and the frequency and severity of the liver pathology is related to the length of exposure. The principal route of exposure is thought to be air inhalation. Sources of increased importance for the general population include food and water. Tumors at multiple and diverse sites have been observed in all species of experimental animals tested for carcinogenicity by inhalation and ingestion of VC. In addition to the health effects of VC, this document also considers the sources, distribution, and control technology. Emissions of VC from VC/PVC plants are estimated to exceed 100 million kilograms annually, about 90 percent of which is from PVC plants. Installation of currently available controls may be adequate to reduce VC emissions from VC/PVC plants in the order of 90 percent. (Katz)
W78-03936

STUDIES OF THE ECOLOGICAL IMPACT OF REPETITIVE AERIAL APPLICATIONS OF HERBICIDES ON THE ECOSYSTEM OF TEST AREA C-52A, EGLIN AFB, FLORIDA,
Arment Development and Test Center, Eglin AFB, FL.; and Air Force Armament Lab., Eglin AFB, FL.
A. L. Young, C. E. Thalken, and W. E. Ward.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A032 773, Price codes: A07 in paper copy, A01 in microfiche. Report AFATL-TR-75-142, 1975. 142 p, 51 fig, 51 tab, 23 ref.

Descriptors: *Pesticides, *Pesticide kinetics, *Pesticide residues, *Herbicides, *Pesticide toxicity, *2,4-D, *2,4,5-T, *Persistence, *Degradation(Decomposition), *Defoliants, Water pollution sources, Water pollution effects, Path of pollutants, Environmental effects, *Picloram, *Cacodylic acid, *Teratogens.

The report attempts to answer the major questions concerned with the ecological consequences of applying massive quantities of herbicides, (346,117 pounds), via repetive applications, over a period of eight years, 1962-1970, to an area of approximately one square mile. Moreover, the report documents the persistence, degradation, and/or disappearance of the herbicides from the Test Area's solid and drainage waters and their subsequent effects (direct or indirect) upon the vegetative, faunal and microbial communities. The active ingredients of the four military herbicides were 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T), 4-amino-3,5,6-trichloropicolinic acid (picloram), and dimethylarsinic acid (cacodylic acid). (Katz)
W78-03937

THE USE OF ION EXCHANGE METHODS FOR DETERMINING TRACE ELEMENTS IN NATURAL WATERS: VII. COPPER, (IN GERMAN),
J. Korkisch, L. Goedl, and H. Gross.
Talanta. 22(3), p 289-298, 1975.

Descriptors: *Pollutant identification, Analytical techniques, Water analysis, Atomic absorption, *Ion exchange methods, *Trace elements, *Austria, *Copper.

A method is described for the separation of ppm levels of Cu from natural waters and final determination by atomic absorption. The sample is made 0.1 M in hydrochloric acid, filtered, treated with ascorbic acid and passed through Dowex 1 X8 (chloride form). The anionic copper(I) chloro-complex is sorbed and the Cu separated from most other elements present. After elution with 1 M nitric acid, the Cu is determined by atomic absorption. The method was used to determine Cu concentrations in the range 10-39 ppm, in some Austrian waters. (See also W77-08787; W76-07409 and W76-07408) --Copyright 1975, Biological Abstracts, Inc.
W78-03939

ON MERCURY AND SELENIUM CONTAINED IN TUNA FISH TISSUES - II. TOTAL MERCURY IN MUSCLES AND VISCERA OF YELLOWFIN TUNA (IN JAPANESE),
Shimonoseki Univ. of Fisheries (Japan).
M. Takeda, Y. Inamasu, T. Koshikawi, T. Ueda, and M. Nakano.
The Journal of the Shimonoseki University of Fisheries, Vol. 25, No. 1, p 47-65, 1976. 13 ref, 6 tab, 8 ref.

Descriptors: *Fish physiology, *Marine fish, *Metals, *Mercury, *Path of pollutants, Analytical techniques, Laboratory tests, Fish diets, Invertebrates, *Fish food organisms, Distribution, Oceans, Sampling, Lipids, Organic compounds, Public health, Commercial fisheries, *Tuna, Yellowfin Tuna, Thunnus albacares, Bioaccumulation, Tissue analysis.

Total mercury level (T-Hg) and lipid content of 39 yellowfin tunas from the Middle Pacific, West Pacific and East Indian Ocean were determined. The correlations of T-Hg in dark and abdominal muscle to that in dorsal muscle were significant at the 0.01 level and the average T-Hg in these muscles were almost the same (0.21-0.25 microg/g). The T-Hg in muscles, liver, stomach, and intestine contents increased almost exponentially and were significant at the 0.01 and 0.05 levels. The average T-Hg in liver and stomach contents were about 1/2 and the average T-Hg in intestine was about 1/4 of that in dorsal muscle, respectively. The major kinds of food species in the stomach were, in order, as follows: squid, sardine, horse mackeral and shrimp. The correlations of total, polar and nonpolar lipid contents to the T-Hg in dorsal and dark muscles were not significant. (See also W78-03942) (Klein)
W78-03941

ON MERCURY AND SELENIUM IN TUNA FISH TISSUES - III. MERCURY DISTRIBUTION IN YELLOWFIN TUNA, (IN JAPANESE),
Shimonoseki Univ. of Fisheries (Japan).
M. Hamada, Y. Inamasu, and T. Ueda.
The Journal of the Shimonoseki University of Fisheries, Vol. 25, No. 3, p 213-220, 1977. 2 fig, 7 tab, 7 ref.

Descriptors: *Mercury, *Fish physiology, *Marine fish, *Metals, Path of pollutants, Analytical techniques, Laboratory tests, Sampling, Organic compounds, Distribution, Heavy metals, Bioassay, Public health, Commercial fisheries, Bioaccumulation, Tissue analysis, *Tuna, Yellowfin tuna, Thunnas albacares.

The distribution of mercury in the tissues of yellowfin tuna, Thunnas albacares, including muscle, skin, and scales, was investigated. Levels of total mercury in muscle among samples showed significant differences, although no difference was found in the levels of the muscle of a particular fish. Mercury levels in muscle were higher than in the other tissues. In hard tissues such as fins, scale and vertebra, levels were extremely low. The ratio of methyl mercury to total mercury in muscle was 1:1. (See also W78-03941) (Klein)
W78-03942

THE USE OF ION EXCHANGE METHODS FOR DETERMINING TRACE ELEMENTS IN NATURAL WATERS: VI. ZINC, (IN GERMAN),
J. Korkisch, L. Goedl, and H. Gross.
Talanta. 22(3), p 281-288, 1975.

Descriptors: *Pollutant identification, Analytical techniques, *Ion exchange methods, *Trace elements, Atomic absorption, Water analysis, *Austria, *Zinc.

A method is described for the separation of ppm levels of Zn in natural waters and final determination by atomic absorption. The sample is acidified, filtered, treated with potassium thiocyanate, and passed through Dowex 1 X 8 (thiocyanate form). The anionic zinc thiocyanate complex is sorbed and separated from most of the accompanying elements. The column is washed with an aqueous-organic hydrochloric acid solution and with 1 M hydrochloric acid, and the Zn is then eluted with 0.15 M hydrobromic acid and determined directly in the elute by atomic absorption. The method was used for determining Zn in some Austrian waters. Zn contents in the range 18-685 were found. (See also W77-08787; W76-07409 and W76-07408) --Copyright 1975, Biological Abstracts, Inc.
W78-03944

AN ENVIRONMENTAL INDEX BASED ON RELATIVE ABUNDANCE OF OLIGOCHAETE SPECIES,
California Univ., Santa Barbara.
R. P. Howmiller, and M. A. Scott.
Journal of the Water Pollution Control Federation, Vol. 49, No. 5, p 809-815, 1977. 2 fig, 3 tab, 34 ref.

Descriptors: *Sampling, *Bioassay, *Data collection, *Statistical methods, *Testing procedures, *Oligochaetes, *Eutrophication, *Water pollution, *Distribution patterns, Oligotrophy, Environmental effects, Analytical techniques, Benthic fauna, Mathematical studies, Methodology, *Environmental quality index, Relative abundance.

Several types of indices used in assessing environmental quality, distinguished by the sort of information they summarize, are discussed and illustrated with examples from the literature. Then an index of eutrophication and pollution that was based upon the relative abundance of oligochaete species differing in their response to organic enrichment was described and the results of a trial in which this index was compared to others, which, through commonly used, were deficient in contrast to the oligochaete index. (Katz)
W78-03954

THE USE OF ION EXCHANGE METHODS FOR DETERMINING TRACE ELEMENTS IN NATURAL WATERS: V. LEAD, (IN GERMAN),
J. Korkisch, and A. Sorio.
Talanta. 22(3), p 273-280, 1975.

Descriptors: *Trace elements, *Pollutant identification, *Lead, Atomic absorption method, Ion exchange method, Analytical techniques, *Austria(Danube River), *Spectrophotometry, Water analysis, Potable water.

A method is described which makes possible the separation of Pb from natural waters at the ppm level, and its final determination by spectrophotometry or atomic absorption. The sample is made 0.15 M in hydrobromic acid, filtered, and passed through Dowex 1 X 8 (bromide form). The Pb is sorbed on the resin and most of the other elements present are separated from it. The lead is eluted with 6 M hydrochloric acid and determined by the dithizone method or by atomic absorption. The method was used to determine Pb in drinking water and water from the Danube River. Pb concentration in the range 2-14 ppm were found. (See also W77-08787; W76-07409 and W76-07408) --Copyright 1975, Biological Abstracts, Inc.
W78-03955

HORIZONTAL DISTRIBUTION OF PUMPED ZOOPLANKTON DURING A CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: IMPLICATIONS FOR SAMPLING STRATEGY IN LARGE-VOLUME ENCLOSED WATER COLUMNS,
Wood Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5B.
W78-03958

AN INVESTIGATION OF USING DERIVATION REACTION GAS CHROMATOGRAPHY TO MEASURE ANIONIC WATER QUALITY PARAMETERS,
Arkansas Univ. at Little Rock. Dept. of Chemistry.
R. H. Hanson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 471, Price codes: A03 in paper copy, A01 in microfiche. Arkansas Water Resources Research Center, Little Rock, Publication No 52, 1977. 28 p, 6 fig, 21 ref. OWRT B-049-ARK(1). 14-34-0001-6004.

Descriptors: *Orthophosphates, *Gas chromatography, *Pollutant identification, Analytical techniques, Measurement, Sampling techniques.

A new analytical method has been developed which provides researchers with another way to measure orthophosphate content in aqueous samples. The reaction gas chromatographic system was capable of analyzing orthophosphate in the range from 0.25-5.0 micrograms of P in 50 microliters of aqueous sample. Flame ionization was the most successful detector. The primary advantage of this technique was the small volume of sample required.
W78-03961

COMPUTER TECHNIQUES FOR IDENTIFYING OIL SPILLS,
Connecticut Univ., Storrs. Inst. of Water Resources.
Y. T. Chien.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 487, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, October 1977. 19 p, 12 fig, 14 ref. OWRT A-060-CONN(1). 14-31-0001-6007.

Descriptors: *Oil spills, *Computer programs, *Pollutant identification, *Water pollution sources, Mathematical models, Water quality control, Probability, Interactive computer systems, *Pattern recognition(Oil spills), Chemical spectra, Weathering effects.

The use of pattern recognition methods as applied to oil spill identification problems has been investigated. Two computer-based systems that are potentially useful for assisting the human user in the identification process have been developed. The first is an interactive system which is suitable for manipulating discrete waveforms (such as infrared or flourescent spectra) with the aid of a graphical display. The other system is a general two-dimensional pictorial information processor, potentially useful for identifying oil images such as those produced by thin-layer chromatography. A probability model for matching suspects with spills has also been developed. This model utilizes information contained in chemical spectra obtained from suspects and spill samples. It also considers the possibility that the true spiller escaped without being sampled.
W78-03963

SUITABILITY OF FLUOROCARBONS AS TRACERS IN GROUND WATER RESOURCES EVALUATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
J. Randall, T. Schultz, and S. Davis.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 488, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, November 1977. 37 p, 16 fig, 4 tab, 40 ref. OWRT A-063-ARIZ(1). 14-34-0001-7006.

Descriptors: *Groundwater, *Tracers, *Gas chromatography, Recharge, Sewage effluents, Organic compounds, Tritium, *Pollutant identification, Texas, Arizona, *Fluorocarbons, Analytical techniques, Air pollution effects.

Trichlorofluoromethane (CCl3F or F-11) and Dichlorodifluoromethane (CCl2F2 or F-12) are artificially produced compounds present in the modern atmosphere. They are slightly soluble in water and can be detected in all surface waters and recently recharged ground water. Because atmospheric concentrations of these compounds have increased rapidly during the past 35 years, equilibrium concentrations in water recharged into the subsurface have also increased. Therefore, F-11 and F-12 concentrations can be used to estimate ground-water age if younger than about 35 years. Furthermore, because F-11 and F-12 have been introduced into the atmosphere at different rates, the ratio of the concentrations of these compounds has changed with time and can also be used to estimate the age of the water. F-11 and F-12 were detected in ground water from Arizona and Texas. A field-operable electron-capture gas chromatograph was constructed for field use, allowing repetitive in situ measurements, thus reducing sample contamination. Results on dating of water were very encouraging. Also, anomalous zones with F-11 and F-12 concentrations greatly exceeding equilibrium values with the atmosphere were found in Arizona and Texas. These areas may be related to landfill leachate, chemical spills, or sewage effluent used for irrigation.
W78-03967

CHRONIC TOXICITY OF METHOXYCHLOR, MALATHION AND CARBOFURAN TO SHEEPSHEAD MINNOWS (CYPRINODON VARIEGATUS),
EG and G Bionomics, Pensacola, FL. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W78-03974

TOXICITY OF DIAZINON TO BROOK TROUT AND FATHEAD MINNOWS,
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5C.
W78-03975

A RAPID ASSESSMENT OF THE TOXICITY OF THREE CHLORINATED CYCLODIENE INSECTICIDE INTERMEDIATES TO FATHEAD MINNOWS,
Environmental Research Lab.-Duluth, MN.
R. L. Spehar, G. D. Veith, D. L. DeFoe, and B. A. Bergstedt.
Available from the National Technical Information Service, Springfie'd, VA 22161 as PB-272 655, Price codes: A03 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA-600/3-77-099, August 1977. 30 p, 38 ref, 3 fig, 3 tab.

Descriptors: *Bioassay, Pesticides, *Insecticides, Larvae, Juvenile fish, *Toxicity, *Absorption, *Minnows, Growth rates, Mortality, Juvenile growth stage, Laboratory tests, *Pesticide residues, Aldrin, Chlorinated hydrocarbon pesticides, Pollutant identification, *Hexachlorocyclopentadiene, *Hexachloronorbornadiene, *Heptachloronorbornene, Bioaccumulation, Bioconcentration, Hex.

A rapid assessment study to determine the toxicity and bioaccumulation of three chlorinated cyclodiene insecticide intermediates to fathead minnow larvae and early juveniles was conducted for 30 days under flow-through conditions. A concentration of 7.3 microg/liter of hexachlorocyclopentadiene caused significant decreases in survival after 4 days. Growth of fish exposed for 30 days was not significantly decreased at any of the concentrations tested. The highest concentration of hexachlorocyclopentadiene having no adverse effect was 3.7 microg/liter. Concentrations of 122 and 226 microg/liter of hexachloronorbornadiene caused significant decreases in survival after 4 days. Growth of 30 day-old larvae was significantly decreased at 38.4 microg/liter and was the most sensitive indicator of toxicity. The highest concentration having no adverse effect was 20.0 microg/liter. The average bioconcentration factor for fish exposed to less than 38.4 microg/liter of this compound was 6400. Survival of fathead minnows exposed to heptachloronorborene was significantly decreased at 83.5 microg/liter after 4 days. Growth was significantly reduced at 40 microg/liter after 30 days and was the most sensitive indicator of toxicity. The highest concentration having no adverse effect was 25.9 microg/liter. The average bioconcentration factor for fish exposed to less than 40 microg/liter of this compound in water was 11,200. (Katz)
W78-03977

ACCURACY IN TRACE ANALYSIS: SAMPLING, SAMPLE HANDLING, ANALYSIS. VOLUME II.
National Bureau of Standards, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 092, Price codes: A99 in paper copy, A01 in microfiche. Proceedings of the 7th Materials Research Symposium. October 7-11, 1974, Gaithersburg, MD. NBS SP-422, Volume II, 1976. 660 p, 197 fig, 147 tab, 703 ref. LaFleur, P.D., Ed.

Descriptors: *Pollutant identification, *Analytical techniques, Water pollution, *Monitoring, *Sampling, Chemistry, *Biology, Bioassay, Gas chromatography, Tracers, Polarographic analysis, Mass spectrometry, Isotope fractionation, Spectroscopy, Neutron activation analysis, Electrochemistry, *Trace elements, *Trace analysis, Electrochemical trace analysis, Anodic stripping voltammetry, Atomic absorption spectrometry.

The focus was on whole chemical analysis, rather than on measurement processes only. Various factors contributing to obtaining accurate analytical results in areas of environmental quality, plant and animal tissue analyses, biological fluids, high purity materials, and geological samples were identified. Papers treated problems of sampling and sample handling as well as analytical methodology, including procedures and problems associated with losses, interferences, contamination, determination, storage, analytical chemistry, gas chromatography, electrochemical trace analysis, pulse polarography, anodic stripping voltammetry, monitoring, mass spectrometry, isotope dilution, atomic absorption spectrometry, trace elements, marine sediments, neutron activation analysis, and electron probe microanalysis. (See W78-03980 thru W78-03987) (Wares-IPA)
W78-03979

SAMPLING PROBLEMS AND THE DETERMINATION OF MERCURY IN SURFACE WATER, SEAWATER, AND AIR,
Reactor Centrum Nederland, Petten.
H. A. Das, and H. A. van der Sloot.
In: Accuracy in Trace Analysis: Sampling, sample Handling, Analysis, Proceedings of the 7th Materials Research Symposium: October 7-11, 1974, Gaithersburg, MD, NBS SP-422. Volume II, p. 669-699, 1976, 13 fig, 8 tab, 15 ref.

Descriptors: *Pollutant identification, *Sampling, *Mercury, Bodies of water, *Surface waters, *Sea water, *Air pollution, Water pollution, Chemical analysis, Adsorption, Isotherms, Environmental effects, Trace elements, Activation analysis.

A sampling procedure for the determination of mercury (ionic, organically bound, total and metallic) in surface water and seawater was developed and applied to Dutch surface waters. The design ensured that the concentration of suspended matter was not affected, the separation of the solid fraction from the sample was performed immediately afer sampling without losses from the aqueous phase due to adsorprtion and losses from the solid phase due to desorption at a too low pH, and the aqueous phase was processed immediately to prevent losses due to adsorption on the wall of the container. The total sample volume was (2,500 ml). About 500 ml. were used for the determination of the content of suspended matter and the total amount of mercury in the water. The sample was filtered through a bed of previously purified active charcoal at a low flow rate. About 2000 ml passed a flow-through centrifuge to separate the solid fraction. One liter was used to separate inorganic mercury. The other liter was led through 2 columns of active charcoal to collect all mercury. Procedures were checked with mercury-197 radiotracer as an ion and as incorporated in organic compounds. Mercury was determined by thermal neutron activation, volatilization in a tube furnace, and adsorption on the fresh carbon bed. The rate of desorption from and adsorption on suspended material was measured as a function of the pH of the solution for mercury and various other ions. The separation of mercury from air was obtained by suction through a fine filter and a charcoal bed; determination was then performed as in the case of water samples. (See also W78-03979) (Wares-IPA)
W78-03980

ANALYTICAL CHEMISTRY OF NATURAL WATERS,
Battelle-Pacific Northwest Lab., Richland, WA.
D. E. Robertson.
In: Accuracy in Trace Analysis: Sampling, Sample Handling, Analysis Proceedings of the 7th Materials Research Symposium, October 7-11, 1974, Gaithersburg, MD, NBS SP-422, Volume II, p 805-836, 1976. 11 fig, 7 tab, 7 ref. AEC AT(45-1)-1830.

Descriptors: *Chemical analysis, Bodies of water, Analytical techniques, Trace elements, Water pollution, *Pollutant identification, Sampling, Storage, Instrumentation, Oceans, Mercury, Geochemistry, Distribution patterns, Errors, Interference.

Using mercury determination as an example, case studies illustrate the parameters which must be evaluated in trace element analysis of natural waters if accurate and precise results are to be obtained. The major sources of error are contamination (positive, negative, or pseudocontamination), chemical interferences, and instrumental disturbances; these sources may pertain to techniques of sampling, containment, handling, analysis, and interpretation. Results of mercury analysis of Atlantic Ocean seawater samples made during participation in the Geochemical Ocean Sections Study (GEOSECS) project are presented. From 22 stations, over 1,000 seawater samples, blanks, and standards were analyzed to provide data to characterize oceanic distribution of mercury in the western basin of the Atlantic Ocean. The analytical method used is based on the cold vapor, ultraviolet absorptiometric detection of vaporized elemental mercury. A parameter evaluation, considering sampling techniques, storage methods, yields of chemical manipulations, procedural blanks, verification, standard references, precision determination, and chemical/instrumental interferences, was carried out to ensure accuracy. A reasonably accurate picture of the actual large scale geographical and vertical distribution of mercury was obtained, with the only uncertainty due to minor sampling and storage problems. (See also W78-03979) (Wares-IPA)
W78-03982

MONITORING DISSOLVED COPPER IN SEAWATER BY MEANS OF ION-SELECTIVE ELECTRODES,
Texas Instruments Inc., Dallas. Central Research Lab.
G. K. Rice, and R. J. Jasinski.
In: Accuracy in Trace Analysis: Sampling, Sample Handling, Analysis Proceedings of the 7th Research Symposium, October 7-11, 1974, Gaithersburg, MD, NBS SP-422, Volume II, p 899-915, 1976. 8 fig, 2 tab, 10 ref. ARPA Order No 2199. ONR 0014-72-C-0368.

Descriptors: *Pollutant identification, *Monitoring, *Ion transport, *Copper, Electrodes, Electrochemistry, Sea water, Adsorption, Water pollution, *Trace elements, Chemical properties, *Ion-selective electrode, *Cupric ion, Flow cell.

The application of an ion-selective electrode method for continuously monitoring copper ions in seawater without sample pretreatment is described. The necessary sensitivity of the electrodes was achieved by preconditioning and by use of a flow cell configuration. Response times, even at trace concentrations, were adequate for monitoring small changes in the copper ion concentration of seawater. Evaluating the effects of solid materials on the chemistry of copper ions in seawater was simplified by the speed and convenience of the ion selective electrode technique. In addition to the adsorption of metal ions on solid surfaces, copper ion electrode analysis indicated that contaminants from some solid materials form complexes with copper ion in solution. Changes in chemical properties, such as pH, measurably affect the distribution of copper ions in seawater. Operation of a trace sampling and analysis system aboard a ship is complicated by chemical and electrical effects of the ship's hull on the continuous seawater flow stream. A method was found for minimizing electrical 'noise' in the flow stream and for distinguishing the copper ion potential of chemical contamination due to the ship from the ambient background of natural seawater. Results indicate the practicality of developing trace analytical methods which require little or no sampling pretreatment for true on-site analysis, thus avoiding many of the problems of sampling and sample handling. (See also W78-03979) (Wares-IPA)
W78-03983

ELECTROANALYTICAL DETERMINATION AND CHARACTERIZATION OF SOME HEAVY METALS IN SEAWATER,
Institut Rudjer Boskovic, Zagreb (Yugoslavia). Center for Marine Research.
M. Branica, L. Sipos, S. Bubic, and S. Kozar.
In: Accuracy in Trace Analysis: Sampling, Sample Handling, Analysis Proceedings of the 7th Materials Research Symposium, October 7-11, Gaithersburg, MD, NBS SP-422, Volume II, p 917-928, 1976. 3 fig, 4 tab, 28 ref. NBS/IG-191/JF.

Descriptors: *Pollutant identification, *Electrochemistry, *Sea water, *Trace elements, *Heavy metals, Adsorption, Copper, Cadmium, Lead, Chemical analysis, Speciation, Zinc, Stability, Chelation, *Electrochemical analysis, *Anodic stripping voltammetry, Complexation, Hydrolyzation.

Experience with application of electroanalytical techniques is presented and discussed with regard to direct determination of concentrations of some metal ions, characterization of the species actually present, and the study of chelation, hydrolyzation, and other interactions between metallic ions and organic ligands in natural aquatic systems. Anodic stripping voltammetry (ASV) with rotating glassy carbon electrode has been used for determination of cadmium, lead, and copper; slowly dropping mercury electrode has been used for determination of zinc. The reproducibility of measurements, behavior of electrodes, the role of cell and storage bottle materials, sampling procedures, and problems of sample storage are discussed. By use of voltammetric measurements with accumulation at various constant potentials representing potential changes in the composition of solution, the distribution of ionic species can be determined at concentration levels as low as the detection limit of the technique. Using this method, the predominant ionic species of cadmium naturally present in seawater were determined as mono and bichloro complexes. ASV is a technique useful not only for analytical purposes, but also for the study of complexation, hydrolyzation, and chelation of trace metals at low concentration levels. (See also W78-03979) (Wares-IPA)
W78-03984

METHODOLOGICAL CONSIDERATIONS IN WESTERN LAKE SUPERIOR WATER-SEDIMENT EXCHANGE STUDIES OF SOME TRACE ELEMENTS,
National Water Quality Lab., Duluth, MN.
J. E. Poldoski, and G. E. Glass.
In: Accuracy in Trace Analysis; Sampling, Sample Handling, Analysis Proceedings of the 7th Materials Research Symposium, October 7-11, 1974, Gaithersburg, MD, NBS SP-422, Volume II, p 1073-1088, 1976. 6 fig, 4 tab, 25 ref.

Descriptors: *Pollutant identification, *Lake Superior, *Trace elements, Sedimentation, Electrochemistry, Connate water, Chemical analysis, Filtration, Sampling, *Sediment-water interfaces, Colorimetry, Lake sediments, *Anodic stripping voltammetry, Flameless atomic absorption.

Trace element measurements were taken as a function of geographical area and distance above and below the water-sediment interface in order to detect gradients of certain constituents. Required methodology examination indicated that values obtained from a particular sample type are constrained by uncertainties and operational definitions. Data were taken and experiments conducted at various points in the analytical scheme to determine the influence of sample collection, handling, and analysis steps. Samples were obtained using Van Dorn and Niskin water samplers, an epoxy encapsulated submersible pump, a Shipek dredge, a Phleger gravity corer, and Benthos type gravity corer, with modifications for sediment and bottom water. Samples were treated aerobically or anaerobically, with filtration and analysis carried out as soon as possible after collection to detect any possible absorption or leaching effects by filter and apparatus. Accuracy of results was investigated by analyzing interstitial water samples for copper, manganese, iron, and silica, employing flameless atomic absorption, colorimetric manganese, anodic stripping voltammetry, colorimetric iron, or colorimetric silica methods. The anaerobic method was preferred since the amount of dissolved element in sediments can change markedly with oxidizing conditions, and since these best approximate actual interstitial water conditions in stratified bodies of water. Flameless atomic absorption was preferred, esp. for copper analysis. Sampling and analytical methods influenced the results of trace analysis sufficiently to warrant the study of their parametric influences in individual studies. (See also W78-03979) (Wares-IPA)
W78-03985

ACCURACY IN DETERMINING TRACE ELEMENT CONCENTRATIONS IN MARINE SEDIMENTS,
Puerto Rico Nuclear Center, Mayaguez.
E. D. Wood, and N. A. Cintron.
In: Accuracy in Trace Analysis: Sampling, Sample Handling, Analysis Proceedings of the 7th Materials Research Symposium, October 7-11, 1974, Gaithersburg, MD, NBS SP-422, Volume II, p 1089-1102, 1976. 6 fig, 3 tab, 5 ref. AEC AT(40-1) 1833.

Descriptors: *Pollutant identification, *Trace elements, *Sea water, *Sediments, *Puerto Rico, Rivers, Standards, Sampling, Calcium, Cadmium, Cobalt, Chromium, Copper, Iron, Magnesium, Nickel, Lead, Strontium, Zinc, Accuracy, Atomic absorption spectrometry, Precision, Replication, Concentration.

An initial survey of a river-ocean system was carried out to determine the distribution and level of trace elements in sediments, including three river discharge regions on the west coast of Puerto Rico. Replicate sediment samples were collected in the course of mapping a portion of the sea floor in the discharge region of the Guanajibo, Mayaguez, and Anasco Rivers. Upon indication of the need for a natural sediment standard, one station in the Guanajibo river discharge region was chosen as a sampling site. Ten replicate grab samples were taken by independent positioning of the ship. The samples were stripped with hydrochloric acid and the resulting solutions analyzed by atomic absorption spectrometry for calcium, cadmium, cobalt, chromium, copper, iron, magnesium, nickel, lead, strontium, and zinc. The standard deviations of replicate analysis of individual samples were generally less than for the individual samples themselves. Chemical standards prepared in the laboratory were used to determine the value of the samples. Particle size and homogeneity were factors considered with respect to the number of replicates required and sample size. The average concentrations for the elements studied are listed in micrograms/gram dry sediment. A composite sample from this location was prepared for use as a standard in future sediment analysis. (See also W78-03979) (Wares-IPA)
W78-03986

ORGANOMERCURY AND TOTAL MERCURY CONTENT OF ENVIRONMENTAL MATRICES AS DETERMINED BY NEUTRON ACTIVATION ANALYSIS,
Pavia Univ. (Italy). Centro di Radiochimica e Analisi per Attivazione.
E. Orvini, and M. Gallorini.
In: Accuracy in Trace Analysis: Sampling, Sample Handling, Analysis Proceedings of the 7th Materials Research Symposium, October 7-11, 1974, Gaithersburg, MD, NBS SP-422, Volume II, p 1233-1240, 1976. 5 tab, 10 ref.

Descriptors: *Pollutant identification, *Mercury, *Environmental gradient, *Separation techniques, Neutron activation analysis, Solvents, Gas chromatography, Analytical techniques, *Organomercury.

Neutron activation analysis and gas chromatographic techniques are used in the determination of organomercury compounds and of total mercury in environmental matrices. The benzene-cysteine separation procedure of Westoo was coupled to neutron activation analysis so that both the total mercury content and the organomercury fraction could be evaluated in one sample, during one radiochemical separation process. The activity of mercury-197 from the inorganic mercury content of the samples was evaluated with a combustion separation technique carried out on the residual sample after benzene extraction. The activity of mercury-197 from organomercury compounds of the samples was evaluated after extraction and purification with cysteine acetate from benzene fraction. The total mercury content was checked on an untreated portion of the same sample. Results showed that neutron activation analysis, while not used here at its best capability, is reliable and precise, and allows determination of both main species of mercury compounds relevant to environmental studies utilizing only one technique. (See also W78-03979) (Wares-IPA)
W78-03987

DANUBIALIA HUNGARICA: LXIII. SEVERAL DATA ON THE ORGANIC MATERIAL CONTENT OF DANUBE WATER, (IN GERMAN),
Magyar Tudomanyos Akademia, Budapest. Station for Danube Research.
E. V. Kozma.
Ann Univ Sci Budap Rolando Eotvos Nominatae Sect Biol. 14, p 47-52, 1972.

Descriptors: Water pollution, Danube River, *Danubialia Hungarica, Hungary, *Organic matter, Oxygen consumption, Seasonal, Measurement, Oxidation.

From July 10, 1968-July 16, 1970, 73 measurements of O2 consumption using KMnO4 oxidation in acid medium were made near Alsogod (Hungary). Values from 4-12 mg/l were obtained for O2 consumption and the living organisms in the filtrate were comprised of seston. The ratio of the oxidizable material dissolved in the water to the particulate oxidizable material was approximately 1:10. O2 consumption is higher in the summer and lower in the winter. Extreme values of 0.05 and 0.60 mg O2/l were recorded. (See also W76-12574, W75-08349 and W74-12731)--Copyright 1975, Biological Abstracts, Inc.
W78-03989

MERCURY CONTENT IN SEVERAL SPECIES OF MARINE FISH,
Genoa Univ. (Italy). Ist. di Farmacologia e Farmacognosia.
F. Cugurra, and G. Maura.
Bulletin of Environmental Contamination & Toxicology, Vol 15, No 5, May 1976, p 568-573, 3 tab, 26 ref.

Descriptors: *Environmental effects, *Water pollution, Toxicity, *Mercury, Fish, Italy, *Mediterranean Sea, Absorption, Pollutant identification, Bioaccumulation.

Total mercury contents were determined in tinned tuna, anchovies, sardines and mackerel, frozen umbrina and dried cod bought on the market and on fresh fish, sardines and oculata fished in the port of Genoa, Italy. Total mercury contents in tinned tuna varied between species ranging from 0.274 to 1.326 ppm. In other types of tinned fish mercury concentrations ranged from 0.104 ppm in sardines to 0.416 ppm in anchovy. Total mercury contents in fresh fish were higher with concentrations of 2.593 ppm in Oblata melamura and 0.484 ppm in fresh sardines. Frozen Umbrina cirrhosa showed mercury contents of 0.707 ppm and dried Gadus morrhua contained 0.326 ppm mercury. Both fresh and dried dolphin had high mercury concentrations. (Chilton-ORNL)
W78-04041

MERCURY IN CATFISH AND BASS FROM THE SNAKE RIVER IN IDAHO,
Idaho State Dept. of Health and Welfare, Boise. Epidemiologic Studies Program.
W. W. Benson, W. Webb, D. W. Brock, and J. Gabica.
Bulletin of Environmental Contamination and Toxicology, Vol 15, No 5, May 1976, p 564-567. 2 tab, 6 ref. EPA 68-02-0552.

Descriptors: *Environmental effects, *Water pollution, *Mercury, Fish, Absorption, Bass, *Catfish, Impounded waters, Reservoirs, River flow, Agricultural runoff, Runoff, *Snake River(Idaho).

Bass and catfish were collected from immediately behind a dam, in a free flowing section of river below the dam, and 120 miles upstream from the dam. Analysis showed that there was an increase in mercury concentration from 0.59 ppm to 0.72 ppm in bass between the ages of two and four years in the impounded waters and from 0.67 ppm to 1.15 ppm for the same age period in the free flowing waters. This condition was not apparent, however, in catfish where both patterns with respect to age and habitat appeared to be reversed. In all cases, however, except for catfish in free flowing waters, the mean levels for mercury concentration set by F. D. A. was exceeded. The Snake River in this area passes through several hundred miles of agricultural land subject to runoff as well as passing through several areas where mercury is found naturally. (Chilton-ORNL)
W78-04047

AUTOMATED METHOD FOR THE DETERMINATION OF TOTAL DISSOLVED MERCURY IN FRESH AND SALINE WATERS BY ULTRAVIOLET DIGESTION AND COLD VAPOR ATOMIC ABSORPTION SPECTROMETRY,
Canada Centre for Inland Waters, Burlington (Ontario).
H. Agemian, and A. S. Y. Chau.
Analytical Chemistry, Vol. 50, No. 1, p 13-16, January, 1978. 3 fig, 16 ref, 2 tab.

Descriptors: *Mercury, *Water analysis, *Pollutant identification, *Spectrophotometry, Ultraviolet radiation, Analytical techniques, Freshwater, Saline water, Water chemistry, Water properties, Water pollution sources, Metals, Trace elements, Organic compounds, *Mercury compounds.

A flow-through UV digester is incorporated into the automated cold vapor atomic absorption spectrometric technique to provide a completely automated method for the determination of total dissolved mercury in fresh and saline natural waters. UV digestion as a means of degradation of organomercurials removes the interference of chloride which is encountered in automated chemical oxidation techniques. The method is shown to degrade seven of the most common organomercurials which may be found in natural waters (phenylmercuric acetate and nitrate, diphenylmercury, and methyl-, ethyl-, methoxyethyl-, and ethoxyethylmercuric chloride). The precision of the method at levels of 0.07, 0.28, and 0.55 micrograms/liter mercury was plus or minus 6.0, plus or minus 3.8, and plus or minus 1.0%, respectively. The detection limit of the system is 0.02 micrograms/liter, and the method is capable of analyzing 30 samples/hr. (Witt-IPC)
W78-04063

DETERMINATION OF POLYCHLORINATED BIPHENYLS IN PAPER MILL EFFLUENTS AND PROCESS STREAMS,
Institute of Paper Chemistry, Appleton, WI.
D. B. Easty, and B. A. Wabers.
Analytical Letters, Vol. 10, No. 11, p 857-867, 1977. 3 fig, 9 ref, 3 tab.

Descriptors: *Polychlorinated biphenyls, *Pollutant identification, *Pulp wastes, *Water analysis, Wastes, Industrial wastes, Water pollution sources, Effluents, Pulp and paper industry, Pollutants, Chlorinated hydrocarbon pesticides, Analytical techniques, Gas chromatography, Chemical analysis, Water pollution, No-carbon paper.

Special techniques were required for isolating PCBs from cellulose fiber-containing effluents and process streams and for determining PCBs in effluents from paper mills recycling no-carbon paper made prior to mid-1971. Significant amounts of PCBs remained on cellulose fibers following separatory funnel extraction of a fiber-water suspension with hexane or 15% methylene chloride in hexane. Reflux of the fibers with 2% alcoholic KOH was necessary to remove the remaining PCBs. PCB losses due to volatilization from aqueous solution occurred during analysis, but these were minimized by working in a cool environment and covering the sample with a layer of hexane. It was hoped that the resolution of gas chromatograms could be sharpened by perchlorinating PCBs in paper mill effluents to decachlorobiphenyl (DCB), whose long retention time would move it away from interfering peaks. However, alkyl biphenyls and naphthalenes (present in newer no-carbon paper) would also be perchlorinated. These compounds have the same retention time as DCB and would be incorrectly identified as PCBs. Chromium trioxide oxidation was found to be valuable in cleaning up extracts from paper mill effluents. (Swichtenberg-IPC)
W78-04064

HOW TO DESIGN AND SELECT A (WASTE WATER) SAMPLER,
Sirco Products Ltd., Vancouver (British Columbia).
C. K. Tompe.
In: International Symposium on Process Control, Canadian Pulp and Paper Association Technical Section, Vancouver, B.C., May 2-4, 1977, Preprint, p 74-77.

Descriptors: *Sampling, *Effluents, *Pulp and paper industry, Pulp wastes, Pollutant identification, Water pollution sources, Equipment, Design, Water sampling, Wastes, Industrial wastes, Water analysis.

Sampling procedures (viz., manual grab, composite, sequential, flow-proportional composite, sequential composite, and continuous composite or sequential sampling), sampling sites, and samplers (chain and bucket, rotating cup, vacuum, and vacuum pressure) are discussed as guides for pulp and paper industries developing an effluent sampling program. (Swichtenberg-IPC)
W78-04068

ARE ALL PULP AND PAPER MILL EFFLUENTS REALLY DIFFERENT. NOT ACCORDING TO THE COD/5-DAY BOD RATIO,
Van Luven Consultants Ltd., Montreal (Quebec).
R. van Soest.
Canadian Pulp and Paper Association, Technical Section, 63rd Annual Meeting (Montreal), February, 1977, Preprints, p A5-A15. 10 fig, 11 ref.

Descriptors: *Pulp wastes, *Chemical oxygen demand, *Biochemical oxygen demand, Wastes, Industrial wastes, Water pollution sources, Inorganic compounds, Organic compounds, Lignins, Clays, Toxicity, Pulp and paper industry, Effluents, Aluminum sulfate, Sugars, Kraft mills, Sulfite pulp mills, Waste paper mills, Deinking mills, Groundwood pulp mills.

To determine the relationship between COD and 5 day BOD, influent and effluent values were plotted on a COD vs. BOD graph at the biological treatment plants of several mills (viz., bleached hard-and softwood kraft, bleched/unbleached softwood ammonia- and Na-base sulfite, and bleached stone groundwood pulps and deinked/bleached waste paper furnish). Four regions were defined to include (1) inorganic materials (e.g., cooking chemicals, filler clays, and alum which exhibit a COD but no BOD since microorganisms cannot degrade them while chemical oxidation is still possible, (2) organic materials (e.g., lignin) which exhibit a COD but no BOD because they are too large and complex to allow biological degradation within the 5-day test period, (3) organic materials (e.g., some sugars and toxic compounds) which exhibit a COD and gradually increasing BOD so that the slope of the curve is gradually decreasing, and (4) organic material (viz., sugars) which exhibit a constant COD/BOD ratio of ca. 1.6. This is the ratio for 85-90% of the dissolved material found in pulp and paper mill effluents, regardless of what production process generated it or what biological treatment method removed it. The influence of the remaining dissolved material is of little significane in the design of biological treatment plants. (Swichtenberg-IPC)
W78-04070

ABSORPTION METHOD FOR DETERMINING ACTIVATED SLUDGE CONCENTRATIONS DURING PURIFICATION OF EFFLUENTS FROM VISCOSE PRODUCTION (ABSORBTSIONNOE OPREDELENIE KONTSENTRATSII AKTIVNOGO ILA PRI BIOKHIMICHESKOI OCHISTKE STOCHNYKH VOD VIZKOZNOGO PROIZVODSTVA),
G. G. Golovanov, A. Ya. Rudomir, and V. D. Tselishchev.
Khimicheskie Volokna, No. 2, p 66-67, 1977. 2 ref.

Descriptors: *Activated sludge, *Waste identification, *Spectrophotometry, Analytical techniques, Analysis, Absorption, Waste water treatment, Pollutant identification, *Viscose process.

A rapid method for determining the concentration of activated sludge is based on measuring the intensity of light passing through a solution containing suspended particles. The error of the method is not greater than plus or minus 6%. The sensitivity threshold is 2 mg/liter. The electrical signal of the absorptiometer can be used in conjunction with an automatic control system. (Chern-IPC)
W78-04081

AN ANALYSIS OF BOD AND COD IN THE STONE GROUNDWOOD PROCESS,
Technische Univ. Darmstadt (West Germany). Inst. fuer Paper-fabrikation.
L. Goettsching, W. Luettgen, and H. L. Dalpke.
In: Proceedings EUCEPA International Mechanical Pulping Conference, June 6-10, 1977, Helsinki, Finland, Volume II, Paper No. 13, 16 p. 3 fig, 6 ref, 3 tab.

Descriptors: *Pulp wastes, *Biochemical oxygen demand, *Chemical oxygen demand, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Temperature, *Pollutant identification, *Groundwood pulp mills, Spruce trees(Picea), Mechanical pulping.

The effluent load created during the manufacture of groundwood from spruce is expressed by the sum-type parameters BOD and COD. Pollution loads on the grinder water, as well as specific initial COD and BOD values (per kg of pulp) are discussed. The specific COD of the process is compared with the experimentally determined value for the fibrous material and with the COD of the filtrate from dried commercial mechanical pulp. The process losses occurring through dissolution of wood solids may be gaged by means of the specific initial COD. The ratio of BOD to COD (ratio of biologically degradable material to the total material in the water) averaged 0.37 for the commercial grinder installations, which is comparable with BOD/COD ratio of an average paper-mill effluent. Differences between the specific initial BOD values of commercial amounts of dissolved material in their shower water. When the industrial variations are excluded, the pilot-plant results show a connection between the original COD and the temperature in the grinder pit. (DuVall-IPC)
W78-04089

SOLIDS CONTENT DETERMINATION OF SPENT SULFITE LIQUORS,
Cellulose Attisholz A.G., (Switzerland).
M. Rutishauser, U. Gasche, P. Felber, L. Smetakova, and T. L. D. Adhihetty.
Tappi, Vol. 60, No. 9, p 155, September, 1977. 1 fig, 8 ref, 2 tab.

Descriptors: *Pulp wastes, *Sulfite liquors, *Suspended solids, *Pollutant identification, Wastes, Industrial wastes, Water pollution sources, Testing procedures, Quality control, Waste identification, Coniferous trees, Softwood, Hardwood, Deciduous trees, *Spent sulfite liquors, Hemlock trees(Tsuga), Spruce trees(Picea), Eucalypt trees(Eucalyptus), Acacia, Beech trees(Fagus).

A more rapid method has been developed to determine the solids content in calcium- and sodium-base spent sulfite liquors (SSL). In over 2,000 determinations solid concentrations ranged from 10 to 60%. Samples of SSL were from North American eastern and western hemlock, Norway spruce, Portuguese and South African eucalypt, South African acacia, and Swiss beech. The apparatus consists of a Mettler LP 12 drying unit and Mettler P 160 N balance. The procedure involves weighing the SSL on a tared pan, drying it under a 150-watt IR bulb for 45 min, and determining the weight while the lamp is still on, so that moisture cannot interfere with results. The difference in results between the new and standard methods averages about 2%. A comparison of standard deviation shows the new method to be slightly superior. (DuVall-IPC)
W78-04095

GROUNDWATER ANALYSIS BY TRITIUM TECHNIQUE: A PRELIMINARY EVALUATION,
Guam Univ., Agana. Water Resources Research Center.
For primary bibliographic entry see Field 2F.
W78-04100

ACID SNOW-MELT EFFECTS ON WATER QUALITY AND FISH SURVIVAL IN THE ADIRONDACK MOUNTAINS OF NEW YORK STATE,
Cornell Univ., Ithaca, NY. Dept. of Natural Resources.
For primary bibliographic entry see Field 5C.
W78-04104

ASSESSMENT OF WATER QUALITY STATUS AND TRENDS IN MINNESOTA BY REMOTE SENSING TECHNIQUES,
Minnesota Univ., Minneapolis.
K. N. Brooks, A. C. Mace, Jr., and M. P. Meyer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 822, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, December 1977. 56 p, 6 fig, 10 tab, 44 ref, 3 append. OWRT A-033-MINN(1).

Descriptors: *Water quality, *Remote sensing, *Monitoring, *Minnesota, *Lakes, Reservoirs, Sampling, *Aerial photography, *Minneapolis-St Paul(Minn), Color, Turbidity, Suspended sediments, *Trophic level, Indicators(Water quality), Regression analysis, Chlorophyll, Plankton, Secchi disk depth, Carlson's Trophic State Index, *Pollutant identification.

Monitoring the water quality of lakes and reservoirs by traditional field sampling techniques is a costly and time consuming process. Aerial photography, with limited field sampling, was investigated as a practical alternative to estimate the water quality of ten lakes in the Minneapolis and St. Paul metropolitan area of Minnesota. These ten lakes represented a wide diversity of trophic state and were sampled for color, turbidity, suspended sediment, chlorophyll, phytoplankton numbers, and Secchi disk depth. Regression equations for these water quality indicators were based on film transmittance of black and white panchromatic (2402), color (2448) and color infrared (2443) films as measured with a VP-8 image analyzer. Tests of 1:2000, 1:3000, and 1:6000 scales indicated that 1:3000 should be used. Statistically significant (Delta = .05) prediction equations were developed for Secchi disk depth, turbidity and color. Varying the film processing had little effect on prediction equations, but overexposing the film had an adverse effect. Variability of transmittance readings with time required that a specific set of procedures be followed for practical application. Procedures are outlined which allow film transmittance to be used to estimate Carlson's Trophic State Index. Predicted trophic state indices were not different from those calculated from water quality samples. (Waelti-Minn)
W78-04105

A CRITICAL EVALUATION OF THE NON-RADIOLOGICAL ENVIRONMENTAL TECHNICAL SPECIFICATION - VOL. 1. PROGRAM DESCRIPTION, SUMMARY AND RECOMMENDATIONS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 6G.
W78-04130

A CRITICAL EVALUATION OF THE NON-RADIOLOGICAL ENVIRONMENTAL TECHNICAL SPECIFICATIONS - VOL. 4, SAN ONOFRE NUCLEAR GENERATING STATION UNIT 1,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 6G.
W78-04131

ON MERCURY AND SELENIUM CONTAINED IN TUNA FISH TISSUES-IV. METHYL MERCURY LEVEL IN MUSCLES AND LIVER OF YELLOWFIN TUNA, (IN JAPANESE),
Shimonoseki Univ. of Fisheries, (Japan). Dept. of Food Science and Technology.
T. Ueda, and M. Takeda.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43, No. 9, p 1115-1121, 1977. 5 ref, 7 fig, 4 tab.

Descriptors: *Mercury, *Commercial fish, *Marine fish, Path of pollutants, Size, Metabolism, Pollutant, Identification, Pacific Ocean, Indian Ocean, Metals, Heavy metals, Public health *Selenium, *Methyl mercury, Tissue analysis Bioaccumulation, Thunnus albacares, *Yellowfi tuna.

The results of methyl mercury (MeHg) analyses o the muscle tissues and the livers of 39 specimen of yellowfin tuna, Thunnus albacares, from th Middle Pacific, the West Pacific, and the East In dian Oceans are presented. The correlations between the levels of MeHg and total mercury (T-Hg) were significant (0.01 level) in both muscle tissues and liver. The difference between the MeHg and the T-Hg levels was insignificant (at 0.01 level) in both dark muscle and liver. On the other hand, the MeHg levels of dorsal muscle were significantly lower than the corresponding T-Hg levels, the difference being approximately 0.04 microgr/gr. The level of MeHg in dark muscle and liver, respectively, correlated significantly with that of dorsal muscle (at 0.01 level). The dark muscle contained a higher level of MeHg than the dorsal muscle, the difference being about 0.03 microgr/gr, while the liver contained less than either (about 0.07 microgr/gr). On the basis of the statistical evaluation described above, the order of mercury levels among the muscles and the liver was estimated as follows: the T-Hg of dorsal muscle is about equal to T-Hg of dark muscle and MeHg of dark muscle. This is greater than MeHg of dorsal muscle which is greater than MeHg of liver and T-Hg of liver. (Katz)
W78-04144

ASBESTOS FIBERS IN NATURAL RUNOFF AND DISCHARGES FROM SOURCES MANUFACTURING ASBESTOS PRODUCTS. PT II-NON-POINT SOURCES & POINT SOURCES MANUFACTURING ASBESTOS PRODUCTS,
McCrone Research Inst., Chicago, IL.
For primary bibliographic entry see Field 5B.
W78-04150

WATER RESEARCH INSTRUMENTATION: 2.
Journal of the Institute of Measurement and Control, Vol 10, No 10, p 364-365, October, 1977. 1 fig.

Descriptors: *Flow measurement, *Sewers, *Equipment, *Flowmeters, *Ultrasonics, Monitoring, Automation, Analytical techniques, Waste water treatment, Instrumentation.

Various measurement techniques which were presented during an open house on May 4-6, 1977, at the Medmenhan Laboratory of the Water Research Centre in England are described. A non-contacting flowmeter for use in sewers has been developed by the Water Research Centre in conjunction with the Department of Control Engineering at the University of Bradford. Flow velocity is measured by means of photodetectors which detect turbulent patterns on the fluid surface. An ultrasonic method of flow velocity and suspended solids measurement being developed for use with influent sewage, mixed liquor, returned sludge, and surplus sludge is described. The Digidip, and instrument for measuring levels in sewers, combines the operating principle of an oscillating probe with the reliability of low power digital electronic circuitry. Sulfur hexafluoride has been used as a tracer gas in detecting leaks in sewer lines. Cross-correlation of leak noise by statistical comparison of shape envelope from one microphone with that of another has also been used. (Schulz-FIRL)
W78-04153

MERCURY IN WATERS AND BOTTOM SEDIMENTS OF SOME SELECTED MAZURIAN LAKES,
Akademia Rolniczo-Techniczna, Olsztyn-Kortowo (Poland). Inst. of Agrochemistry.
K. Krasnicki, and A. Szczepanski.
Polskie Archiwum Hydrobiologii, Vol. 24, No. 3, 1977, p 383-387, 1 fig, 2 tab, 17 ref.

Descriptors: *Pollutant identification, Water quality, Water pollution, *Mercury, Lakes, Sediments, Hypolimnion, *Bottom sediments, Water pollution sources, Fallout, *Lake sediments, *Mazurian lakes(Poland).

Analytical results showed that mercury occurs in the profundal sediments and near-bottom water of all 20 of the lakes investigated. Mercury content in near-bottom water relatively uniform. It was concluded that, at the present time, the investigated area is free from any potential sources of mercury, and that the mercury contents found remain within the natural background range. Almost the whole of mercury occurring in water was organically bound with traces of inorganic mercury being found in only seven lakes. Mercury contents in the bottom sediments was more differentiated. (Chilton-ORNL)
W78-04184

THE DISTRIBUTION OF HEAVY METALS IN ANAEROBIC DIGESTION,
Notre Dame Univ., IN.
T. D. Hayes, and T. L. Theis.
Journal Water Pollution Control Federation, January 1978, p 61-72. 15 fig, 5 tab, 21 ref.

Descriptors: *Water pollution, Waste water treatment, Wastes, *Anaerobic digestion, *Heavy metals, Nickel, Copper, Lead, Chromium, Zinc, Cadmium, Distribution, Pollutant identification.

The purpose of this study was to observe the effects of heavy metals on bench-scale anaerobic digesters and to determine the distribution of these metals among various forms in the digester. The disruption of anaerobic digestion by heavy metals characteristically resulted in a lowering of gas production and the proportion of methane present and a subsequent accumulation of intermiate organic acid substrates through inhibition of methanogenic bacteria. This accumulation was less at shock loadings because of rapid toxification of all active bacterial forms in the digester. The order of decreasing toxicity on a weight-weight or molar basis was Ni, Cu, Pb, Cr, Zn. In the dosages used, Cd produced no toxic or inhibitory effects. Heavy metal removal from digester supernatant was generally greater than 95%. Metals in a precipitated phase could be removed through a mild acidification treatment followed by solids removal but for metals which are organically bound, a prolonged exposure under more extreme acid conditions would be required. (Chilton-ORNL)
W78-04190

WATER QUALITY IN THE FORTH ESTUARY: A DISCRIMINANT FUNCTIONAL ANALYSIS,
Napier Coll. of Commerce and Technology, Edinburgh (Scotland).
P. A. Read, T. Renshaw, A. D. Jackes, P. G. Watson, and K. J. Anderson.
Environmental Pollution, Vol 14, 1977, p 275-287. 11 tab, 16 ref.

Descriptors: *Water quality, Analysis, Water analysis, Coasts, Beaches, Chemical analysis, Biochemical oxygen demand, Phosphates, Chlorophyll, *Forth estuary, *Pollutant identification, *Discriminant functional analysis.

The purpose was to present the results of a discriminant function analysis of water quality measurements recorded on four or more occassions at eight different places, comprising both sandy and rocky shores, on the south coast of the outer Firth of Forth. It was concluded that chemical measures fail to discriminate completely amongst the four sandy beaches because of resuspension, by wave action, of sediments. BOD, PO4 and chlorophyll a appear to be the most effective variables in contributing to the discrimination of sandy beaches. For the four rocky shores, the chemical and microbiological measures included in the analysis completely discriminate within each of the pairs. The more important variables contributing to this discrimination were BOD, PO4, chlorophyll a, number of faecal coli in the water, and number of faecal coli in mussels. (Chilton-ORNL)
W78-04199

5B. Sources Of Pollution

THE ACCUMULATION OF 110MAG BY THE PLAICE, PLEURONECTES PLATESSA L. AND THE THORNBACK RAY, RAJA CLAVATA L.,
Ministry of Agriculture, Fisheries, and Food, Lowestoft (England). Fisheries Radiobiological Lab.
R. J. Pentreath.
Journal of Experimental Marine Biology and Ecology, Vol. 29, p 315-325, 1977. 15 ref, 7 tab, 3 fig.

Descriptors: *Metals, *Food chains, *Path of pollutants, *Radioisotopes, *Absorption, *Marine fish, *Fish eggs, Larvae, Food webs, Fish physiology, Metabolism, Tracers, Analytical techniques, Radiochemical analysis, *Silver, Raja, *Plaice, Bioaccumulation, Tissue analysis, *Thornback ray.

Studies on the accumulation of 110mAg from both food and water by the plaice, Pleuronectes platessa L. and thornback ray, Raja clavata L. have shown that the metabolism of silver by these two species is markedly different. The direct accumulation of the radionuclide from sea water was low for both species, but higher for rays than for plaice. Retention of the radionuclide from labelled Nereis by plaice was poor, with a very short biological half-time. In contrast, rays retained the radionuclide well from labelled food with a long biological half-time and with very high concentrations in the liver. Comparisons of 110mAg organ distributions for both species have been compared with stable element determinations. Analyses have also been made of livers from fish caught within the vicinity of a nuclear fuel reprocessing plant: 110mAg was found to be present in ray livers but could not be detected in plaice. (Katz)
W78-03702

EFFECT OF SIZE UPON METAL CONTENT OF SHELLFISH,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
C. R. Boyden.
Journal of the Marine Biology Association of the United Kingdom, Vol. 57, No. 3, p 675-714, 1977. 90 ref, 11 tab, 13 fig.

Descriptors: *Heavy metals, *Absorption, Size, *Mollusks, *Shellfish, *Zinc, *Mussels, *Cadmium, *Path of pollutants, *Oysters, *Copper, *Regression analysis, Estuarine environment, Invertebrates, Commercial shellfish, Public health, Gastropods, Seasonal, Bioaccumulation, *Scallops.

The influence of body size upon whole tissue metal content has been examined for eight elements in a variety of marine and estuarine molluscs. Generally, plotting element content against body weight on a double logarithmic basis produces straight line relationships. The calculated regression slopes for 131 lines fall into two main categories: those around 0.77 and those close to 1.00. In the former cases, e.g. zinc in Mytilus edulis, element concentrations are greatest in the smallest individuals; in the second, e.g. cadmium in M. edulis, concentrations are independent of size. In a few cases, e.g. cadmium in the limpet Patella vulgata, highest concentrations are recorded in the largest individuals. Curves on double logarithmic plots obtained relating copper content to body size in the oysters Crassostrea gigas and O. edulis and the mussel M. edulis introduced to a 'contaminated' environment. Large individuals of these species require longer than 5 months to equilibrate to exceptionally high environmental concentrations of copper. The same is true for zinc in C. gigas. In the single case of cadmium in the scallop Pecten maximus an upward directed curve was obtained relating cadmium content to body size, resulting in exceptionally high cadmium concentrations in large scallops. Steeper slopes, and almost twice as much variability, was recorded when using wet weight data compared with dry weight. (Katz)
W78-03703

ORGANOCHLORINE AND MERCURY RESIDUES IN CANVASBACK DUCK EGGS, 1972-73,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
R. C. Stendell, E. Cromartie, S. N. Wiemeyer, and J. R. Longcore.
Journal of Wildlife Management, Vol. 41, No. 3, p 453-457, 1977. 3 tab, 23 ref.

Descriptors: *DDT, *DDD, *DDE, *Pesticide residues, *Bird eggs, *Polychlorinated biphenyls, *Mercury, *Path of pollutants, *Canvasback duck, Chlorinated hydrocarbon pesticides, Metals, Dieldrin, Reproduction, Waterfowl, Water birds, Ducks(Wild), Bioaccumulation.

Eggs of canvasback ducks (Aythya valisineria) from several major breeding areas were analyzed for organochlorine and mercury residues. Polychlorinated biphenyls (PCBs) were detected in 96 of 97 eggs, in concentrations up to 29 ppm (wet wt.). DDE occurred in 79 percent of the samples with a maximum residue of 12 ppm (wet wt.). DDT, DDD, dieldrin, hexachlorobenzene, cis-chlordane, heptachlor epoxide, and oxychlordane were detected less frequently. Mercury was detected in only 6 of 34 eggs analyzed. Most of the eggs contained concentrations of organochlorines and mercury below levels known to cause adverse effects on avian survival or reproduction. (Katz)
W78-03704

MERCURY IN BENTHIC INVERTEBRATES OF THE ELBE ESTUARY,
Hamburg Univ. (West Germany). Inst. fuer Hydrobiologie und Fishcherei-wissenschaft.
G. -P. Zauke.
Helgolander wissenschaftliche Meeresuntersuchungen, Vol. 29, p 358-374, 1977. 35 ref, 4 fig, 9 tab.

Descriptors: *Mercury, *Benthic fauna, *Invertebrates, *Estuarine environment, *Food chains, *Brackish water, *Spatial distribution, *Absorption, Sea water, Path of pollutants, Heavy metals, Industrial wastes, Benthos, Crustaceans, Radix, Littorina, Crangon, *River Elbe(Germany), Gammarids, Nereis, Moulting.

Hg concentrations in benthic invertebrates of the Elbe estuary were analyzed by atomic absorption spectrophotometry and instrumental neutron activation analysis. In general Hg levels in organisms decreased from the limnic region to the marine environment. Highest Hg levels were found in Asellus aquaticus and Radix balthica taken from the Elbe upstream of Hamburg (0.35 and 0.34 ppm wet weight). The concentrations in gammarid species decreased from 0.20 ppm (limnic region) to 0.02-0.05 ppm (brackish and marine environment). Hg levels in organisms from the brackish region proved to be 0.08-0.16 ppm (Littorina littorea), 0.04-0.09 (Crangon crangon) 0.05-0.10 (Corophium volutator) and 0.04-0.08 ppm wet weight (Nereis diversicolor). Some factors which may influence the heavy metal concentrations in aquatic organisms are discussed, such as: food chain, weight of organisms, and elimination via moulting products in the case of crustaceans. (Katz)
W78-03705

ACCUMULATION AND ELIMINATION OF PENTACHLOROPHENOL BY THE BLUEGILL, LEPOMIS MACROCHIRUS,
University of Southern Mississippi, Hattiesburg. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-03709

ENERGETICS OF PACIFIC HERRING (CLUPEA HARENGUS PALLASI) EMBRYOS AND LARVAE EXPOSED TO LOW CONCENTRATIONS OF BENZENE, A MONOAROMATIC COMPONENT OF CRUDE OIL,
National Marine Fisheries Service, Tiburon, CA. Tiburon Lab.
For primary bibliographic entry see Field 5C.
W78-03710

ARSENIC CONTENT AND ITS SEASONAL VARIATION IN SEAWEED, (IN JAPANESE),
Shimonoseki Univ. of Fisheries (Japan).
For primary bibliographic entry see Field 5A.
W78-03712

HEAVY METALS, SELENIUM AND ARSENIC IN NINE SPECIES OF AUSTRALIAN COMMERCIAL FISH,
New South Wales Dept. of Fisheries, Sydney (Australia).
For primary bibliographic entry see Field 5A.
W78-03713

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: FORMALDEHYDE,
Atlantic Research Corp., Alexandria, VA.
J. F. Kitchens, R. E. Casner, G. S. Edwards, W. E. Harward, III, and B. J. Macri.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 839, Price codes: A10 in paper copy, A01 in microfiche. Environmental Protection Agency, Report No EPA 560/2-76-009, August 1976. 204 p, 42 tab, 16 fig, 208 ref.

Descriptors: *Water pollution effects, *Toxicity, *Mortality, *Chemical wastes, *Environmental effects, *Public health, Industrial wastes, Industrial production, Persistence, Mammals, Fish, Invertebrates, Bibliographies, Reviews, *Formaldehyde, Paraformaldehyde, Trioxane, Hexamethylene tetramine, Methanamine, Mutagen, Carcinogens.

This report reviews the potential environmental hazards of formaldehyde resulting from its manufacture, use, production from combustion processes and inadvertent production in the environment. Nascent sources of formaldehyde, such as paraformaldehyde, trioxane and hexamethylenetetramine, are also reviewed. The major source of atmospheric discharge of formaldehyde is combustion processes, specifically from automobile emissions. Formaldehyde is also a product of atmospheric photooxidation of hydrocarbons emitted from automobiles. Photochemical degradation of formaldehyde also occurs in the atmosphere. Formaldehyde is a mutagen in lower animals such as Drosophila and bacteria. This property is the basis of its use as a fumigant. Even though formaldehyde is a strong alklylating agent, information to date indicates that it is not mutagenic or carcinogenic in mammals, probably due to the mammalian body's ability to repair this type of nucleic acid damage. Formaldehyde is an allergen. It is also highly toxic in low concentrations causing eye and lung damage and affecting the central nervous system. However, formaldehyde is also a metabolite in biological systems and can be efficiently metabolized to formic acid, carbon dioxide and water, or utilized in the one carbon pool. (Katz)
W78-03714

CHLORDANE AND HEPTACHLOR IN RELATION TO MAN AND THE ENVIRONMENT. A FURTHER PESTICIDE REVIEW 1972-1975,
Environmental Protection Agency, Washington, DC. Office of Pesticide Programs.
H. E. Fairchild.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 339, Price codes: A05 in paper copy, A01 in microfiche. Environmental Protection Agency, Report No EPA 540/4-76-005, August 1976. 10 tab, 156 ref.

Descriptors: *Pesticides, *Chlorinated hydrocarbon pesticides, *Heptachlor, *Reviews, *Fish, *Wildlife, *Public health, Water, Soils, Air, Environmental effects, Epidemiology, *Pesticide toxicity, Foods, Pesticide residues, *Chlordane.

This report presents an additional review of both chlordane and heptachlor, which is intended to present selected papers appearing in the literature from 1972-1975. The review indicates new and significant literature in the areas of fish, wildlife, distribution in the environment (air, soil, water), residues in crops and food items, and toxicology and epidemiology. The chemistry information for 1972-1975 was published as a part of a 1975 amendment to the 1972 reviews. This review summarizes rather than interprets scientific data studies in the process of updating the earlier reviews of chlordane and heptachlor. It is not intended to correlate data from different sources of present opinions on contradictory findings. The review covers all uses of the pesticides in the United States and should be applicable to future needs in the Agency. (Katz)
W78-03715

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: ACRYLAMIDES,
Syracuse Research Corp., NY. Center for Chemical Hazard Assessment.
L. N. Davis, P. R. Durkin, P. H. Howard, and J. Saxena.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 704, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency, Report No. EPA 560/2-76-008, August 1976. 147 p, 36 tab, 17 fig, 162 ref.

Descriptors: *Reviews, *Environmental effects, *Toxicity, Biochemistry, Physiology, *Water pollution effects, Physical properties, Chemical properties, Mammals, Invertebrates, Microorganisms, *Standards, Bioassay, *Acrylamide, Polyacrylamides, Subacute toxicity, Chronic toxicity, Tetragenicity, Mutagenicity.

This report reviews the potential environmental Hazard from the commercial use of acrylamide and its derivatives. For the most part, acrylamides are used in the production of polyacrylamides, which are used as flocculants in sewage and wastewater treatment (about 40%) and as a strengthener in the pulp and paper industry (about 20%). Water leaching of the monomer from the polymer has been demonstrated by effluent monitoring, but the monomer has been demonstrated to be biodegradable. Acrylamide causes peripheral neuropathic effects and is, therefore, of occupational concern. Its other toxicological properties are not well defined. From the available information, acrylamides do not appear to be widespread contaminants but local incidences of contamination may occur. (Katz)
W78-03717

PESTICIDAL ASPECTS OF CHLORDANE IN RELATION TO MAN AND THE ENVIRONMENT,
Environmental Protection Agency, Washington, DC. Office of Pesticide Programs.
O. G. Fitzhugh, and H. E. Fairchild.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 107, Price codes: A06 in paper copy, A01 in microfiche. EPA Report No. EPA-540/4-76-006, August 1976. 108 p, 1 fig, 7 tab, 250 ref.

Descriptors: *Pesticide residues, *Path of pollutants, *Toxicity, *Insecticides, *Chlorinated hydrocarbon pesticides, *Soil contamination effects, *Soil treatment, Public health, Environmental effects, Heptachlor, Food chain, Soil environment, Pesticides absorption, Agricultural chemicals, Fish, Shellfish, Birds, *Chlordane.

Thie review evaluates scientific data in the area of fish, wildlife, distribution of chlordane in the environment (air, soil, water), residues in crops and food items, and toxicology and epidemiology. This review summarizes rather than interprets scientific data studied during the process of reviewing chlordane. It is not intended that this report correlates data from different sources. All uses of the pesticide in the United States are covered. (Katz)
W78-03721

SETTLER'S CABIN PARK: ENVIRONMENTAL ASSESSMENT OF MINE DRAINAGE POLLUTION,
Ackenheil and Associates Geo Systems, Inc, Pittsburgh, PA.
For primary bibliographic entry see Field 5G.
W78-03723

DREDGING OF CONTAMINATED BED SEDIMENT IN JAPAN,
Ministry of Transport, Kobe (Japan). Bureau of Ports and Harbors.
For primary bibliographic entry see Field 5G.
W78-03736

THE MECHANISM OF METHYLMERCURY ACCUMULATION IN FISH,
Tsukuba Univ., Ibaraki (Japan). Dept. of Environmental Epidemiology.
M. R. Fujiki, R. Hirota, and S. Yamaguchi.
In: Management of Bottom Sediments Containing Toxic Substances: Proceeding of the Second U.S.-

Japan Experts' Meeting-October 1976, Tokyo, Japan. EPAt600/3-77-083, July 1977, p 89-95. 3 fig, 2 tab.

Descriptors: *Absorption, *Mercury, *Bottom sediments, Industrial wastes, Marine fish, Public health, *Path of pollutants, *Food chains, *Dissolved solids, Laboratory tests, Metals, Heavy metals, Suspended solids, Water pollution sources, Methodology, Bioaccumulation, *Minamata Bay(Japan), *Methylmercury, Chrysophrys sp., *Red Sea Bream.

The factors contributing to methylmercury accumulation in the Red Sea bream (Chrysophrys major) were investigated by using sea water containing methylmercury, bottom sediment from Minamata Bay (methylmercury: 0.015 mg/kg dry weight, total mercury: 192 mg/kg dry weight), and bait containing methylmercury. The contaminated sea water contained 0.5 microg/liter of methylmercury and fish placed in this water accumulated methylmercury in the body, going from a concentration of 0.012 microg/g (muscle tissue) to 0.033 microg/g (muscle tissue). The fish fed on methylmercury bait (0.133 microg/g) accumulated a little methylmercury; the methylmercury concentration in the fish increased from 0.012 microg/g (muscle tissue) to 0.020 microg/g (muscle tissue). Fish raised in a rearing tank containing bottom sediment from Minamata Bay did not show an effective accumulation of methylmercury; and methylmercury accumulation was almost the same as that of the control group. (See also W78-03735) (Katz)
W78-03739

DETERMINATION OF TRACE AMOUNTS OF METHYLMERCURY IN SEA WATER,
Kumamoto Univ., (Japan). Dept. of Industrial Chemistry.
For primary bibliographic entry see Field 5A.
W78-03740

BEHAVIOR OF HEAVY METALS AND PCBS IN DREDGING AND TREATING OF BOTTOM DEPOSITS,
Public Works Research Inst., Tokyo (Japan).
K. Murakami, and K. Takeishi.
In: Management of Bottom Sediments Containing Toxic Substances: Proceedings of the Second U.S.-Japan Experts' Meeting-October 1976, Tokyo, Japan. EPA-600/3-77-083, July 1977, p 107-126. 7 tab, 13 fig.

Descriptors: *Water quality, *Bottom sediments, *Mercury, *Polychlorinated biphenyls, Water pollution sources, Acidity, Pollutants, Dispersion, Solubility, *Heavy metals, Particle size, *Suspended solids, Environmental engineering, Dredging, Water quality control, Solvents, Distribution, Sediments, Cadmium, Lead, Chromium, Metals, Laboratory tests, Turbidity, Landfills, *Pollutant releases.

Water quality is affected when bottom deposits containing toxic substances such as heavy metals and PCBs are dredged and treated. This problem and the results of laboratory experiments on the solubility of these toxic substances when contained in bottom sediments are discussed. Laboratory tests indicate that deposit constituents vary according to particle size and the kind of deposit with heavy metals and PCBs more concentrated in finer grained sediments. Little mercury or PCBs were released from sediments into the overlying water and most was bound to suspended particles. Concentration of dissolved PCBs in the waste water from dredging operations was low and dissolved mercury concentrations was also low in the normal range, of pH. Mercury transferred from the deposits into the water tended to increase sharply when the solvent was of a high pH. When mercury-containing deposits were solidified with an agent of the cement-line group, the solubility of mercury was greater for solidified deposits than for the original deposits. (See also W78-03735 (Katz)
W78-03741

A STUDY ON THE BEHAVIOR OF MERCURY-CONTAMINATED SEDIMENTS IN MINAMATA BAY,
Japan Bottom Sediments Management Association, Tokyo.
T. Yoshida, and Y. Ikeyaki.
In: Management of Bottom Sediments Containing Toxic Substances: Proceedings of the Second U.S.-Japan Experts' Meeting-October 1976, Tokyo, Japan. EPA-600/3-77-083, July 1977, p 127-143. 18 fig, 1 tab.

Descriptors: *Dredging, *Mercury, *Water quality control, *Suspended solids, *Path of pollutants, *Settling basins, Chemical precipitation, *Bottom sediments, *Flocculation, Water quality, Water pollution sources, Pollutants, Separation techniques, Laboratory tests, Water pollution control, Water treatment, *Minamata Bay(Japan), *Sediment disposal.

Tests were conducted to determine the behavior of mercury compounds in sediments during dredging and disposal for application to dredging operations in Minamata Bay. From the studies it was concluded that the concentration of suspended solids in the final effluent should be maintained below 10 mg/kg in order to control water quality. To achieve this it is necessary to treat the spillwater from a settling pond using a clarification plant. If chemical precipitation is employed to remove suspended solids, the combined use of PAC and polyelectrolyte (such as polyacrylamide) is recommended. In the dredging of the sediments there may be no problem concerning mercury release from dredge spoil particles into the seawater. (See also W78-03735) (Katz)
W78-03742

USING SAND FILL TO COVER DREDGE SPOILS CONTAINING MERCURY,
Kitakyushu Municipal Bureau of Port and Harbor, Fukuoka (Japan).
For primary bibliographic entry see Field 5G.
W78-03743

INTERCHANGE OF NUTRIENTS AND METALS BETWEEN SEDIMENTS AND WATER DURING DREDGED MATERIAL DISPOSAL IN COASTAL WATERS,
Corvallis Environmental Research Lab., OR.
D. J. Baumgartner, D. W. Schultz, S. E. Ingle, and D. T. Specht.
In: Management of Bottom Sediments Containing Toxic Substances: Proceedings of the Second U.S.-Japan Experts' Meeting-October, 1976, Tokyo, Japan, EPA-600/3-77-083, July 1977, p 229-245. 2 ref, 5 tab, 7 fig.

Descriptors: *Dredging, *Metals, *Polychlorinated biphenyls, *Methodology, *Analytical techniques, Environmental effects, *Waste disposal, *Absorption, *Path of pollutants, *Sampling, Standards, Water quality control, Distribution patterns, Marine algae, Benthos, Suspended solids, Cadmium, Lead, Mercury, Phosphorous, Nitrogen compounds, *Elliott Bay(Puget Sound), *Dredge spoils.

Conventional barge dumping of over 100,000 cubic meters of channel sediment was arranged by the Corps of Engineers at a controlled experimental dump site in Elliott Bay, Puget Sound to study the fate and effects of metals, PCBs, and nutrients in the dredged materials. Periodic sampling was conducted before, during, and at intervals after dumping to determine the distribution and uptake of materials as well as other biological effects resulting from the dumping. The objective was to provide guidance to the regulatory agencies regarding the effects of disposal of material containing measurable levels of pollutants in 'open water' disposal sites. Research was also directed towards improving analytical techniques and handling of samples. Perturbations in some water quality parameters were considerable but short-term during the dumping operation. The concentration of chemical species in the water were below the values recommended as maximum concentrations by the U.S.E.P.A. Partial results of sediment analyses indicate that there has not been substantial chemical alteration of the disposal site environment. (See also W78-03735) (Katz)
W78-03748

DREDGING CONDITIONS INFLUENCING THE UPTAKE OF HEAVY METALS BY ORGANISMS,
Army Engineer District, San Francisco, CA.
J. F. Sustar, and T. H. Wakeman.
In: Management of Bottom Sediments Containing Toxic Substances: Proceedings of the Second U.S.-Japan Experts' Meeting - October 1976, Tokyo, Japan. EPA-600/3-77-083, July 1977, p 246-252.

Descriptors: *Dredging, *Environmental effects, *Absorption, *Path of pollutants, *Dissolved oxygen, *Suspended solids, *Trace elements, *Seasonal, *Salinity, *Nitrogen compounds, *Heavy metals, *Invertebrates, Water properties, Water quality, Water pollution sources, Sediment-water interface, Bottom sediments, Lead, Copper, Zinc, Mercury, Cadmium, Mussels, *San Francisco Bay(Calif), *Dredged spoils.

Studies were conducted by the San Francisco District of the U.S. Army Corps of Engineers during the period 1971 through 1976 to evaluate the impacts associated with dredging and sediment release at open water disposal sites in San Francisco Bay. Although significant changes were observed in dissolved oxygen reductions, suspended solids increases, and trace elements, chlorinated hydrocarbons and nitrogen (nitrate and ammonia) releases, the changes were not found to be synonymous with biological impacts. Uptake and desorption of trace elements by organisms were observed. Contaminant levels in estuarine organisms appear to be controlled by a limited number of factors. Suggested factors are the long-term process of sediment resuspension-recirculation, seasonal fluctuations in salinity and sources of contaminants both introduced by man and formed geologically. (See also W78-03735) (Katz)
W78-03749

ECOLOGICAL CONSIDERATIONS IN SITE ASSESSMENT FOR DREDGING AND SPOILING ACTIVITIES,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5C.
W78-03751

RECHARGE AND NITROGEN TRANSPORT MODELS FOR NASSAU AND SUFFOLK COUNTIES, N. Y.,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
K. S. Porter, and C. A. Shoemaker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 906, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, January 1978. 55 p, 19 fig, 15 tab, 24 ref. OWRT A-075-NY(1). 14-34-0001-7068.

Descriptors: *Computer models, *Groundwater recharge, *Nitrates, *Regional analysis, *Water balance, *Water pollution sources, Aquifer management, Comprehensive planning, Denitrification, Evapotranspiration, Federal water pollution control act, Fertilizers, Land use, Nitrogen, Septic tanks, Soil moisture, Spatial distribution, Water quality, New York, Path of pollutants, *Nitrogen pollution, Groundwater quality, Non-point source pollution.

Groundwater aquifers underlying Long Island are the only source of drinking water for more than 2.5 million people in Nassau and Suffolk Counties in Long Island, New York. Due to residential and agricultural land use, the groundwater is being contaminated by nitrogen. In order to quantify both the amount of recharge water and the nitrogen concentration in the recharge, a simulation model has been developed. The model calculates a mass balance of water and nitrogen on 762 cells, each of which is 1.5 miles square. The calculations which are computed daily or monthly are based upon land use, soil type, temperature, precipitation and sewerage in each grid. Detailed soil moisture data were collected at several sites. Data from the early part of the year were used to calibrate the model. Validation was achieved by comparison with independent data collected in the late part of the year. The average recharge of precipitation for Nassau and Suffolk Counties was estimated by the model to be 1140 million gallons per day or 20.5 inches per year. Lawn fertilizer and septic systems were the major sources of nitrogen in the recharge water.
W78-03756

DISCHARGE AND WATER-QUALITY DATA FOR SELECTED STREAMS AT LOW FLOW INCLUDING SOME BOTTOM-MATERIAL ANALYSES, AND LIMNOLOGICAL STUDY OF SIX LAKES, WESTCHESTER COUNTY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
R. J. Archer, and J. T. Turk.
Open-file report 77-781, 1977. 72 p, 9 fig, 18 tab, 14 ref.

Descriptors: *Water quality, *Streams, *Lakes, *Limnology, *Discharge(Water), Basic data collections, Streamflow, Low-flow frequency, Chemical analysis, Lakes, Bottom sediments, Nutrients, Pesticides, Thermal stratification, Waste assimilative capacity, Surface waters, Travel time, New York, *Westchester County(NY), Biological indicators, Algal growth potential.

Water-quality data collected at sites on 33 Westchester County, N.Y., streams August 4 to 6, 1976 during low flow (80-percent or more duration) indicate that although the chemical characteristics of most streams met State standards for water-supply source waters, none met the coliform standard, and several failed to meet standards for organic nitrogen, pH, and dissolved oxygen. Chemical analyses of bottom materials indicated detectable concentrations of the insecticides chlordane, dieldrin, and DDT at most of the 17 stream sites sampled. Polychlorinated biphenyls(PCB's) were found in more than half the samples, and the lead concentration on one stream was significantly higher than at the other sites. The six lakes studied are similar in bedrock geology, climate, and algal types and numbers. Minor differences in the chemistry of the lakes is attributable to the presence or absence of marble (calcium carbonate) in the gneissic basins, septic loadings of soluble constituents, or runoff containing salt from winter road deicing. The lakes probably receive most of their water by direct runoff and groundwater seepage rather than from major streams. All six lakes can be classed as eutrophic on the basis of algal type and density, dissolved-oxygen distribution, and nitrogen and phosphorus concentrations. (Woodard-USGS)
W78-03758

LEACHATE PLUMES IN GROUND WATER FROM BABYLON AND ISLIP LANDFILLS, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, NY. Water Resources Div.
G. E. Kimmel, and O. C. Braids.
Open-file report 77-583, 1977. 72 p, 21 fig, 17 tab, 34 ref.

Descriptors: *Landfills, *Water pollution sources, *Malenclaves, *Path of pollutants, *Groundwater movement, Leachate, Model studies, Data collections, Sampling, Water wells, Aquifer characteristics, Chemical analysis, Mapping, Travel time, Evaluation, New York, *Suffolk County(NY), *Long Island.

Landfills operated by the towns of Babylon and Islip in southwest and central Suffolk County, N.Y., contain urban refuse, incinerated garbage, and scavenger (cesspool) waste; some industrial refuse is deposited at the Babylon site. The Islip landfill was started in 1933, the Babylon landfill in 1947. The landfills are in contact with and discharge leachate into the highly permeable upper glacial aquifer hydraulic conductivity 190 to 500 ft/d. The aquifer is 74 feet thick at the Babylon landfill and 170 feet thick at the Islip landfill. The leachate-enriched water occupies the entire thickness of the aquifer beneath both landfills, but hydrologic boundaries retard downward migration of the plumes to deeper aquifers. The Babylon plume is 1,900 feet wide at the landfill and narrows to about 700 feet near its terminus 10,000 feet from the landfill. The Islip plume is 1,400 feet wide at the landfill and narrows to 500 feet near its terminus 5,000 feet from the landfill. Hydrochemical maps and sections show the distribution of the major chemical constituents of the plumes. The most highly leachate-enriched ground water obtained was from the Babylon site; it contained 860 mg/liter sodium, 110 mg/liter potassium, 565 mg/liter calcium, 100 mg/liter magnesium, 2,700 mg/liter bicarbonate, and 1,300 mg/liter chloride. Simulation of the movement and dispersion of the Babylon plume with a mathematical dispersion model indicated the coefficient of longitudinal dispersion to be about 60 feet squared per day and the ground-water velocity to be 1 ft/d. However, the velocity determined from the hydraulic gradient and public-supply wells in the area was 4 ft/d, which would cause a plume four times as long as that predicted by the model. (Woodard-USGS)
W78-03759

OCCURRENCE AND DISTRIBUTION OF COLOR AND HYDROGEN SULFIDE IN WATER FROM THE PRINCIPAL ARTESIAN AQUIFER IN THE VALDOSTA AREA, GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
R. E. Krause.
Open-file report 76-378, June 1976. 11 p, 6 fig, 3 ref.

Descriptors: *Groundwater, *Water quality, *Sulfates, *Sulfides, *Color, Artesian aquifers, Water levels, Groundwater recharge, Georgia, *Valdosta area(Ga).

Hydrogen sulfide and color occur in objectionable amounts in ground water from the principal artesian aquifer in the Valdosta, Ga., area. Generally, water from wells south of Valdosta is high in hydrogen sulfide; water from wells north of the city is high in color. Water with high sulfate is likely to be a problem in wells deeper than about 540 ft. Heavy pumpage concentrated in a small area may cause high-sulfate water to migrate vertically upward into shallower wells. (Woodard-USGS)
W78-03762

PHYSICAL, CHEMICAL, AND BIOLOGICAL RELATIONS OF FOUR PONDS IN THE HIDDEN WATER CREEK STRIP-MINE AREA, POWDER RIVER BASIN, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
D. J. Wangsness.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 512, Price codes: A03 in paper copy, A01 in microfiche.
Water-Resources Investigations 77-72, July 1977. 48 p, 8 fig, 9 tab, 15 ref.

Descriptors: *Coal mines, *Strip mines, *Ponds, *Biological communities, Aquatic environment, Phytoplankton, Periphyton, Invertebrates, Fish, Chemical properties, Biological properties, Physical properties, Salinity, Trace elements, Hardness(Water), Hydrogen ion concentration, Nutrients, Conductivity, Water temperature, *Wyoming, *Hidden Water Creek(Wyo), Freshwater ponds.

The Hidden Water Creek area in Wyoming was mined from 1944 to 1955 and abandoned. The open pits filled with water and pond-type ecosystems developed. Light was transmitted to greater depths within two control ponds located outside the mine area. The lower light transmittance in the ponds within the mined area probably was due, in part, to the greater number of phytoplankton cells. Also, unconsolidated soil material within the mine area was observed to slough off the pond banks, which could add to the concentration of suspended sediments. Dissolved oxygen concentrations were lower in the ponds within the mined area. Most of the major ions (calcium, magnesium, sulfate, and sodium) were present in greater concentrations in the ponds within the mined area. Higher concentrations of bicarbonate and total hardness were in the water within the mined area. Biological communities were less diverse and chemical concentrations fluctuated more in the mined area than in the ponds outside the mined area. (Woodard-USGS)
W78-03763

DISTRIBUTION AND ABUNDANCE OF BENTHIC ORGANISMS IN THE SACRAMENTO RIVER, CALIFORNIA.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-03773

SOME ASPECTS OF THE PERSISTENCE AND FATE OF ACROLEIN HERBICIDE IN WATER,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
K. H. Bowmer, and M. L. Higgins.
Archives of Environmental Contamination and Toxicology, Vol. 5, No. 1, p 87-96, 1976. 4 fig, 3 tab, 14 ref.

Descriptors: *Path of pollutants, *Persistence, *Acrolein, Flow rates, *Streamflow, Currents(Water), *Aquatic weed control, Murrumbidgee Irrigation Areas(Australia), Chemcontrol, *Hydrogen ion concentration, *Chemical degradation.

An investigation was made of the influence of water quality, particularly pH, on the rate of degradation and the fate of the reaction product of acrolein, a common herbicide for aquatic weeds in lakes and channels. Acrolein added to water from the supply and drainage systems of the Murrumbidgee Irrigation Areas, Australia and to buffered solutions (pH 5.1-8.6) was incubated at 20.6 plus or minus 2C. In buffered solutions an equilibrium was observed after reaction of about 92% of the initial acrolein. In local waters the reaction continued to completion. In buffered solutions during dissipation of 92% of the acrolein initially present, change in total aldehyde was only about 15%. In contrast, in local waters the reaction product was dissipated rapidly when acrolein concentrations fell below about 2 or 3 ppm. The reaction in supply water fitted the results for buffered solutions at the appropriate pH level within a factor of 1.5, but in drainage water the reaction was 2.7 time faster than predicted, suggesting involvement of a catalyst apart from hydroxyl ions. The reaction product of degradation of acrolein in water was nonvolatile, gave a positive reaction with dinitriphenylhydrazine, and dissipated rapidly when acrolein concentrations fell below 2 or 3 ppm. (Harris-Wisconsin)
W78-03817

DEGRADATION OF MALATHION BY SALT-MARSH MICROORGANISMS,
Environmental Research Lab., Gulf Breeze, FL.
A. W. Bourquin.
Applied and Environmental Microbiology, Vol. 32, No. 2, p 356-362, February 1977. 3 fig, 3 tab, 30 ref.

Descriptors: *Chemical degradation, *Aquatic microorganisms, *Insecticides, *Malathion, *Biodegradation, *Microbial degradation, *Salt marshes, Microorganisms, Monocarboxylic acid(MCA), Dicarboxylic acid(DCA), K-desmethyl-malathion(KDM), Path of pollutants, Santa Rosa Island(Florida).

A study was made to isolate from a salt-marsh microbes capable of readily degrading malathion and to identify the major metabolites formed during biodegradation of this chemical. Eleven of 15 bacterial cultures isolated from the salt-marsh environment (on Santa Rosa Island, Florida) after malathion enrichment degraded malathion as a sole carbon source. All 15 isolates degraded malathion within five days when an additional carbon source was added. All the microbial systems were found to have an effective carboxyesterase system that caused rapid breakdown of malathion to the acids with a delayed demethylation reaction to produce desmethyl-malathion. Some microbial systems catalyzed demethylation earlier, resulting in a more rapid release of carbon dioxide from the malathion methoxy group. Both sole-carbon-degrading as well as co-metabolizing bacterial cultures, yielded 10 metabolites which were identified by thin-layer chromatography and infrared spectroscopy as: malathion monocarboxylic acid (MCA), malathion dicarboxylic acid (DCA), K-desmethyl-malathion (KDM), and a number of phosphodithionates. Although these metabolites are degraded rapidly by bacterial action and are present in water in low concentrations, their toxicity persists for some time after the parent compound is no longer detectable. (Harris-Wisconsin)
W78-03818

DISSOLVED ORGANIC CARBON IN SOME DARK VENEZUELAN WATERS AND A REVISED EQUATION FOR SPECTROPHOTOMETRIC DETERMINATION OF DISSOLVED ORGANIC CARBON,
Colorado Univ., Boulder. Dept. of Environmental, Population, and Organismic Biology.
For primary bibliographic entry see Field 5A.
W78-03819

INSECTICIDE AND NUTRIENT TRANSPORT IN WATER, RELATED TO AGRICULTURAL LAND USE OF A STREAM BASIN IN ONTARIO, CANADA,
Department of Agriculture, London (Ontario). Research Inst.
J. R. W. Miles, E. F. Bolton, and C. R. Harris.
Archives of Environmental Contamination and Toxicology, Vol 5, No 1, p 119-128, 1976. 10 fig, 1 tab, 10 ref.

Descriptors: *Path of pollutants, *Insecticides, *DDT, *Dieldrin, *Streamflow, *Land use, *Currents(Water), Flow rates, Big Creek(Ontario), *Canada, Diffusion, Pesticide residues, Nutrients, Nitrogen, Phosphorus.

Big Creek, Norfolk County, Ontario, Canada, was selected for the study of relationship between agricultural land use and the water transport of insecticides and nutrients. While Big Creek headwaters flow through dairy cattle country, its central stream passes through a tabacco growing area, and its lower stream reaches a mixed farming area (corn and vegetables). One site from each area, reflecting the different land use patterns, was chosen for water sampling. Results of the water analysis indicate that the average stream flows for the three sites were in proportion of 5.4:2.9:1.0 which is in agreement with the proportion of three land areas represented by each site (5.1:2.6:1.0). Dieldrin concentrations in the water at three sites were fairly uniform and the three levels of transport were caused by different flows at the three sites. DDT transport showed a similar pattern, with the exception of two sampling days when the transport from the central area was equal to the transport of DDT by the whole creek as measured at the mouth. Loss of potassium, calcium and magnesium was area-dependent. The largest quantities of all nutrients lost occured early in the season before the crops were sown. (Harris-Wisconsin)
W78-03823

MICHIGAN TRIBUTARY LOADINGS TO THE UPPER GREAT LAKES,
Michigan Dept. of Natural Resources, Lansing.
T. A. Newell, and S. G. Buda.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 183, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-905/4-75-001, July 1976. 30 p, 1 tab, 2 append. 68-01-1899.

Descriptors: *Water pollution sources, *Michigan, *Tributaries, *Lake Superior, *Lake Huron, *Stream loading, Great Lakes, International Joint Commission, Water quality, Data collections, Runoff, Computer programs, Watersheds(Basins), Minnesota, Wisconsin, Baseline studies, Organic loading, Path of pollutants, EPA STORETS.

Sixteen Lake Superior tributaries and seventeen Lake Huron tributaries in Michigan were sampled monthly between July 1973 and June 1975 to compute constituent loadings for each tributary, as part of a study by the International Joint Commission's Upper Lakes Reference Group (IJC-ULRG). Extra samplings were made during spring high runoffs. Fifty-three microbiological, chemical, radiological, metal and other water quality parameters were monitored during the study. Total tributary loadings for the two lakes are given by parameter. The Final Project Report of the IJC-ULRG Working Group C is appended, which includes a table giving relative municipal, industrial, and tributary inputs of chloride, total nitrogen, total phosphorus, total dissolved solids, and dissolved silica from Michigan in the case of Lake Huron, and from Michigan, Minnesota, and Wisconsin for Lake Superior. Michigan developed a computer program utilizing the federal EPA STORET system for rendering all data into report-ready copy; a description of this program is included in an appendix. Michigan sampled tributary loadings to Lake Superior were (in kg/day): 101,000 chloride, 11,100 total nitrogen, 565 total phosphorus, 1,220,000 total dissolved solids, and 99,200 silica. For Lake Huron, the loadings were 1,110,000 chloride, 68,000 total nitrogen, 5,750 total phosphorus, 9,800,000 total dissolved solids, and 234,000 dissolved silica. (Lynch-Wisconsin)
W78-03825

CHLORIDE AND NITROGEN CONCENTRATIONS ALONG THE WEST SHORE OF LAKE ERIE,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
T. J. Ecker, and R. A. Cole.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 557, Price codes: A07 in paper copy, A01 in microfiche. Institute of Water Research, East Lansing, Technical Report No 32.8, May 1976. 132 p, 15 fig, 14 tab, 43 ref, 14 append. MSU-IWR-TR-76-0032.8. X-290059.

Descriptors: *Lake Erie, *Chlorides, *Nitrogen, *Detroit River(MI), *Maumee River(MI), *Raisin River(MI), Great Lakes, Michigan, Powerplants, Electric powerplants, Watersheds(Basins), Eutrophication, Nutrients, Agricultural runoff, Urban runoff.

Water quality in the western basin of Lake Erie near the Monroe (MI) Power Plant depends primarily on input from tributaries due to dissimilar flushing rates, about two months for the streams compared with about three years for the lake as a whole. Three tributaries were studied. The Detroit River contributes 95% of annual inflow of water to the basin, compared with 2.5% for the Maumee River, and 0.5% for the Raisin River. The study, conducted from 1970-75, assesses the impact of once-through cooling, used at the power plant, on redistribution and alteration of influent waters containing chemical elements associated with eutrophication, such nitrogen. The three tributaries are the major sources of nitrogen to the basin. The Detroit River carries nitrogenous waste from Detroit; the Maumee River drains nitrogen from an intensively farmed watershed and from Toledo; and the proximity of the smaller Raisin River to the power plant gives it a disproportionate effect on local nitrogen distribution. Relative concentrations of the chloride ion provided a means of tracing derivation of waters. It was found that the Monroe Power Plant enhanced mixing of Raisin River with lake water, but otherwise had little effect on nitrogen concentration. Nitrate received from Maumee and Raisin River watersheds during heavy winter and spring runoff was the most important source of nitrogen. (Lynch-Wisconsin)
W78-03826

ACTINOMYCETE DISTRIBUTION IN NORTHERN GREEN BAY AND THE GREAT LAKES, TASTE AND ODOR RELATIONSHIPS IN EUTROPHICATION OF NEARSHORE WATERS AND EMBAYMENTS,
Michigan Dept. of Natural Resources, East Lansing.
For primary bibliographic entry see Field 5C.
W78-03827

ATMOSPHERIC INPUT OF PHOSPHORUS TO SOUTHERN LAKE HURON, APRIL-OCTOBER, 1975,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
R. G. Delumyea, and R. L. Petel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 943, Price codes: A04 in paper copy, A01 in microfiche. Report No EPA-600/3-77-038, April 1977. 53 p, 14 fig, 12 tab, 19 ref, append. EPA-600/3-77-038, R803086.

Descriptors: Path of pollutants, *Fallout, *Lake Huron, *Phosphorus, *Air pollution effects, Water pollution, Seasonal, Nutrients, Agriculture, Aerosols, Model studies, Michigan, Canada, Sampling, On-site data collections, Great Lakes, Particulates, Wet deposition, Dry deposition.

Atmospheric phosphorus inputs to southern Lake Huron were determined for April-October 1975 through analysis of total integrated fallout from 11 shore-based sampling stations in Michigan and Canada. Additionally, relative inputs of wet and dry fallout were measured using event rain samples and filtered particulate samples from shore-based and shipboard stations. The available phosphorus input rate was recorded at 6.5 mg/sq cm/day, about one-third of total atmospheric phosphorus input. Of available phosphorus, wet input was measured at 2.2 ng/sq cm/day, and dry input at 1.7 ng/sq cm/day. The discrepancy between total available phosphorus and the sum of wet and dry inputs is apparently due to biological events and other local phenomena which can elevate the phosphorus content of the integrated samples. Both wet and dry phosphorus inputs are highest in spring and fall and can be attributed to agricultural activity. At least 10% of inputs are probably due to fossil fuel combustion. Deposition velocity of phosphorus-containing particles was calculated at 0.6 cm/sec using a simple mixing box model. About 25% of both wet and dry inputs of phosphorus is immediately soluble and 50% is

potentially available. As shipboard collection of samples proved expensive and inefficient, a permanently anchored platform equipped with electric power is recommended for future sampling. (Lynch-Wisconsin)
W78-03828

IFYGL TEMPERATURE TRANSECTS: TEMPERATURE DISTRIBUTIONS ACROSS THREE SECTIONS OF LAKE ONTARIO CONTINUOUSLY TRANSVERSED OVER FOUR-DAY INTERVALS IN JULY, AUGUST, AND OCTOBER 1972,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W78-03841

INVESTIGATION OF MINING RELATED POLLUTION REDUCTION ACTIVITIES AND ECONOMIC INCENTIVES IN THE MONONGAHELA RIVER BASIN,
Baker (Michael), Jr., Inc., Beaver, PA.
For primary bibliographic entry see Field 5G.
W78-03844

GROUND-WATER POLLUTION PROBLEMS IN THE SOUTHEASTERN UNITED STATES,
Geraghty and Miller, Inc., Port Washington, NY.
J. C. Miller, P. S. Hackenberry, and F. A. DeLuca.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 234, Price codes: A17 in paper copy, A01 in microfiche. Report No EPA-600/3-77-012, January, 1977. 379 p, 55 fig, 66 tab, 185 ref, 4 append.

Descriptors: *Southeast US, *Water pollution sources, *Groundwater, Water quality, Administrative agencies, Aquifers, Karst, Surface-groundwater relationships, Impoundments, Landfills, Waste disposal, Injection wells, Underground storage, Septic tanks, Mine wastes, Agricultural chemicals, Unconsolidated formations.

Ground water of high natural quality can be developed over the major portion of the southeast U. S. Extensive aquifers in the seven-state region under study (Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, and Mississippi) supply 46 percent of the total water withdrawn in the area. At least 90 percent of the population of Florida and Mississippi are dependent upon ground water for drinking water supplies. Principal sources of man-caused ground water quality problems in order of their severity are: surface impoundments, landfills, subsurface storage of waste and surplus water, leaks and spills, agricultural activity, mining, and septic tanks. Findings of this investigation indicate that the cases of contamination recorded to date represent only a small portion of those that actually exist. Recommendations resulting from this study include promotion of the importance of ground water through public-awareness programs in the region, some restructuring of administrative agencies in charge of water pollution control, and initiation of more comprehensive inventorying and monitoring programs in these states. (Eberle-NWWA)
W78-03856

ENVIRONMENTAL ASSESSMENT OF GEOPRESSURED WATERS AND THEIR PROJECTED USES,
Dow Chemical U. S. A., Freeport, TX. Texas Div.
For primary bibliographic entry see Field 4B.
W78-03857

EVALUATION OF SCINTILLATION PROBE PROFILES FROM 200 AREA CRIB MONITORING WELLS,
Atlantic Richfield Hanford Co., Richland, WA. Research Dept.
K. R. Fecht, G. V. Last, and K. R. Price.
Available from the National Technical Information Service, Springfield, VA 22161 as ARH-ST-156, Price codes: A11 in paper copy, A01 in microfiche. Publ. No. ARH-ST-156, June, 1977. 3 Vol., 496 p, 332 fig, 30 ref, 2 append.

Descriptors: *Radioactive waste disposal, Groundwater, Water pollution sources, Path of pollutants, Stratigraphy, Monitoring, Observation wells, Washington, *Crib facilities, *Scintillation probes.

Ground disposal of liquid radioactive waste from Atlantic Richfield Hanford company separation plants has been effected in the past via liquid dispersion systems known as cribs. Approximately 300 monitoring wells adjacent to over 100 cribs in the Hanford land reservation were logged with a scintillation probe in 1976; these logs were compared to others taken between 1954 and 1973, and profiles were compiled to measure qualitatively the distribution, redistribution, and decay of radioactive contaminants disposed to the ground beneath crib facilities. Data indicate that most contaminants are retained high above the water table, although some breakthrough of radionuclides to the ground water appears to have occurred at 20 crib facilities. In general, no appreciable downward redistribution of radioactive contaminants appears to have occurred after a crib facility has been removed from service in this area; 1976 data suggest that the contaminants are essentially fixed to the sediments. (Eberle-NWWA)
W78-03860

THE REPORT TO CONGRESS: WASTE DISPOSAL PRACTICES AND THEIR EFFECTS ON GROUND WATER: EXECUTIVE SUMMARY.
Environmental Protection Agency, Washington, DC. Office of Water Supply.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 364, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-570/9-77-002, January, 1977. 9 fig, 4 tab, append.

Descriptors: *Groundwater, *Waste disposals, *Water pollution sources, *Water quality control, Water wells, Water supply, Aquifers, Industrial wastes, Impoundments, Lagoons, Landfills, Septic tanks, Cesspools, Municipal wastes, Waste treatment, Sludge, Brines, Mines wastes, Injection wells, Groundwater movement, Sewerage, Legislation, Administrative agencies, Feedlot wastes, Land spreading.

This document summarizes the report, 'Waste Disposal Practices and their Effects on Ground Water.' All material presented in the Executive Summary is duplicated in the full Report so that it will stand alone as a complete document. Waste disposal practices included in this study are those activities which result in the actual collection and disposal of liquid, semi-solid, and solid wastes. The first few sections of the report describe the use and occurrence of the ground water resource along with the mechanisms of contamination. These are followed by a discussion of each of the major waste disposal practices responsible for either localized or regional ground water pollution. The next section deals with the importance of non-waste disposal practices as they affect ground water quality. The final two sections define the present status of Federal legislation that applies to ground water protection and the various regulatory options and strategies available to state and local agencies. (Eberle-NWWA)
W78-03864

PLANKTON OF COASTAL LAGOONS: VI. SEASONAL DISTRIBUTION OF PHYTOPLANKTON IN THE YAVAROS LAGOON, SONORA, MEXICO (1969-1970), (IN SPANISH),
Universidad Nacional Autonoma de Mexico City. Inst. de Biologia.
H. Santoyo.
Rev Latinoam Microbiol. 16(1), p 49-58, 1974.

Descriptors: *Temperature, Brackish water, Biomass, *Coastal lagoons, *Diatoms, *Distribution, Lagoons, *Mexico(Sonora), *Phytoplankton, *Salinity, *Seasonal cycles, Sonora, *Yavaros Lagoon(Mex).

Phytoplankton, salinity and temperature were analyzed in a seasonal cycle in the Yavaros Lagoon. Three halinobiological areas were observed: Euhaline (30-40 parts per thousand), with marine phytoplankton in the central and southeast areas of the lagoon and ticoplanktonic forms in the inside margins; Pleiomesohaline (10-18 parts per thousand) and meiomesohaline (3-10 parts per thousand) areas, with brackish water phytoplankton and predominance of ticoplanktonic forms; Polyhaline intergradient area (18-30 parts per thousand) between the 2 anterior zones, with little marine and brackish water phytoplankton. Diatom groups had a 90% dominance over the other phytoplankton groups. Phytoplanktonic blooms were in spring and again is autumn. The most elevated cell densities were registered in the Moroncarit Inlet. The phytoplankton density varied between 5000 to 1,545,000 cells per liter. During the seasonal cycle, an inverse relation was observed between temperature and phytoplankton abundance. (See also W77-03145)--Copyright, 1974, Biological Abstracts, Inc.
W78-03866

THE STATE OF METAL IONS IN SEAWATER,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 5A.
W78-03870

SOLUTION CHEMISTRY, SOLUBILITY, AND ADSORPTION EQUILIBRIA OF IRON, COBALT, AND COPPER IN MARINE SYSTEMS,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5A.
W78-03871

PERIODIC PHENOMENA AT THE MOUTH OF THE MISSISSIPPI RIVER,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
W. J. Wiseman, Jr., L. D. Wright, L. J. Rouse, and J. Coleman.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 744, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 223, Reprinted from: Contributions in Marine Science, Vol 20, p 11-32, 1976. 15 fig, 17 ref. ONR-N00014-69-A-0211-0007.

Descriptors: *Internal waves, *Estuaries, *Water pollution sources, *Mississippi River, Deltas, Remote sensing, Time series analysis, Satellite imagery, Plumes, Periodic phenomena.

Time series of temperature fluctuations, as well as aerial and satellite imagery, indicate the presence of periodic phenomena within the effluent from South Pass, Mississippi River Delta. Time scales on the order of 1 min and 15 min recur in both remotely sensed and in situ data, a fact which suggests that the same phenomenon is being measured. Vertical coherence estimates indicate this to be internal wave motion. Estimates of gross Richardson numbers are near critical; instabilities in the wave field are a possible mechanism for entrainment, but cannot account for all the required entrainment. (Sinha - OEIS)
W78-03872

WASTE DISPERSION CHARACTERISTICS AND EFFECTS IN AN OCEANIC ENVIRONMENT,
Du Pont de Nemours (E.I.) and Co., Wilmington, DE. Engineering Dept.
For primary bibliographic entry see Field 5C.
W78-03874

PRELIMINARY REPORT ON IN SITU MEASUREMENTS OF THE EFFECTS OF SEWAGE DISCHARGE FROM NAVY SHIPS OPERATING WITHIN THE 12-MILE LIMIT,
Naval Ship Research and Development Center Bethesda, MD.
For primary bibliographic entry see Field 5B.
W78-03877

FLOW AND MAIN ELEMENTS OF BALANCE OF BIOGENIC SUBSTANCES AND MAIN IONS IN THE KIEV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk USRS, Kiev. Inst. Hidrobiologii.
For primary bibliographic entry see Field 5C.
W78-03878

MISSISSIPPI SOUND TEMPORAL AND SPACIAL DISTRIBUTION OF NUTRIENTS,
Gulf Coast Research Lab., Ocean Springs, MS.
C. K. Eleuterius.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 942, Price codes: A04 in paper copy, A01 in microfiche. Mississippi-Alabama Sea Grant Consortium Report No. MASGP-76-024, 1976. 66 p, 54 fig, 4 tab, 8 ref, append. SG-04-5-158-54.

Descriptors: *Estuaries, *Baseline studies, *Nutrients, *Resources development, *Environmental effects, Water quality, Water resources, Mississippi, Effluents, Nitrates, Phosphates, Dredging, Construction, Temporal distribution, Spatial distribution, Environmental impact, *Mississippi Sound.

Mississippi Sound, an estuarine system, is the eventual recipient of the accumulative effluents from activities throughout the drainage basin and is further altered by other direct actions such as dredging and construction. In order to assess the effect of present and future development on the water quality of the Sound, it is necessary to ascertain the existing regime of nutrients through determination of descriptive norms and causal relationships. A 'baseline' thus established serves as a reference to which perturbations in the nutrient levels can be compared to evaluate whether the level is a normal variation or an abnormality. The estuarine waters are the principal sources of the major elementary components of estuarine organisms: carbonate, phosphate and nitrate ions. While added amounts of phosphates and nitrates serve to increase the fertility of the estuary, excessive amounts result in algae blooms and accompanying anoxic conditions. Excessive nutrient levels result in degradation of water quality and are therefore used as indicators of pollution. One objective of the Mississippi Sound research effort was to ascertain the temporal and spatial distribution of nutrients. (Sinha-OEIS)
W78-03880

REMOTE SENSING OPERATIONS (MULTISPECTRAL SCANNER AND PHOTOGRAPHIC) IN THE NEW YORK BIGHT, SEPTEMBER 22, 1975,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
R. W. Johnson, and J. B. Hall, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-18539, Price codes: A02 in paper copy, A01 in microfiche. National Aeronautics and Space Administration Technical Memorandum No. X-73993, February 1977. 13 p, 4 fig, 3 tab, 1 ref.

Descriptors: *Water pollution sources, *Remote sensing, *Waste disposal, New York, Sewage sludge, Outer Continental Shelf, *Ocean dumping, *New York Bight, Plumes.

Ocean dumping of waste materials is a significant environmental concern in the New York Bight. One of these wastes materials, sewage sludge, was monitored in a joint National Aeronautics and Space Administration/National Oceanic and Atmospheric Administration (NASA/NOAA) experiment conducted in the New York Bight on September 22, 1975. NASA remote sensing over controlled sewage sludge dumping included an 11-band multispectral scanner, five multispectral cameras and one mapping camera on the Johnson Space Center NP-3A aircraft. Concurrent in situ water samples were taken and acoustical measurements were made of the sewage sludge plumes during the experiment by NOAA. Data were obtained for sewage sludge plumes resulting from line (moving barge) and spot (stationary barge) dumps. Multiple aircraft overpasses were made to evaluate temporal effects on the plume signature. (Sinha-OEIS)
W78-03881

BEHAVIOR OF MERCURY, CHROMIUM, AND CADMIUM IN AQUATIC SYSTEMS,
Georgia Univ., Athens. Dept. of Zoology.
James E. Schindler, and J. J. Alberts.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 559, Price codes: A04 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-77-023, February 1977. 61 p, 22 fig, 5 tab, 112 ref.

Descriptors: *Metals, *Mercury, *Chromium, *Cadmium, *Transportation, Sorption, Sediments, Freshwater fish, Absorption, *Humic acids, Reduction(Chemical), Oxidation, *Path of pollutants, Organic matter, Laboratory tests, *Mosquito fish, Bioaccumulation.

This report is concerned with determining the fate and possible transformations of mercury, cadmium, and chromium in freshwater sediment-water environments. Mercury and cadmium show a high affinity for natural organic (humic and fulvic) material. Organic material may also cause or catalyze the reduction of ionic mercury to elemental mercury. The rate of release of elemental mercury from lake sediments depends on both the amount and form of the organic material present, the Eh and pH of the environment. Under continuous exposure, elemental mercury is readily accumulated by fish (Gambusia) at a rate comparable with ionic mercury. However, uptake is five times greater than ionic mercury under periodic exposure conditions. The excretion rates of elemental mercury approximately equal ionic mercury. (Katz)
W78-03923

EFFECTS OF FEEDLOT RUNOFF ON FREE-LIVING AQUATIC CILIATED PROTOZOA,
Illinois Univ. at Urbana-Champaign. Dept. of Veterinary Pathology and Hygiene.
K. S. Todd, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 236, Price codes: A02 in paper copy, A01 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 131, August 1977, 13 p, 5 tab, 1 fig. OWRT A-074-ILL (1).

Descriptors: *Water pollution, Water chemistry, Surface water, *Protozoa, Water sampling, *Ciliated protozoa, *Feed lots runoff, Illinois.

Water samples and free-living and sessite ciliated protozoa were collected at various distances above and below a stream that received runoff from a feedlot. No correlation was found between the species of protozoa recovered, water chemistry, location in the stream, or time of collection.
W78-03929

HEALTH SIGNIFICANCE OF KLEBSIELLA PNEUMONIAE IN DRINKING WATER EMANATING FROM REDWOOD TANKS,
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 5F.
W78-03933

IDENTIFICATION OF ASBESTOS-MATERIALS IN SUSPENDED SOLIDS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-03934

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON VINYL CHLORIDE AND POLYVINYL CHLORIDE,
Environmental Protection Agency, Research Triangle Park, NC. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W78-03936

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS,
Syracuse Research Corp., NY. Center for Chemical Hazard Assessment.
For primary bibliographic entry see Field 5C.
W78-03938

COPPER SORPTION AND RELEASE BY CYCLOTELLA MENEGHINIANA (BACILLARIOPHYCEAE) AND CHLAMYDOMONAS REINHARDTII (CHLOROPHYCEAE),
Ohio State Univ., Columbus. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-03945

EFFECT OF HURRICANE ELOISE ON THE BENTHIC FAUNA OF PANAMA CITY BEACH, FLORIDA, USA,
National Marine Fisheries Service, Panama City, FL. Panama City Lab.
For primary bibliographic entry see Field 2L.
W78-03946

PROLONGED RETENTION OF METHYL MERCURY BY MALLARD DRAKES,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
L. F. Stickel, W. H. Stickel, M. A. R. McLane, and M. Bruns.
Bulletin of Environmental Contamination and Toxicology, Vol. 18, No. 4, p. 393-400, 1977. 2 fig, 1 tab, 14 ref.

Descriptors: *Mercury, Industrial wastes, *Mallard Duck, Ducks(Wild), Migratory birds, *Seasonal, Life cycles, *Path of pollutants, Waterfowl, Spectormeters, Water pollution effects, Diets, *Methyl mercury, Tissue analysis, Bioaccumulation, Dietary uptake.

Mallard drakes accumulated mercury rapidly from dietary dosage of methylmercury dicyandiamide and eliminated it slowly, retaining approximately one half at the end of 84 days; no measurable loss occurred between the end of the 7th and 56th days, but less resumed concurrently with new feather growth, and continued through the 112th day, the close of the study. (Katz)
W78-03950

APPLICATION OF VARIOUS MATHEMATICAL MODELS TO DATA FROM THE UPTAKE OF METHYL MERCURY IN BLUEGILL SUNFISH (LEPOMIS MACROCHIRUS),
Oak Ridge National Lab., TN.
E. H. Curtis, J. J. Beauchamp, and B. G. Blaylock.

Ecological Modelling, Vol. 3, p. 273-284, 1977. 6 fig, 1 tab, 7 ref.

Descriptors: *Mathematical models, *Absorption, *Mercury, *Heavy metals, *Sunfishes, *Water temperature, *Estimating equations, *Model studies, *Mathematical studies, *Statistical methods, Analytical techniques, Methodology, Freshwater fish, Laboratory tests, *Methyl mercury.

Data from the direct uptake of methyl mercury in bluegill from water at 9C and 0.2 ppb methyl mercury as a function of time were statistically analyzed by several models: (1) Straight line; (2) one-compartment or single-exponential; (3) slope-exponential; (4) two-compartment or double-exponential; (5) three-compartment or storage; and (6) empirical, having the form of a rectangular hyperbola. Each of the models examined has favorable attributes; however, the empirical model was superior in adapting to data and describing it in a manner by which predictive estimation procedures could be developed. (Katz)
W78-03951

HORIZONTAL DISTRIBUTION OF PUMPED ZOOPLANKTON DURING A CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: IMPLICATIONS FOR SAMPLING STRATEGY IN LARGE-VOLUME ENCLOSED WATER COLUMNS,
Wood Hole Oceanographic Institution, MA.
I. P. Williams, V. R. Gibson, and W. K. Smith.
Marine Science Communications, Vol. 3, No. 3, p 239-253, 1977. 6 tab, 9 ref.

Descriptors: *Zooplankton, *Samplings, *On-site data collections, *Distribution, *Spatial distribution, *Distribution patterns, *Copepods, Statistical methods, Populations, Density, Analytical techniques, Methodology, On-site-investigations, *Oithona, Pseudocalanus, Saanich Inlet(British Columbia).

A large-volume pump system was used to collect zooplankton samples from several locations in three 1300 m3 plastic enclosures (CEEs). The horizontal distribution of three groups of zooplankton (Pseudocalanus, Oithona and copepod nauplii) was analyzed. Although the distribution of the organisms was demonstrated to be non-random, tests failed to show any consistent patterns of abundance. It was concluded that the horizontal distribution of zooplankton in the CEEs was not significantly influenced by the location of the sampling position (side of enclosure vs. center, etc.); or by any external factor, such as weather condition. (Katz)
W78-03958

BIOKINETICS OF NEPTUNIUM-237 IN MUSSELS AND SHRIMP,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
For primary bibliographic entry see Field 5C.
W78-03959

SPREADING OF OIL SLICKS IN A WIND-WAVE CHANNEL,
Connecticut Univ., Storrs. Inst. of Water Resources.
J. D. Lin, and G. S. Campbell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 486, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, September 1977. 12 p, 6 fig, 11 ref. OWRT A-059-CONN(2). 14-31-0001-5007.

Descriptors: *Oil spills, Flow measurement, *Oil-water interfaces, *Waves(Water), *Wind velocity, Water pollution sources, *Path of pollutants, Oil pollution, *Oil slick spreading, Wind-generated waves, Mechanically generated waves, Laboratory wind-wave channel, Polyethylene sheets, *Drift velocity, Wave steepness, Shear velocity.

Drift velocities of surface films floating on the water surface under the action of wind-generated waves and mechanically generated waves were investigated in a laboratory wind-wave channel by using polyethylene sheets. In order to simulate the drift of oil slicks in a laboratory channel, the size of the film should be greater than two wavelengths for wind-waves and one wavelength for mechanically generated waves. Film drift velocity over wind-generated waves is a function of wind velocity and wave steepness. However, the ratio of drift velocity to shear velocity of the air boundary layer correlates uniquely with wave steepness and becomes independent of wave steepness for sufficiently large wave steepness. For mechanically generated waves, film drift velocity is substantially greater than the surface particle drift of the Stokes waves. In comparison of the drift velocities in a wave field characterized by wave steepness, the effect of wind on drift velocity of surface films predominates in general over that due to waves. Experiments of oil films under the action of wind-generated waves were also carried out in the wind-wave channel. Drift velocities of oil slicks are initially influenced by the size of oil volume due to the asymmetrical spreading in the direction of winds; however, they approach the values of film drift velocities as the fetch increases downwind. (de Lara-Conn)
W78-03962

COMPUTER TECHNIQUES FOR IDENTIFYING OIL SPILLS,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5A.
W78-03963

FEEDLOT RUNOFF AND SEWAGE EFFLUENT AS POTENTIAL WATER POLLUTANTS WITH EMPHASIS ON NITROGEN AND PHOSPHATE LEVELS AND OXYGEN DEPLETION,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Chemistry; and New Mexico Inst. of Mining and Technology, Socorro. Dept. of Biology.
D. K. Brandvold, and J. A. Brierley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 484, Price codes: A03 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No 090, Completion Report, November 1977. 20 p, 18 tab, 9 ref. OWRT A-054-NMEX(1). 14-31-0001-5031.

Descriptors: Water pollution sources, *Sewage effluents, Feed lots, *Nitrogen, *Phosphates, Biochemical oxygen demand, Ammonia, Oxygen depletion, Drainage ditches, Waste water treatment, *Feedlot runoff, New Mexico.

The effects of the input from a small sewage plant and a feedlot on a small drainage ditch were investigated. Primary parameters used in the study were bacterial numbers and type, chemical forms of nitrogen, phosphate and dissolved oxygen. The feedlot contributed both Kjeldahl nitrogen and nitrate to the drain. No phosphate contribution was detected. Oxygen levels were unaffected by the feedlot except after storm runoff. The feedlot runoff after heavy rainfall was very high in nitrate, Kjeldahl nitrogen, phosphate and BOD. During the dry time of the year, significant amounts of ammonia were released. Microbial studies were difficult to assess due to high levels associated with agricultural drains. These drains also interfered with chemical studies because of high background levels of pollutants. (Stockton-New Mex State)
W78-03968

ACCURACY IN TRACE ANALYSIS: SAMPLING, SAMPLE HANDLING, ANALYSIS. VOLUME II.
National Bureau of Standards, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-03979

SAMPLING PROBLEMS AND THE DETERMINATION OF MERCURY IN SURFACE WATER, SEAWATER, AND AIR,
Reactor Centrum Nederland, Petten.
For primary bibliographic entry see Field 5A.
W78-03980

METHODOLOGICAL CONSIDERATIONS IN WESTERN LAKE SUPERIOR WATER-SEDIMENT EXCHANGE STUDIES OF SOME TRACE ELEMENTS,
National Water Quality Lab., Duluth, MN.
For primary bibliographic entry see Field 5A.
W78-03985

ACCURACY IN DETERMINING TRACE ELEMENT CONCENTRATIONS IN MARINE SEDIMENTS,
Puerto Rico Nuclear Center, Mayaguez.
For primary bibliographic entry see Field 5A.
W78-03986

ORGANOMERCURY AND TOTAL MERCURY CONTENT OF ENVIRONMENTAL MATRICES AS DETERMINED BY NEUTRON ACTIVATION ANALYSIS,
Pavia Univ. (Italy). Centro di Radiochimica e Analisi per Attivazione.
For primary bibliographic entry see Field 5A.
W78-03987

DERIVATION OF RESIDUAL COEFFICIENTS FOR TYPICAL INDUSTRIES IN NEW ENGLAND,
Center for the Environment and Man, Inc., Hartford, CT.
For primary bibliographic entry see Field 5G.
W78-03988

DANUBIALIA HUNGARICA: LXIII. SEVERAL DATA ON THE ORGANIC MATERIAL CONTENT OF DANUBE WATER, (IN GERMAN),
Magyar Tudomanyos Akademia, Budapest. Station for Danube Research.
For primary bibliographic entry see Field 5A.
W78-03989

METABOLISM AND MODEL OF AN ESTUARINE BAY ECOSYSTEM AFFECTED BY A COASTAL POWER PLANT,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
For primary bibliographic entry see Field 5C.
W78-04036

FUNGI AS A COMPONENT OF FRESHWATER BIOCENOSES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Botaniki.
For primary bibliographic entry see Field 2I.
W78-04042

ARE ALL PULP AND PAPER MILL EFFLUENTS REALLY DIFFERENT. NOT ACCORDING TO THE COD/5-DAY BOD RATIO,
Van Luven Consultants Ltd., Montreal (Quebec).
For primary bibliographic entry see Field 5A.
W78-04070

BIODEGRADABILITY OF TOXIC COMPOUNDS IN PULP MILL EFFLUENTS,
B. C. Research Ltd., Vancouver.
J. M. Leach, J. C. Mueller, and C. C. Walden.
Canadian Pulp and Paper Association, Technical Section, 63rd Annual Meeting (Montreal), February, 1977, Preprints, p A135-A140. 5 fig, 16 ref, 4 tab.

Descriptors: *Bleaching wastes, *Biodegradation, *Activated sludge, *Toxicity, Wastes, Industrial wastes, Water pollution sources, *Pulp wastes, Pulp and paper industry, Effluents, Fermentation, Lignins, Microorganisms, Enzymes, Organic acids, Dehydroabietic acid, Pimaric acid, Pimarol, Monochlorodehydroabietic acid, Dichlorodehydroabietic acid, Trichloroguaiacol, Tetrachloroguaiacol, Resin acids.

Laboratory batch fermentation studies were conducted to determine the biodegradability by activated sludge of 7 toxic compounds commonly found in bleached kraft mill effluents, viz., dehydroabietic acid (DHA), pimaric acid, and pimarol -- all characteristic of toxicants in softwood debarking and pulping effluents, and mono- and dichlorodehydroabietic (DDHA) acids and tri- (TCG) and tetrachloroguaiacol (TTCG) -- characteristic of bleach plant effluents. Biodegradation of DHA, pimaric acid, and pimarol took place within 2-3 days, but more time may be needed to remove toxic metabolities of DHA and pimarol. DDHA and TCG were the most resistant to biodegradation. Toxic levels of DDHA may arise if resin acids are not efficiently washed from the brown stock prior to bleaching. TCG is probably derived from the lignin that remains in the brown stock entering the bleach plant, and its concentration increases as the kappa-number of the unbleached pulp increases. TTCG was not readily degraded under laboratory conditions until the microorganisms adapted by synthesizing the enzymes necessary to attack the molecule. (Swichtenberg-IPC)
W78-04072

THE SELF-PURIFICATION OF UNDERGROUND WATERS, (IN RUSSIAN),
Belorussian Sanitary-Hygienic Research Inst., Minsk (USSR).
A. G. Kokina, and E. A. Hel'fer.
Gig Sanit 10, p 106, 1976.

Descriptors: *Self-purification, Groundwater resources, Ions, Water pollution sources, *Chlorides, Microorganisms, *Nitrates, *Sulfates.

On the basis of archival data for 1953-1959 on the chemical composition of intermorainic waters of Quaternary deposits in the region of the filtration fields of a large city, the behavior of Cl, SO and NO ions in underground waters was analyzed. Data from the literature on the microbial population in borehole samples was also studied. There was an interrelationship between the number of microbes in the water as calculated by direct count and the concentration of SO and NO ions formed as the result of the biochemical oxidation of organic compounds (household sewage).--Copyright 1978, Biological Abstracts, Inc.
W78-04076

REFINER PULP MILL EFFLUENT,
New Zealand Forest Service, Rotorua.
S. R. Corson, and J. A. Lloyd.
In: Proceedings EUCEPA International Mechanical Pulping Conference, June 6-10, 1977, Helsinki, Finland, Volume II, Paper No. 15, 32 p. 7 fig, 8 ref, 9 tab.

Descriptors: *Pulp wastes, Effluents, Wastes, Industrial wastes, Pulp and paper industry, Pine trees, Hydrogen ion concentration, Temperature, Chemical oxygen demand, Dissolved solids, Biochemical oxygen demand, Water reuse, Carbohydrates, Lignins, Color, Suspended solids, Water pollution sources, Mechanical pulp mills, White water(Paper machine), Resin acids, Fatty acids, Pinus ponderosa, Pinus radiata, Pinus contorta.

The mill observed in the reported 3-yr project produced medium-freeness, unscreened, flash-dried pulp by 2-stage mechanical refining of Pinus ponderosa, Pinus radiata, and Pinus contorta mixtures. Mill productive capacity increased from 400 to 700 tons/day during the period. Effluent pH was 6.5 and temperature was 35-55C. Data are presented on COD and extractive content of water flows from various strategic points in the mill. The COD of the dissolved solids fraction of the effluent was 1,000-2,000 mg/liter. This corresponds to a demand of 45 and 25 kg/ton of pulp at water consumption levels of 30 and 15 cu m/ton, respectively. Total effluent COD was 2,000-3,500 mg/liter. Five-day BOD of the dissolved solids in the effluent was 400-600 mg/liter, and 500-800 mg/liter for the total sample. At the upper and lower levels of water usage, BOD was 20 and 9 kg/ton, respectively. The greater variability of the BOD values is apparent in the BOD/COD relationship presented. Use of old chips decreased the BOD and the dissolved solids content in the effluent, but produced no difference in COD. White water temperature had the dominant effect on the dissolved solids content of the effluent at low white water recycle rates, but not at high recycle rates. Resin acids were more abundant in the dissolved solids fraction of the effluent than were fatty acids, but fatty acids predominated in the suspended solids fraction. Up to 40 mg/liter of resin acids were found in the total effluent. Degraded carbohydrates were responsible for the distinct yellow-brown color of the effluent. No significant quantities of lignin were observed in the white water or the effluent. (DuVall-IPC)
W78-04091

ECOLOGICAL LAND UNITS OF BEAR CREEK WATERSHED AND THEIR RELATIONSHIP TO WATER QUALITY,
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 4D.
W78-04099

RUNOFF POLLUTION FROM MULTIPLE FAMILY HOUSING,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr, J. V. Hunter, and S. L. Yu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 805, Price codes: A02 in paper copy, A01 in microfiche. A Partial Completion Report, 17 p, November 1977. 6 fig, 5 tab, 10 ref. OWRT A-046-NJ(2), 14-34-0001-8032.

Descriptors: Pollution, *Urbanization, *Urban runoff, Storm runoff, *Land use, Heavy metals, Ammonia, Nutrients, Phosphates, Lead, Copper, Biochemical oxygen demand, *Water pollution sources, *Nonpoint pollution sources, *Storm runoff pollution, *Multiple family housing, Areawide water quality planning.

Increasingly, residential development in urbanizing areas is accomplished by large housing projects, composed of clusters of townhouses or garden apartments. It is hypothesized that the runoff from such developments should carry more pollution than that from the same number of housing units on separate plots, because the runoff is coveyrd directly to drainage channels rather than being drained across lawns and gardens, which may absorb part of the pollutants. In order to evaluate this effect, storm event data were obtained from a planned unit development near Highstown, N.J., using samples taken every 10 minutes throughout the storm at two different storm sewers. Results show that BOD and phosphate pollution from runoff were much higher per housing unit than from runoff of single family housing, perhaps twice as high. There is also considerable ammonia. Metals pollution from multiple family housing is comparable to that from single family housing with considerable commercial development. The results are significant for areawide water quality planning in metropolitan areas, where projection of future pollution loadings depends upon the land use.
W78-04102

THE EFFECTS OF WOOD DEBRIS AND DRIFT LOGS ON ESTUARINE BEACHES OF NORTHERN PUGET SOUND,
Western Washington State Coll., Bellingham. Dept. of Geography and Regional Planning.
For primary bibliographic entry see Field 2L.
W78-04103

PERMISSIBLE LEVELS OF MIGRATION OF CHEMICALS FROM PLASTICS INTO WATER, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Gigieni i Toksikologii Pestitsvidov, Kiev (USSR).
For primary bibliographic entry see Field 5G.
W78-04126

DEVELOPMENT OF A UNIFIED TRANSPORT APPROACH FOR THE ASSESSMENT OF POWER-PLANT IMPACT,
Oak Ridge National Lab., TN. Enegy Div.
A. H. Eraslan, E. J. Akin, J. M. Barton, J. L. Bledsoe, and K. E. Cross.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL/NUREG/TM-89, Price codes: A04 in paper copy, A01 in microfiche. ORNL/NUREG/TM-89, Report March 1977, 46 p 12 fig, 30 ref. W-7405-eng-26.

Descriptors: *Environmental effects, *Powerplants, *Model studies, *Mathematical models, Assessments, Temperature, Radioactivity, Chemistry, Biology, Rivers, Estuaries, Lakes, Coasts.

The purpose of the study was to develop mathematical models for fast-transient, one-and two-dimensional transport of thermal, radiological, chemical, and biological properties in rivers, estuaries, lakes, and coastal regions for assessing the impact of power-plant operations. Progress during the first 18 months (through December 1976) is summarized. Included in the models are submodels for sediment transport, exchange of a soluble isotope with sediment, and zone-matching models to connect near-field problems of reentrainment and recirculation with far-field convective transport. Recent work in the areas of thermal, chemical, or radiological transport is described. (Chilton-ORNL)
W78-04129

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES, THE KEWAUNEE NUCLEAR POWER PLANT SITE,
Argonne National Lab. IL.
For primary bibliographic entry see Field 5C.
W78-04132

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES - THE QUAD-CITIES NUCLEAR POWER STATION SITE,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5C.
W78-04133

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES, THE ZION NUCLEAR POWER STATION SITE,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5C.
W78-04134

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES - PRAIRIE ISLAND NUCLEAR GENERATING PLANT SITE,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5C.
W78-04135

ASBESTOS FIBERS IN NATURAL RUNOFF AND DISCHARGES FROM SOURCES MANUFACTURING ASBESTOS PRODUCTS. PT II-NON-POINT SOURCES & POINT SOURCES MANUFACTURING ASBESTOS PRODUCTS,
McCrone Research Inst., Chicago, IL.
I. M. Stewart, R. E. Putscher, H. J. Humecki, and R. J. Shimps.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 746, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-560/6-76-020, October 1976. 166 p, 6 fig, 1 tab, 29 ref. EPA 68-01-2690.

Descriptors: *Asbestos, *Industrial wastes, *Water pollution sources, *Nonpoint polution, Effluents, Runoff, Seasonal, Water supply, Baseline studies, Industries, Pollution abatement, Sampling.

A nation-wide survey of the impact of point and nonpoint asbestos sources on waterborne asbestos levels identifies and evaluates seven natural asbestos-bearing sites, and 22 plants manufacturing asbestos products. Water samples were analyzed from five cities with water supplies from natural sites with high asbestos content, and from 12 cities with water supplies contaminated by manufacturing operations. Five major areas of the country were investigated: northern Vermont and New Hampshire; southern Montana; Washington-Oregon region; northern California; and the boundary region of Georgia, the Carolinas, and Tennessee. Three river systems were studied: the upper Connecticut, upper Red Rock and Beaverhead, upper Trinity, Little Tennessee, Hiwassee, and Chatooga-Savannah. The 22 plants sampled account for about 45% of the asbestos tonnage used in the United States, and include all major asbestos products--asbestos cement pipe, cement sheet, paper and millboard, roofing and tile, textiles, and friction materials. Effluent treatment varied from none through various settling and pH controls to total recycling. Waterborne asbestos levels originating from natural sources were as high as 100 million fibers/1, and fibers were usually less than 5 micrometers long. Asbestos from manufacturing ranged from undectable to over one trillion fibers/1. Asbestos paper plants constitute the most serious environmental hazard. (Lynch-Wisconsin)
W78-04150

HYDROTHERMAL MODELING,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
D. R. F. Harleman.
CONF-750 980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California, September 28-October 2, 1975. Vol 2. Technical and Topical Papers. p 128-135, 17 ref.

Descriptors: *Environmental effects, *Model studies, *Hydrothermal studies, Mathematical models, Design, Temperature, Discharge(Water), Cooling water, *Thermal pollution, Zone models.

The paper traces the development of hydrothermal models for the prediction of water temperature distributions associated with waste heat emissions over the past decade. Both mathematical and physical models have evolved in response to the changing requirements for the licensing and operation of electric generating stations. This report classes mathematical models as zone models or complete models and discusses three zone models (surface discharge: near-field; submerged, multiport diffuser: near-field; and surface discharge: far-field) which have been developed at MIT. Steps to develop a biologically based temperature criteria, relating hydrothermal models to predicted biological impact, are reviewed. It is suggested that in the future discharge designs will be increasingly determined by site specific biological requirements rather than by arbitrary temperature standards. (See also W78-04155) (Chilton-ORNL)
W78-04164

RADIONUCLIDES IN AQUATIC ECOSYSTEMS ASSOCIATED WITH POWER PLANTS,
Northeast Utilities Service Co., Hartford, CT. Environmental Program Branch.
W. C. Renfro.
CONF-750 980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California, September 28-October 2, 1975. Vol 2. Technical and Topical Papers. p 170-176, 2 tab.

Descriptors: *Environmental effects, *Water pollution, *Radioisotopes, *Radioactivity, Powerplants, *Nuclear powerplants, Standards, Water quality, Water quality standards, Cooling water, Discharge(Water).

Concentration of radionuclides in primary coolant water of a typical boiling water reactor and liquid radionulcide annual releases from U.S. nuclear power reactors are presented in tabular form. Releases of radionucludes from operating nuclear power plants have amounted to only small fractions of the limits established by Title 10, Code of Federal Regulations, Part 20 (10CFR20). However recent guidelines (10CFR50, Appendix I) will further limit the quantities of radioactive effluents from power reactors. From the standpoint of the electric utilities operating nuclear power reactors, issues in need of research are radioanalytical sensitivity and accuracy of commercial service companies, evaluation of the concept of long-term build-up of radionuclides in aquatic ecosystems around nuclear power plants, and adequacy of concentration factors used for pathway and dose commitment analyses. (See also W78-04155) (Chilton-ORNL)
W78-04167

PROBLEMS ASSOCIATED WITH AQUATIC MONITORING AND RESEARCH AT OPERATING POWER STATIONS,
Consumers Power Co., Jackson, MI. Environmental Planning.
J. Z. Reynolds.
CONF-750 980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California, September 28-October 2, 1975. Vol 2. Technical and Topical Papers. p 177-181.

Descriptors: *Environmental effects, *Monitoring, Powerplants, *Nuclear powerplants, Aquatic environments, Design, Data collections.

Problems involved in fitting aquatic study programs to actural field situations are reviewed. Four general categories into which these problems fall are identified as: pecularities of plant design which have failed to make accomodations for respresentative sampling at critical locations; program logistics which have not anticipated time, manpower and obstacles in collecting, preparing and analyzing samples in the field; program design which has not adequately anticipated natural environmental variability and extremes; and data, after collection and analysis, which does not provide for proper interpretation of impacts being studied. Examples of aquatic studies programs (thermal plume dimensions, entrainment effects, and thermal effects) which do not result in data related to impact evaluation are discussed. It is suggested that research plans which are directed at better utilization of field data for interpreting impacts of practical concern should be of high priority. (See also W78-04155) (Chilton-ORNL)
W78-04168

WHAT CAN WE LEARN FROM THERMAL PLUME PREDICTION,
Corvallis Environmental Research Lab., OR.
M. A. Shirazi.
CONF-750 980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California, September 28-October 2, 1975. Vol 2. Technical and Topical Papers. p 187-197, 6 fig.

Descriptors: Environmental effects, *Model studies, Mathematical models, Powerplants, Cooling water, *Forecasting, *Thermal plume prediction.

The paper presents background information on thermal plume analysis and prediction. The essential features of the mathematical analysis for jets and plumes is explained and examples are given to demonstrate the strength of these analyses to simulate some important physical processes of a real-world problem and their versality for producing qualitative predictions in a general situation. (See also W78-04155) (Chilton-ORNL)
W78-04170

RELEASE OF MERCURY AND ORGANICS FROM RESUSPENDED NEAR-SHORE SEDIMENTS,
Florida State Univ., Tallahassee.
For primary bibliographic entry see Field 5C.
W78-04192

SEDIMENT CONTAMINATION AND BENTHIC MACROINVERTEBRATE DISTRIBUTION IN A METAL-IMPACTED LAKE,
Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5C.
W78-04193

OCCURRENCE OF METHYL MERCURY IN PIKE AND BALTIC HERRING FROM THE TURKU ARCHIPELAGO,
Turku Univ. (Finland). Inst. of Biochemistry.
For primary bibliographic entry see Field 5C.
W78-04194

THE EFFECT OF ROAD DEICING SALT ON THE DRIFT OF STREAM BENTHOS,
Waterloo Univ. (Ontario). Dept. of Biology.
R. A. Crowther, and H. B. N. Hynes.
Environmental Pollution, Vol. 14, 1977, p 113-126, 5 fig, 42 ref.

Descriptors: Environmental effects, *Water pollution, *Deicers, *Salts, *Benthos, Streams, Drifting(Aquatic), Sodium, Chlorine, Calcium.

An urban stream was monitored for chlorine, sodium, and calcium ions. Winter peaks of concentration were found to be generally associated with periods of low discharge, although there was little direct correlation between salt levels and discharge. In summer, when water levels fall due to evaporation, high temperatures and low rainfall, the correlation was stronger and fairly high levels of salt were found. Laboratory and field experiments indicated that Gammarus and Hydropsychidae are apparently unaffected by chloride pulses up to 800 mg/l. In one field experiment, a pulse of 2165 mg/l Cl increased the drift of all organisms in a salted channel. (Chilton-ORNL)
W78-04196

THE OCCURRENCE OF SOME HEAVY METALS IN POPULATIONS OF THE FRESHWATER MUSSEL ANODONTA ANATINA (L.) FROM THE RIVER THAMES,
Kingston Polytechnic, Kingston upon Thames (England). School of Chemical and Physical Sciences.
R. Manly, and W. O. George.

Environmental Pollution, Vol 14, 1977, p 139-154. 3 fig, 4 tab, 31 ref.

Descriptors: Environmental effects, *Water pollution, *Sewage, Sewage effluents, *Heavy metals, *Mussels, Zinc, Lead, Cadmium, Copper, Mercury, *River Thames(England).

Mussels from three urban and four rural sites along the River Thames were analyzed to determine Zn, Ni, Pb, Cd, Cu and Hg levels. The daily flow of sewage effluent was at least 13 times greater in the vicinity of the urban sites than in that of the rural sites. Higher concentrations of Zn, Ni, Pb, and Cd were found in mussels from the urban sites. With the exception of nickel, considerable variations were found in the concentrations of all metals in mussels from the same locality which were apparently related to dry body weight in some or all of the samples comprised of more highly contaminated individuals. The metals were not evenly distributed throughout the tissues of mussels with each element having a somewhat different distribution from the others. (Chilton-ORNL)
W78-04198

CONTROL OF NONPOINT WATER POLLUTION FROM AGRICULTURE: SOME CONCEPTS,
Agricultural Research Service, Chickasha, OK. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 5G.
W78-04200

5C. Effects Of Pollution

THE EFFECT OF SULFIDE ON THE BLUE-GREEN ALGAE OF HOT SPRINGS II. YELLOWSTONE NATIONAL PARK,
Oregon Univ., Eugene. Dept. of Biology.
R. W. Castenholz.
Microbial Ecology, Vol 3, No 2, 1977, p 79-105. 10 fig, 4 tab, 38 ref. NSF GB-31945x, BMS72-01806 A03.

Descriptors: *Algae, *Hot springs, *Sulfides, Water temperature, Photosynthesis, Aquatic plants, *Inhibitors, Toxicity, *Cyanophyta, Wyoming, *Spirulina labyrinthiformis, *Yellowstone National Park(WY), Mammoth Hot Springs(WY), DCMU.

While most blue-green algae are intolerant of even low concentrations of soluble sulfide in neutral and alkaline pH waters of hot springs, exceptions include Oscillatoria amphigranulata in New Zealand, and as shown in the present study, Spirulina labyrinthiformis in the near-neutral hot springs of the Mammoth area in Yellowstone National Park (WY). Source waters of the Upper Terraces of Mammoth generally have pH values of 6.2-6.8, and a mean sulfide concentration of 1.8 mg/l (H_2S, HS^-, and S^{-2}). Maximum concentration was 4.2 mg/l. Field observations showed domination of substrate covers by Spirulina labyrinthiformis below 50C. Laboratory experiments indicated that sulfide-adapted Spirulina photosynthesized at maximum rates at 45C (with a range of 42-48C), and at about 300-700 micro-Ein/sq m/sec of visible radiation. At sulfide concentrations no higher than about 1 mM Spirulina actually showed a slight increase in photosynthesis. However, Spirulina not adapted to sulfide in nature was severely inhibited by it. Nonadapted Spirulina continuously exposed to over 30 micro-M tolerated at least 1 mM without inhibition. In sulfide-adapted Spirulina, inhibition of photoincorporation by DCMU, hydroxylamine, or far red light was relieved by addition of sulfide. It appears that sulfide is used as a photoreductant of CO_2, and in some blue-green algae photosystem II is poisoned by a low sulfide concentration, thus making them sulfide-dependent if they are to continue photosynthesizing in a sulfide environment. (See also W77-03045) (Lynch-Wisconsin)
W78-03701

THE ACCUMULATION OF 110MAG BY THE PLAICE, PLEURONECTES PLATESSA L. AND THE THORNBACK RAY, RAJA CLAVATA L.,
Ministry of Agriculture, Fisheries, and Food, Lowestoft (England). Fisheries Radiobiological Lab.
For primary bibliographic entry see Field 5B.
W78-03702

EFFECT OF SIZE UPON METAL CONTENT OF SHELLFISH,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group.
For primary bibliographic entry see Field 5B.
W78-03703

ORGANOCHLORINE AND MERCURY RESIDUES IN CANVASBACK DUCK EGGS, 1972-73,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
For primary bibliographic entry see Field 5B.
W78-03704

MERCURY IN BENTHIC INVERTEBRATES OF THE ELBE ESTUARY,
Hamburg Univ. (West Germany). Inst. fuer Hydrobiologie und Fishcherei-wissenschaft.
For primary bibliographic entry see Field 5B.
W78-03705

THE EFFECT OF COPPER ON THE EGGS AND LARVAE OF PLAICE AND HERRING,
Dunstaffnage Marine Research Lab., Oban (Scotland).
J. H. S. Blaxter.
Journal of the Marine Biology Association of the United Kingdom, Vol 57, No 3, p 849-858, 1977. 29 ref, 4 fig, 1 tab.

Descriptors: *Copper, *Fish eggs, *Larvae, *Herring, *Mortality, *Toxicity, *Fish behavior, *Feeding rates, *Growth rates, Metals, Larval growth stage, Fish physiology, *Lethal limit, Hatching, Marine fish, Clupea, Pleuronectes, *Plaice, Year-class strength, Sublethal effects.

Newly-hatched larvae of plaice (Pleuronectes platessa L.) showed a high mortality in 1000 microgr/l and older larvae in 300 microgr/l copper. Newly-hatched larvae of herring (Clupea harengus L.) also showed high mortality in 1000 microgr/l. The eggs of herring were much more sensitive, mortality being high even in 30 microgr/l. Sublethal effects of copper on feeding of plaice were evident at about 100 microgr/l in young feeding larvae but as low as 90 microgr/l in older feeding larvae. Feeding by yolk-sac plaice was totally inhibited by as little as 90 microgr/l copper. Growth and differentiation were retarded in feeding plaice larvae at 90-300 microgr/l copper. The activity of herring larvae, as shown by a laboratory-scale vertical migration, was impaired in 300 microgr/l copper. (Katz)
W78-03706

RELATIONSHIPS BETWEEN POTASSIUM PERMANGANATE TREATMENT AND WATER QUALITY,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5G.
W78-03707

EFFECTS OF PROLONGED EXPOSURE TO AMMONIA ON FERTILIZED EGGS AND SAC FRY OF RAINBOW TROUT (SALMO GAIRDNERI),
Montana State Univ., Bozeman. Dept. of Biology.
D. E. Burkhalter, and C. M. Kaya.
Transactions of the American Fisheries Society, Vol 106, No 5, p 470-475, 1977. 36 ref, 3 fig, 1 tab.

Descriptors: *Fish eggs, *Fry, *Rainbow trout, *Mortality, *Growth rates, Fish physiology, *Fish diseases, *Toxicity, *Ammonia, *Incubation, Nitrogen compounds, Laboratory tests, Lethal limit, Hatching, Environmental effects, Water quality, Aquiculture, *Sublethal effects, *Blue-sac disease, Histological analyses.

Effects of ammonia on fertilized eggs and resulting sac fry of rainbow trout (Salmo gairdneri) were tested at concentrations of un-ionized ammonia ranging from 0.05 to 0.37 mg/liter (as NH3-N). Exposure was continuous throughout the incubation period and for 42 days thereafter. There was no differential egg mortality or effect on incubation period. The lowest concentration of 0.05 mg/liter NH3-N caused some retardation of early growth and development and 0.1 mg/liter caused similar but more severe effects throughout most of the test period. Hypertrophy of secondary gill lamellae epithelium occurred at 0.19 mg/liter. Karyolysis and karyorrhexix occurred in the same tissue at 0.28 mg/liter. Pale coloration and blue-sac disease occurred in sac fry at concentrations of 0.19 mg/liter and higher. The estimated incipient LC50 (lethal threshold concentration) for rainbow trout sac fry was 0.25 mg/liter NH3-N (Katz)
W78-03708

ACCUMULATION AND ELIMINATION OF PENTACHLOROPHENOL BY THE BLUEGILL, LEPOMIS MACROCHIRUS,
University of Southern Mississippi, Hattiesburg. Dept. of Biology.
G. W. Pruitt, B. J. Grantham, and R. H. Pierce, Jr.
Transactions of the American Fisheries Society, Vol 106, No 5, p 462-465, 1977. 14 ref, 2 tab.

Descriptors: *Pesticides, *Chlorinated hydrocarbon pesticides, *Absorption, *Path of pollutants, *Sunfishes, *Bioassay, *Toxicity, Food chains, Laboratory tests, Lethal limit, Gas chromatography, Herbicides, Phenolic pesticides phenols, *Pentachlorophenol, Bioconcentration, Sublethal effects, Tissue analysis.

The toxicity, accumulation, and elimination of pentachlorophenol (PCP) were investigated for the bluegill, Lepomis macrochirus. The 96-hour median lethal concentration (LC50) was 0.3 plus or minus 0.04 mg PCP/liter. Fish exposed to sublethal concentrations (0.1 mg/liter) accumulated PCP in various tissues from 10 to 350 times the ambient concentration. The liver had the greatest concentration followed by the digestive tract, gills, and muscle. Upon removal from PCP-containing water the contaminated fish rapidly eliminated PCP. Residues ranging from 0.03 to 0.6 ppm were still detectable, however, 16 days after fish were placed into a clean environment. (Katz)
W78-03709

ENERGETICS OF PACIFIC HERRING (CLUPEA HARENGUS PALLASI) EMBRYOS AND LARVAE EXPOSED TO LOW CONCENTRATIONS OF BENZENE, A MONOAROMATIC COMPONENT OF CRUDE OIL,
National Marine Fisheries Service, Tiburon, CA. Tiburon Lab.
M. B. Eldridge, T. Echeverria, and J. A. Whipple.
Transactions of the American Fisheries Society, Vol 105, No 5, p 452-461, 1977. 33 ref, 7 tab, 3 fig.

Descriptors: *Fish eggs, *Herrings, *Organic compounds, *Oil, *Metabolism, *Embryonic growth stage, *Respiration, *Energy budget, Laboratory tests, Hatching, Oxygen requirements, Larval growth stage, Marine fish, Commercial fish, Oil pollution, Water pollution effects, *Pacific herring, Clupea harengus, Sublethal effects, *Benzene, Caloric content.

Interest in the energetic processes of critical early life stages of Pacific herring (Clupea harengus pallasi) and the potential effects from sublethal exposure to benzene, a monoaromatic component of crude oil, led to a series of experiments which examined metabolism of herring embryos, yolk-sac larvae, and post-yolk-sac larvae. Yolk caloric content was 6,020 cal/g or 1.3 calories per egg. This energy was consumed rapidly during incubation; total yolk absorption occurred 12 days after fertilization. Anabolic rates varied but at no time was there an energy deficit. Oxygen consumption of embryos increased prior to hatching, then a 10-fold rise was seen in newly hatched yolk-sac larvae. Exogenous calories were estimated from ingested rotifers and were less definable than endogenous energy due to variable grazing rates. Sublethal concentrations of benzene caused (a) significantly less embryonic tissue growth, (b) significantly greater assimilation in feeding larvae. It is believed activity of larvae played an important role in accounting for increased metabolism of later stages. (Katz)
W78-03710

A STUDY OF SODIUM UPTAKE BY THE WATER FLEA DAPHNIA MAGNA,
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.
R. H. Stobbart, J. Keating, and R. Earl.
Comparative Biochemistry and Physiology, Vol 58A, p 299-309, 1977. 26 ref, 8 fig, 2 tab.

Descriptors: *Sodium, *Daphnia, Animal physiology, *Waterfleas, *Absorption, *Semipermeable membranes, *Inhibitors, *Toxins, Invertebrates, Plankton, Electrolytes, Regulation, Metabolism, Membrane processes, Laboratory tests, Biochemistry, Kinetics, *Dinitrophenol.

The Na transport mechanism (which is stimulated by Na deficiency) of the fresh-water branchiopod Daphnia magna is inhibited by KCN and 2-4 dinitrophenol, and exhibits saturation kinetics with respect to the external Na concentration. Na-depleted animals absorb Na from the external medium, and regain their normal Na content after some 15 hr. During net Na uptake influx, outflux, and net uptake all appear to decline exponentially at the same rate. It appears therefore that effective negative feedback operates continually upon the mechanism, which generates appreciable amounts of carrier-mediated exchange, and which resembles those of fresh-water mosquito and chironomid larvae. (Katz)
W78-03711

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: FORMALDEHYDE,
Atlantic Research Corp., Alexandria, VA.
For primary bibliographic entry see Field 5B.
W78-03714

CHLORDANE AND HEPTACHLOR IN RELATION TO MAN AND THE ENVIRONMENT. A FURTHER PESTICIDE REVIEW 1972-1975,
Environmental Protection Agency, Washington, DC. Office of Pesticide Programs.
For primary bibliographic entry see Field 5B.
W78-03715

RAPID BIOASSAY FOR WATER SOLUBLE FUNGITOXICANTS,
Army Mobility Equipment Research and Development Command, Fort Belvoir, VA.
For primary bibliographic entry see Field 5A.
W78-03716

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: ACRYLAMIDES,
Syracuse Research Corp., NY. Center for Chemical Hazard Assessment.
For primary bibliographic entry see Field 5B.
W78-03717

ACUTE AND CHRONIC PARATHION TOXICITY TO FISH AND INVERTEBRATES,
Environmental Research Lab., Duluth, MN.
A. Spacie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 800, Price codes: A06 in paper copy, A01 in microfiche. EPA Report, 1976. 106 p, 53 tab, 8 fig, 46 ref. 18050 HQG.

Descriptors: *Toxicity, *Bioassay, Freshwater fish, *Daphnia, Aquatic insects, Midges, Crustacea, *Organophosphorous insecticides, Invertebrates, *Sunfishes, *Brook trout, Minnows, Enzymes, Fish physiology, Fish eggs, Mortalities, Pesticides, Water pollution effects, Juvenile fish, *Lethal dosage, *Acethylcholinesterase, *Parathion, Nervous system, Bluegill sunfish, Lepomis, Salvelinus, Fathead minnow, Pimephales, Scud, Gammarus, Chironomus.

Acute and chronic toxicities of parathion (0,0-diethyl 0, p-nitrophenyl phosphorothionate) were found for bluegill, brook trout, fathead minnow, water flea, scud, and midge. The 96-hour LC50 values were: bluegill - 0.51 mg/l, trout - 1.76 mg/l, minnow 1.6 to 0.5 mg/l, water flea - 0.63 microg/l, scud - 0.4 microg/l and midge - 31 microg/l. Deformities and depressed acetylcholinesterase were found in bluegills above 0.17 microg/l after 23 months exposure. Trout showed no ill effects at 7.2 microg/l but trout eggs had reduced hatchability at 32 microg/l. Minnows had reduced egg production and deformities at about 4 microg/l in 8 1/2 months. Bluegills had parathion residues of 5 to 25 times the chronic water concentrations, trout had several hundred times, and minnows had residue levels intermediate to the tow other species. Chronically exposed fish appeared to be most sensitive to parathion at the juvenile or adult stages. The chonic no-ill-effect level for water flea was 0.08 microg/l, for scud less than 0.04 microg/l, and for midge, less than 3.1 microg/l. (Katz)
W78-03718

BASELINE STUDY OF TRACE HEAVY METALS IN BIOTA OF PUGET SOUND,
Washington Univ., Seattle. Coll. of Fisheries.
For primary bibliographic entry see Field 5A.
W78-03719

PESTICIDAL ASPECTS OF CHLORDANE IN RELATION TO MAN AND THE ENVIRONMENT,
Environmental Protection Agency, Washington, DC. Office of Pesticide Programs.
For primary bibliographic entry see Field 5B.
W78-03721

ASSESSMENT OF EFFECTS OF ALTERED STREAM FLOW CHARACTERISTICS ON FISH AND WILDLIFE. TASK 3: ANALYSIS OF CASE STUDY FINDINGS, IDENTIFICATION OF PROBLEMS, AND RECOMMENDATION OF REMEDIES,
Enviro Control, Inc., Rockville, MD.
W. Nelson, G. Horak, M. Lewis, and J. Colt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 470, Price codes: A07 in paper copy, A01 in microfiche. Final Report to Fish and Wildlife Service, Ft. Collins, Colo., August 1976. 128 p, 34 tab, 8 fig.

Descriptors: *Oregon, *Washington, *Idaho, *Colorado, *New Mexico, *Utah, *Wyoming, *Arizona, Dams, *Flow control, Water resources development, Streamflow, *Water quality control, Pacific Northwest U.S., Rocky Mountain Region, Fish barriers, Fisheries, Flow rates, On-site investigations, *Instream flow, *Montana.

This report contains analysis, findings, conclusions, and recommendations regarding changed flow regimes below dams, the impact on fisheries and methodologies used to assess flow requirements for 96 dams and diversions in the Rocky Mountain and Pacific Northwest Regions. (Katz)
W78-03722

EFFECTS OF ANTIMYCIN A AND ROTENONE ON MACROBENTHOS IN PONDS,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
L. J. Houf, and R. S. Campbell.
Investigations in Fish Control, No. 80, 1977. Department of the Interior, Fish and Wildlife Service, 29 p. 15 ref, 22 fig, 10 tab.

Descriptors: *Rotenone, *Antimycin A, *Antibiotics(Pesticides), *Diptera, *Pesticides, *Benthic fauna, *Aquatic populations, *Fish control agents, *Toxicity, *Insects, Mayflies, Dragonflies, Caddisflies, Midges, Snails, Organic pesticides, Seasonal, Benthos, Dissolved oxygen, Ponds, Aquatic habitats, Invertebrates, On-site investigations, Fish food organisms, Species diversity, Emergence, Abundance.

Samples of macrobenthos, collected over a 14-month period from nine 0.03-ha experimental ponds at the Fish-Pesticide Research Laboratory, Columbia, Missouri, were analyzed to determine the long- and short-term effects of antimycin A and rotenone. The ponds were characterized by an abundance of bushy pondweed (Najas guadalupensis) and by the absence of fish. Treatment concentrations of 0.5 mg/l of rotenone and 20 microgr/l of antimycin and concentrations of 2.0 mg/l of rotenone and 40 microgr/liter of antimycin were applied. There were no effects on species diversity, emergence, seasonal dynamics, abundance, or relative numbers of taxa that could be attributed to either toxicant. Periods of spring emergence, summer buildup, and fall emergence of insects were closely associated with the seasonal development and decline of vegetation. (Katz)
W78-03724

AQUATIC MACROINVERTEBRATES IN A SMALL WISCONSIN TROUT STREAM BEFORE, DURING, AND TWO YEARS AFTER TREATMENT WITH THE FISH TOXICANT ANTIMYCIN,
Wisconsin Univ.-Stevens Point. Coll. of Natural Resources.
G. Z. Jacobi, and D. J. Degan.
Investigations in Fish Control, No. 81, 1977. Department of the Interior, Fish and Wildlife Service, 24 p. 19 ref, 8 fig, 9 tab.

Descriptors: *Biomass, *Benthic fauna, *Insects, *Seasonal, *Fish control agents, *Antimycin A, *Piscicides, *Invertebrates, *Diptera, *Aquatic populations, Benthos, Invertebrates, Mayflies, Caddisflies, Fish food organisms, Crayfish, On-site investigations, Snails, Stoneflies, Wisconsin, *Seas Branch Creek(Wis).

Benthos and benthic drift were sampled periodically in Seas Branch Creek (Vernon County, Wisconsin) for 5 months before and for 2 years after the stream was treated with antimycin, and over the same period in nearby untreated Maple Dale Creek. During treatment antimycin concentrations varied from 17 to 44 microgr/l at the two sampling stations in Seas Branch Creek. Populations of macroinvertebrates were drastically reduced 2 days after treatment, but all common taxa identified before treatment were present in the stream 1 year later. Estimated biomass reductions of living organisms 2 days after treatment

were as high as 50% for one caddis fly, Hydropsyche sp., and 75% for another, Brachycentrus americanus, 70% for a crane fly, Antocha sp.; and nearly 100% for a mayfly, Baetis cingulatus, and a scud, Gammarus pseudolimnaeus. Summer biomass of Antocha and Brachycentrus did not regain pretreatment levels during the second year. The mortality of the riffle beetle, Optioservus fastiditus, was approximately 20% 9 days after treatment. A crayfish, Orconectes propinquus, was not affected by the treatment. The biomass of Gammarus, Prosimulium (a black fly), Baetis, and Hydropsyche was high during both summers after treatment. After 1 year, and continuing into the second year, total benthic biomass approached or exceeded that before treatment. (Katz)
W78-03725

CHLORINE-INDUCED MORTALITY OF EGGS AND LARVAE OF SPOTTED SEATROUT (CYNOSCION NEBULOSUS),
National Marine Fisheries Service, Port Aransas, TX. Port Aransas Lab.
A. G. Johnson, T. D. Williams, and C. R. Arnold.
Transactions of the American Fisheries Society, Vol. 106, No. 5, p 466-469, 1977. 15 ref, 1 tab.

Descriptors: *Larvae, *Fish eggs, *Mortality, *Lethal limit, *Toxicity, *Chlorine, *Water pollution effects, *Marine fish, *Estuarine environment, Larval growth stage, Commercial fish, Laboratory tests, Water pollution sources, Chlorination, *Chloramine, 5-Chlorouracil, *Spotted seatrout, Cynoscion, Sodium hypochlorite.

The acute lethal effects of sodium hypochlorite, chloramine, and 5-chlorouracil on eggs and larvae of spotted seatrout, Cynoscion nebulosus, are presented. Forty-eight-h median tolerance limits (TLm) for the various toxicants and age classes (2-h-old eggs, 10-h eggs, and 1-h posthatch larvae) were, respectively; sodium hypochlorite-0.21 ppm plus or minus 0.01, 0.21 ppm plus or minus 0.01, 0.17 ppm plus or minus 0.28 ppm; chloramine-14.14 ppm plus or minus 1.13, 0.57 ppm plus or minus 0.28, 5.75 plus or minus 3.01 ppm; 5-chlorouracil-8.91 plus or minus 1.03, greater than 100, 79.43 plus or minus 44.97 ppm. The 48-h TLm varied depending on toxicant and age class. (Katz)
W78-03726

EFFECTS OF THERMOCYCLES ON BODY WEIGHT GAIN AND GONADAL GROWTH IN THE GOLDFISH, CARASSIUS AURATUS,
Milwaukee Public Museum, WI.
R. E. Spieler, T. A. Noeske, V. deVlaming, and A. H. Meier.
Transactions of the American Fisheries Society, Vol. 106, No. 5, p 440-444, 1977. 8 ref, 7 tab, 2 fig.

Descriptors: *Water temperature, *Growth rates, Aquiculture, Cycles, *Environmental effects, *Heated waters, *Sexual maturity, *Photoperiodism, Temperature, Aquatic environment, Productivity, Biorhythms, Fish physiology, Carassius auratus, *Thermocycles, Gonadal growth, *Goldfish.

Goldfish subjected to increased temperatures at one of six different times of day had significant differences in weight gain and testicular growth depending on the time of treatment. Depending on the time of day the thermocycle was initiated, weight gain and testicular growth could be either stimulated, inhibited, or equal to that in fishes subjected to constant heat or constant cold. Heat applied during the last 4 h of darkness was particularly conducive to weight gain and testicular growth. The results of this study may have important implications for aquaculture. (Katz)
W78-03727

DEPTH DISTRIBUTION OF ADULT CHINOOK SALMON (ONCORHYNCHUS TSHAWYTSCHA) IN RELATION TO SEASON AND GAS-SUPERSATURATED WATER,
Batelle Pacific Northwest Labs., Richland, WA.
R. H. Gray, and J. M. Haynes.
Transactions of the American Fisheries Society, Vol. 106, No. 6, p 617-620, 1977. 29 ref, 2 tab.

Descriptors: *Seasonal, *Tracking techniques, *Chinook salmon, *Supersaturation, *Fish behavior, Depth, Aquatic environment, Gases, *Fish diseases, Dams, Remote sensing, Salmon, Hydrostatic pressure, Fish migration, Water properties, Environmental effects, *Snake River(Wash), Radio transmitters, *Gas bubble disease.

Pressure-sensitive radio transmitters were used to determine swimming depths of adult chinook salmon in relation to season and gas-supersaturated water in the lower Snake river, southeastern Washinton. Thirty radio-tagged fish, 15 with external and 15 with internal transmitters, were monitored in supersaturated water in spring 1976. Nine fish with internal and 30 with external transmitters were monitored in the absence of supersaturation in fall 1976 and spring 1977 respectively. Spring chinook salmon spent about 89% of their time below the critical supersaturation zone in 1976. Swimming depths of fall 1976 and spring 1977 chinook, migrating in normally saturated water, were shallower and differed significantly from those of fish migrating in supersaturated water in spring 1976. (Katz)
W78-03728

THE DIFFERENTIAL EFFECTS OF FREE AND COMBINED CHLORINE ON JUVENILE MARINE FISH,
Woods Hole Oceanographic Institution, MA.
J. M. Capuzzo, J. A. Davidson, S. A. Lawrence, and M. Libni.
Estuarine and Coastal Marine Science, Vol. 5, p 733-741, 1977. 20 ref, 2 tab, 4 fig.

Descriptors: *Chlorine, *Bioassay, *Mortality, *Killifishes, *Juvenile fish, *Fish behavior, *Toxicity, *Metabolism, Laboratory tests, Behavior, Lethal limits, Water pollution effects, Temperature, Marine fish, Pseudopleuronectes, Stenotomus, Fundulus, *Scup, *Flounder, Sublethal effects, Combined chlorine.

The differential effects of free chlorine and chloramine on three species of juvenile marine fish have been investigated in continuous flow bioassay units. The toxicity of both chlorine forms to winter flounder, scip, and killifish, appeared to be a threshold effect: an abrupt increase in mortality was observed over a narrow range of toxicant concentrations. The three species were similar in their responses to free chlorine, the more toxic of the two chlorine forms. However, there was a difference in chloramine toxicity among the three species tested; killifish were more susceptible than either of the other two species, probably reflecting differences in metabolic regulation or uptake rates. Behavioral aberrations--distended gills and erratic swimming behavior--of winter flounder and scup and significant reductions in standard respiration rates of killifish were observed with exposure to chlorine and chloramine concentrations approaching lethal levels. (Katz)
W78-03729

PREDATION ON HARD CLAM (MERCENARIA MERCENARIA) POPULATIONS,
National Marine Fisheries Service, Highlands, NJ. Sandy Hook Sport Fisheries Marine Lab.
C. L. MacKenzie, Jr.
Transactions of the American Fisheries Society, Vol. 106, No. 6, p 530-537, 1977.

Descriptors: Aquatic populations, *Clams, *Food webs, *Predation, *Commercial shellfish, *Crabs, *Productivity, Laboratory tests, On-site investigations, Competition, Crustaceans, Invertebrates, Pest control, Balance of Nature, *Pesticides, Water pollution effects, *Sevin

Predation on hard clams (Mercenaria mercenaria) was examined in laboratory experiments and in wild populations. Increases in clam density following predator reduction was also examined. The principal predators of hard clams are gastropods and crabs, which take mostly small clams. In the laboratory, crabs consume clams rapidly. Wild populations of clams are most abundant in areas where either predators are scarce or stones provide cover from them. Variations in recruitment and predation on clams smaller than about 15 to 20 mm determine the strength of year classes. As clams grow, they become less vulnerable to a succession of predators, first outgrowing mud crabs at a length of about 7 mm, rock crabs at about 15 mm, oyster drills at about 20 mm, and moon snails at about 50 mm. Clam densities were seven and eight times as great in sections of shellfish beds where predators were reduced by pesticide applications compared with untreated sections of the same beds. (Katz)
W78-03730

FOOD AND FEEDING BEHAVIOR OF THE SHOVELNOSE STURGEON, SCAPHIRHYNCHUS PLATORYNCHUS, IN THE UNCHANNELIZED MISSOURI RIVER, SOUTH DAKOTA,
University of Southern Mississippi, Hattiesburg. Dept. of Biology.
T. Modde, and J. C. Schmulbach.
Transactions of the American Fisheries Society, Vol. 106, No. 6, p 602-608, 1977.

Descriptors: *Fish behavior, *Feeding rates, *Missouri River, *Diptera, *Fish diets, Seasonal, River flow, *Forage fish, *Benthos, Freshwater fish, Foods, Aquatic insects, Velocity, Rivers, On-site investigations, Mayflies, Biomass, Temperature, Environmental effects, Movement, South Dakota, Scaphirhynchus, *Sturgeon, *Lewis and Clark Reservoir, Feeding behavior.

The feeding habits of the shovelnose sturgeon (Scaphirhynchus platorynchus) were investigated in the unchannelized Missouri River, South Dakota. The annual diet was dominated by aquatic arthopods, particularly larvae of the insect orders Trichoptera, Diptera, and Ephemeroptera. The annual feeding behavior was separated into three intervals: (1) the fall months, during which the fish extensively utilize the major components of the drift; (2) the winter period, characterized by exploitation of a greater diversity of aquatic and terrestrial invertebrates; and (3) the late spring and summer interval, in which feeding was restricted to benthic foraging. Electivity values indicated opportunistic feeding activity. Shifts of feeding activity were influenced by timing and rates of discharge from the Lewis and Clark Reservoir located upriver. Changes in the elevation and velocity of the water mass appeared to affect the vulnerability of prey organisms. (Katz)
W78-03731

CHRONIC ORAL TOXICITY OF 2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN (TCDD) TO RAINBOW TROUT,
Pacific Northwest Forest and Range Experiment Station, Corvallis, OR. Forest Services Lab.
C. L. Hawkes, and L. A. Norris.
Transactions of the American Fisheries Society, Vol. 106, No. 6, p 641-645, 1977. 2 fig, 2 tab, 10 ref.

Descriptors: *Toxicity, *Rainbow trout, *Bioassay, *Herbicides, *Brush control, *Growth rates, *Feeding rates, *Mortality, *Pesticide residues, *Chlorinated hydrocarbon pesticides,

Trout, Salmonids, Path of pollutants, Fish behavior, 2,3,5nT, Fish diseases, Water pollution effects, *TCDD, Sublethal effects, Tissue analysis, *Dioxin.

Rainbow trout (Salmo gairdneri) consumed diets containing 2.3 parts per trillion (10 to the -12 power pptr), 2.3 parts per billion (10 to the -9 power, ppb), and 2.3 ppm TCDD 6 days each week for 105 days, resulting in an average intake of, respectively, 3.2 x 10 to the -8 power, 3.6 x 10 to the -5 power, or 2.1 x 10 to the -2 power microgr/TCDD/g fish, freeze-dry weight per day. Consumption of food containing 2.3 pptr or 2.3 ppb TCDD caused no mortality, no reduction in food consumption or growth, and no fin erosion. Consumption of diets containing 2.3 ppm TCDD caused an average mortality of 50% and 88% in 61 and 71 days, respectively. Feeding activity and growth were also reduced, and fin erosion and liver pathology increased. These data indicates that the 'no-effect' level for survival, growth, feeding activity, and fin erosion in rainbow trout receiving TCDD orally is between 2.3 ppm and 2.3 ppb. (Katz)
W78-03733

PHOSPHOROUS FERTILIZATION OF SUNFISH PONDS,
Auburn Univ., AL. Department of Fisheries and Allied Aquacultures.
F. Lichtkoppler, and C. E. Boyd.
Transactions of the American Fisheries Society, Vol. 106, No. 5, p 634-636, 1977. 5 ref, 2 tab.

Descriptors: *Phosphorous, *Sunfishes, *Aquiculture, *Fertilization, *Productivity, *Primary productivity, *Ponds, Fish farming, Fertilizers, Food chains, Aquatic algae, Aquatic productivity, Nutrients, Fish management.

Phosphorus fertilization rates were reduced from 9 to 4.5 kg/hectare/application of P2O5 in ponds on a wooded watershed without significant decline in sunfish population production. Evaluation of the present and an earlier study suggests that 9 kg/hectare/application of P2O5 be used for woodland ponds with heavy fishing pressure, while 4.5 kg/hectare/application is suitable for woodland ponds subject to less fishing. (Katz)
W78-03734

MANAGEMENT OF BOTTOM SEDIMENTS CONTAINING TOXIC SUBSTANCES, PROCEEDINGS OF THE SECOND U.S.-JAPAN EXPERTS MEETING, OCTOBER 1976--TOKYO, JAPAN.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5G.
W78-03735

AN EXPERIMENT IN REMOVAL OF ORGANICALLY POLLUTED BOTTOM MUD FROM THE SETO INLAND SEA,
Nansei Regional Fisheries Research Lab., Hiroshima (Japan).
For primary bibliographic entry see Field 5G.
W78-03738

THE MECHANISM OF METHYLMERCURY ACCUMULATION IN FISH,
Tsukuba Univ., Ibaraki (Japan). Dept. of Environmental Epidemiology.
For primary bibliographic entry see Field 5B.
W78-03739

HYDRAULIC DREDGING AS A LAKE RESTORATION TECHNIQUE: PAST AND FUTURE,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5G.
W78-03747

INTERCHANGE OF NUTRIENTS AND METALS BETWEEN SEDIMENTS AND WATER DURING DREDGED MATERIAL DISPOSAL IN COASTAL WATERS,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5B.
W78-03748

DREDGING CONDITIONS INFLUENCING THE UPTAKE OF HEAVY METALS BY ORGANISMS,
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5B.
W78-03749

ECOLOGICAL CONSIDERATIONS IN SITE ASSESSMENT FOR DREDGING AND SPOILING ACTIVITIES,
Environmental Research Lab., Narragansett, RI.
D. K. Phelps, and A. C. Myers.
In: Management of Bottom Sediments Containing Toxic Substances: Proceedings of the Second U.S.-Japan Experts - Meeting - October 1976, Tokyo, Japan. EPA-600/3-77-083. July 1977, p 266-286. 10 fig, 7 tab.

Descriptors: *Water pollution effects, *Bottom sediments, *Dredging, *Environmental effects, *Benthos, *Water quality control, Analytical techniques, *Absorption, *Metals, *Sediment-water interface, *Path of pollutants, Invertebrates, Biological communities, Lead, Sediments, Cadmium, Copper, Zinc, Trace elements, *Narragansett Bay(Rhode Island).

The results of a series of studies which are aimed at the identification of methods that give the most expeditious yet meaningful demonstration of possible negative environmental impacts from disposal of contaminated sediments into clean marine systems are presented. Comparisons have been made of sediments, faunal diversity, and animal tissue residues between highly contaminated and clean benthic systems. The nature of the area of study is such that a series of field stations along a gradient of benthic systems ranging from highly contaminated to a clean system proved helpful. Laboratory tests were made with animals and sediments. Results demonstrate that a contaminated sediment disposed of in a clean environment will tend to degrade quality of the overlying water column. The benthic system, once contaminated, provides a major reservoir of contaminants which continue to be exchanged with the overlying water column. It is recommended that responses, such as feeding rate and carbon fixation of organisms from contaminated and uncontaminated areas be examined. (See also W78-03735) (Katz)
W78-03751

ROTIFER SENSITIVITY TO COMBINATIONS OF INORGANIC WATER POLLUTANTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
A. L. Buikema, Jr., C. L. See, and J. Cairns, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 123, Price codes: A03 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 92, December 1977. 42 p, 4 tab, 12 fig, 79 ref. OWRT A-071-VA(1).

Descriptors: *Rotifers, Invertebrates, *Toxicity, *Inorganic compounds, *Bioassay, Water pollution effects, Pollutant identification, Chlorine, Copper, Chromium, Fluorides, Iron, Zinc, Metal complexes, Hazard assessment(Pollution).

This research assesses the toxicity of interactions of selected inorganic compounds to the rotifer Philodina acuticornis. Bioassays were conducted in a synthetic dilution medium under static conditions. Effective concentrations of the compounds that produced rotifer mortality were determined by recording, after 24 and 48 hours, the number of dead or withdrawn animals in triplicate samples. Results indicate a range of rotifer response to these compounds, from supra-additive (synergistic) to antagonistic. The interaction of chromium and chlorine was supra-additive. Additive interactions were observed for mixtures of chromium and fluoride, copper and chromium, and copper and chlorine; the interaction of copper and chromium fluctuated along the line of additivity. Combinations of iron and chlorine, iron and fluoride, zinc and fluoride, and chloride and fluoride produced antagonistic responses. No interactions were observed for mixtures of zinc and copper and copper and fluoride. The interaction of zinc and chlorine was unique: the effect was infra-additive below a 50:50 mixture and antagonistic above this mixture. Zinc was most toxic in high concentrations, and as the concentrations of chlorine increased, rotifer sensitivity decreased, probably because of the formation of metal complexes.
W78-03754

STRUCTURE OF LEECH GROUPS (HIRUDINEA) IN POLLUTED PARTS OF THE CATCHMENT AREA OF THE RIVERS BZURA AND NER, PART I. FIELD INVESTIGATION,
Instytut Ksztalcenia Nauczycieli i Badan Oswiatowych, Lodz (Poland).
K. Matysiak.
Acta Hydrobiologica, Vol 18, No 3, p 259-276, 1976. 5 fig, 4 tab, 23 ref.

Descriptors: *Water pollution effects, *Bzura River(Poland), *Ner River(Poland), *Leeches, *Systematics, Watersheds(Basins), Hirudinea, Poland, Tributaries, Rivers, River beds, Annelids.

Leech fauna (Hirudinea) in the longitudinal profile of the Rivers Bzura and Ner (Poland) as well as in certain tributaries and old riverbeds, were studied in relation to the degree of water pollution. Some 3,269 specimens of 12 species, caught at 37 stations, were analyzed and classified using coenological methods. No leeches were found at 14 stations due to severe water pollution. In the River Bzura 2,219 individuals representing 10 species were found, and in the upper sector of the Ner 366 specimens of seven species were caught. In old riverbeds seven species (505 specimens) were caught, and in Bzura tributaries six species (179 specimens) were found. Species were assigned to two groups on the basis of their concomitant or separate occurrence: (1) Haemopis sanguisuga, Gliossiphonia complanata, Helobdella stagnalis, and Erpobdella negricollis; (2) Hemiclepsis marginata and Erpobdella testacea. Five species did not fit into either group: Erpobdella testacea. Five species did not fit into either group: Erpobdella monostriata, Dina lineata, Glossiphonia heteroclita, Theromyson tessulatum, and Piscicola geometra. Stations were likewise categorized by similarities. Relationships between groups of species and single species, and groups of stations and single stations are presented in a synthetic diagram. Similarity of stations is conditioned by the occurrence of eurytopic species tolerating a high degree of water pollution, living in different environmental conditions. (Lynch-Wisconsin)
W78-03814

COMPUTERIZED ANALYSIS OF STREAM ALGAE,
Uppsala Univ. (Sweden).
B. Klasvik.
Vaxtekologiska studier, 1974. 100 p, 19 fig, 31 tab, 50 ref.

Descriptors: *Algae, *Trophic levels, *Eutrophication, *Oligotrophy, *Verkean River(Sweden), *Kaltisjokk Brook(Sweden), Computer models, Seasonal, Rivers, Streams, Ecosystems, Periphyton, Currents(Water), Baseline studies, Statistical methods.

Two Swedish streams of the Vaucheria (eutrophic) and Zygnema (oligotrophic) types were investigated for types and amounts of benthic algae, seasonal variation, and their relationship to certain environmental factors. The Verkean River is a Vaucheria stream in southern Sweden, while Kaltisjokk Brook is an oligotrophic stream in Swedish Lapland. Only two abundant macroscopic species, Draparnaldia mutabilis and Lemanea fluviatilis, and four abundant microscopic species, Achnanthes minutissima, Gomphonema parvulum, Chamaesiphon fuscus, and Hydrurus foetidus, were common to both streams. Except at one station with lower water hardness and pH, the Eunotia group was absent in the Verkaen, but dominant in the Kaltisjokk. The Nitzschia group was almost entirely absent in the Kaltisjokk, inferring that most species of this group may be heterotrophic in organic nitrogen compounds, and do not thrive in oligotrophic, unpolluted waters. Algal growth on plastic foils used as artificial substrates proved valuable for recording trophic level and evaluating factors which promote algal growth. In the Verkean an average 250,000 organisms per sp cm colonized the foil, compared with a maximum 50,000 per sp cm in the Kaltisjokk. Growth density differences appear to reflect nutritional standards in the two streams. Computer analyses included stepwise discriminant analysis and multivariate analysis of variance. (Lynch-Wisconsin)
W78-03815

PHYTOPLANKTON AND ENVIRONMENTAL FACTORS IN LAKE HJALMAREN, 1966-1973,
National Swedish Environment Protection Board, Uppsala. Limnological Survey.
E. Willen.
SNV PM 718, NLU Rapport 87, 1976. 89 p, 29 fig, 3 tab, 92 ref.

Descriptors: *Phytoplankton, *Eutrophication, *Algae, *Baseline studies, *Lake Hjalmaren(Sweden), Lakes, Data collection, Agricultural runoff, Water pollution, Nutrients, Biomass, Chlorophyll, Phosphorus, Sewage effluents, Primary productivity, Circulation, Species diversity.

Phytoplankton species composition and diversity, biomass, and production were studied in Lake Hjalmaren, Sweden's fourth largest lake, during 1966-73. Water chemistry, bacteria, macrophytes, attached algae, phytoplankton (including chlorophyll-a) primary production, zooplankton, benthic fauna, and fisheries were investigated in the shallow, eutrophic lake which has a mean depth of 6 m, greatest depth of 20 m, length of 60 km, width of 20 km, and a drainage area of 4,000 sq km. Four main basins comprise the lake--Hemfjarden, Mellanfjarden, Storhjalmaren, and Ostra Hjalmaren--separated by islands and narrow sounds. Oxygen supply is good, due to constant water circulation. Nutrient concentrations decrease from west to east, with highest concentrations near Orebro. Total nitrogen range is 0.62-2.17 mg/l, total phosphorus 0.03-0.26 mg/l, nitrogen loading 4.1-30.0 g/sq m/yr, and phosphorus loading 0.2-3.0 g/sq m/yr. A total of 330 species of phytoplankton were found, dominated by blue-green algae, diatoms, and green algae. Species diversity in Hemfjarden was much higher (4.13) than in Storhjalmaren (2.34), although the former is the more highly polluted; constantly-circulating water provides a steady nutrient supply and prevents blue-green algae shading. Phosphorus precipitation begun in 1975 at the Orebro sewage treatment plant is expected to decrease phytoplankton biomass and limit algal blooms in the western basins. (Lynch-Wisconsin)
W78-03816

LIMNOLOGICAL STUDIES IN A LARGE, DEEP, OLIGOTROPHIC LAKE (LAKE OHRID, YUGOSLAVIA): SEASONAL AND ANNUAL PRIMARY PRODUCTION DYNAMICS OF THE PELAGIAL PHYTOPLANKTON,
Hidrobioloski Zavod, Ochrida (Yugoslavia).
B. T. Ocevski, and H. L. Allen.
Archiv fur Hydrobiologie, Vol 79, No 4, p 429-440, May 1977. 6 fig, 1 tab, 17 ref.

Descriptors: *Period of growth, *Oligotrophy, *Phytoplankton, *Radioactive dating, *Lake Ohrid(Yugoslavia), Lake stages, Primary productivity, Limnology, Seasonal, Annual, Lakes.

Carbon-14 light and dark bottle measurements of pelagial phytoplankton production were estimated in the vertical column of Lake Ohrid, Yugoslavia during 1972-73. Lake Ohrid is a large, calcareous, grabben lake of probable Pliocene origin located in southwestern Yugoslavia. In spite of its probable age, it has been characterized as highly oligotrophic. As part of a larger comprehensive and intensive limnological study of the lake, in which nutritional factors governing the phytoplankton were also evaluated by sensitive carbon-14 methods, annual production of the pelagial phytoplankton was monitored to establish vertical, seasonal and annual production dynamics that could then be used to compare production in Lake Ohrid to existing published production data from other large lakes. Annual mean production was calculated for 1973 and compares favorably with other published data on annual mean production rates for oliotrophic lakes. The apparent low mean annual production rate for Lake Ohrid appears to be controlled by a host of interacting chemical-physical factors which effectively restrict the potential openwater phytoplankton productivity. (Coyle--Wisconsin)
W78-03820

S190 INTERPRETATION TECHNIQUES DEVELOPMENT AND APPLICATION TO THE NEW YORK STATE WATER RESOURCES,
Calspan Corp., Buffalo, NY.
For primary bibliographic entry see Field 5A.
W78-03822

ALGAL NUTRIENT AVAILABILITY AND LIMITATION IN LAKE ONTARIO DURING IFYGL, PART I. AVAILABLE PHOSPHORUS IN URBAN RUNOFF AND LAKE ONTARIO TRIBUTARY WATERS,
Texas Univ. at Dallas, Richardson.
W. F. Cowen, and G. F. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 974, Price codes: A11 in paper copy, A01 in microfiche. Report No. EPA-600/3-76-094a, October 1976. 216 p, 23 fig, 64 tab, 94 ref. EPA-600/3-76-094a, R-800537-02.

Descriptors: *Lake Ontario, *Phosphorus, *Tributaries, *Urban runoff, *Madison(WI), *Genesee River Basin(NY), Wisconsin, New York, Snow, Algae, Nutrients, Eutrophication, Great Lakes, IFYGL, Selenastrum capricornutum, Nutrient availability.

Urban runoff in Madison, Wisconsin was analyzed to determine the availability of various phosphorus forms for algal growth, and methods for urban systems were applied to phosphorus availability in Lake Ontario tributary waters. Total phosphorus, soluble phosphorus, particulate phosphorus, and soluble reactive forms were measured. Data for the Madison experiments were gathered at eight city locations between August 1972-March 1973; the test alga was Selenastrum capricornutum. Based on the Madison data, plus rain gauge samples from 13 New York State locations, water samples from streams in the Genesee River Basin, and samples from four Lake Ontario tributaries in New York State, it was concluded that only about 20% of insoluble orthophosphate present in surface water drainage is available for algal growth. Recommendations are: (1) phosphorus available to aquatic plants as inputs into a water course can be computed by adding together soluble orthophosphate and 20% of insoluble orthophosphate; and (2) ion exchange incubation and algal assay techniques (used in this study) should be used to evaluate potentially available phosphorus in studies of all major U.S. rivers prior to designing a national phosphate control program. (Lynch-Wisconsin)
W78-03824

ACTINOMYCETE DISTRIBUTION IN NORTHERN GREEN BAY AND THE GREAT LAKES, TASTE AND ODOR RELATIONSHIPS IN EUTROPHICATION OF NEARSHORE WATERS AND EMBAYMENTS,
Michigan Dept. of Natural Resources, East Lansing.
D. P. Tierney, R. Powers, T. Williams, and S. C Hsu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 551, Price codes: A09 in paper copy, A01 in microfiche. Report No EPA-905/9-74-007, July 1976. 167 p, 31 fig, 34 tab, 59 ref, 6 append. 68-01-1885.

Descriptors: *Taste, *Odor, *Actinomycetes, *Great Lakes, *Green Bay(Lake Michigan), Bays, Eutrophication, Nutrients, Trophic levels, Phytoplankton, Lake Michigan, Michigan, Water pollution, Water pollution sources, Water pollution effects, Bacteria, Streptomyces.

Earthy-musty odors and tastes reported in Green Bay and other parts of the Great Lakes were traced to increases in populations of the bacterial genus Streptomyces, an actinomycete. Laboratory tests showed that actinomycete concentrations are higher in nutrient-enriched waters. Actinomycetes can use a variety of organic substances as carbon sources, including phenol, cellulose, effluents from secondary municipal wastewater treatment plants or paper mills, and dead algal cells. Surveys of actinomycete population structure, abundance, and history of odor problems were conducted from April-October 1974 at eight Michigan stations in northern Green Bay; hydrochemistry and phytoplankton surveys of northern Green Bay were also conducted to assess trophic status. Questionaire data were gathered on taste and odor problems in other Michigan communities using Great Lakes water. Untreated water samples were obtained from 26 Municipal water supply facilities in Michigan. It is recommended that both organic and inorganic nutrient inputs to the Great Lakes should be reduced to the lowest practicable level, thus directly and indirectly regulating actinomycete population growth. (Lynch-Wisconsin)
W78-03827

BACTERIAL COENOSES OF WATER AND BOTTOM SEDIMENTS OF THE FISHERY PONDS IN THE UKRAINIAN SSR, (IN RUSSIAN),
Ukrainian Research Inst. of the Fish Industry, Kiev (USSR).
A. F. Antipchuk.
Gidrobiol Zh 9(4), p 5-13, 1973.

Descriptors: *Bacteria, *Bottom sediments, Algae, *Bacterial cenoses, Fertilizers, Fisheries, Forests, Microbes, Minerals, Ponds, Steppe Zones(USSR), *Ukrainian-SSR, Vegetation, Water pollution.

A study carried out in 1967-1968 in the nursery ponds, situated in forest, forest-steppe and steppe zones of the Ukraine (USSR), showed a remarkable increase of bacterial density with depth. Mineral fertilizer application, together with slack lime, decidedly affects the density and pattern of these coenoses. Zonality in the occurrence of some microbial forms has been observed. The density of bacterial cover decreased toward the end of the vegetation (primarily algae) period.--Copyright 1975, Biological Abstracts, Inc.
W78-03829

FLORA AND FAUNA IN FRESHWATER BODIES OF THE THALA HILLS OASIS (ENDERBY LAND, EASTERN ANTARCTICA),
Polish Academy of Sciences, Warsaw. Inst. of Experimental Biology.
K. W. Opalinski.
Pol Arch Hydrobiol. 19(4), p 383-398, 1972. (Polish summ.).

Descriptors: Lakes, *Antarctic oasis, *Antarctica, *Bacteria, Birds, Chlorophyta, Chlorosphaera antarctica, *Cyanophyta, *Diatoms, Hypsibius chilensis, Lepadella patella, Navicula seminulum, Nematoda, Oedogoniales, Phormidium, Phormidium glaciale f longiarticulat, Pinnularia gibba var parva, Plankton, Protozoa, Rotatoria, Schizothrix antarctica, Tardigrada, Water pollution.

The composition of flora and fauna in several freshwater lakes of the Antarctic oasis Thala Hills (67 degrees 40 minutes S, 45 degrees 50 minutes E), Enderby Land, Eastern Antarctica is discussed. Water bodies were selected which were not yet disturbed by man (pollution, changes in water intake, etc.). In the Antarctic freshwater lakes, most living organisms concentrate in the bottom layer where the so-called bacterio-algal substratum is formed. The main elements of that layer consists of various species of Phormidium (Cyanophyta), as well as bacteria and Diatomeae. Animals are also connected with that layer. Plankton in the Antarctic lakes is very poor, consisting mainly of Diatomeae. In the lakes of the Thala Hills oasis there are 5 spp. of Protozoa, 3 spp. of Rotatoria, 2 spp. of Tartigrada and Nematoda (species not determined). The flora of the lakes is represented by 15 spp. of Diatomeae, 9 spp. of Cyanophyta, 5 spp. of Chlorophyta and Oedogoniales. The most abundant animals are: Ledpadella patella and Hypsibius chilensis. The dominant plants are: Diatomeae (Navicula seminulum, Pinnularia gibba var. parva) and Cyanophyta (Phormidium glaciale forma longiarticulata). Cosmopolitan forms are prevalent in the fauna and flora of the oasis. Endemic forms were: Chlorophyta (Chlorosphaera antarctica) and Cyanophyta (P. glaciale forma longiarticulata, Schizotrix antarctica). On the whole, endemics constitute 9.7% of all species and 26.3% of total floral density. The number of endemic species in other oases of Enderby Land is of a similar order. In all probability, the greatest role in the settlement process is played by the movement of living organisms (or their sporophyte forms) into Antarctic oases by birds or through air currents.--Copyright 1974, Biological Abstracts, Inc.
W78-03830

THE CHEMICAL COMPOSITION OF CENTRAL AMAZONIAN AQUATIC MACROPHYTES WITH SPECIAL REFERENCE TO THEIR ROLE IN THE ECOSYSTEM,
Max-Planck-Inst. fuer Limnologie zu Ploen (West Germany).
C. Howard-Williams, and W. J. Junk.
Archiv fur Hydrobiologie, Vol 79, No 4, p 446-464, 1977. 3 fig, 7 tab, 46 ref, 1 append.

Descriptors: *Aquatic plants, *Amazon River(Brazil), Potassium, Calcium, Sodium, Magnesium, Nitrogen, Phosphorus, Silicon, Ash, Macrophytes.

Levels of ash, sodium, potassium, calcium, magnesium, silicon, nitrogen, phosphorus, calories and cell wall material were determined in 27 species of aquatic plants from the Central Amazon. Replicates of the ten commonest species were collected from the most widely differing habitats. Of the remaining species only a couple of samples were analysed. Aquatic macrophytes had particularly high levels of phosphorus and potassium compared with levels in the soils and waters of the region. Compared with macrophytes from elsewhere, calcium was extremely low in the Amazon material. Floating species had significantly greater ash, magnesium and calcium values than the rooted species but lower dry matter and cell wall content. Levels of all the nutrient elements correlated negatively with cell wall values. It is suggested that aquatic plants of the area act as nutrient reservoirs in the water bodies, particularly the varzea lakes, and that they play a major role in the biogeochemical cycling in the aquatic ecosystems of the varzea. They also have potential for use as green manures or as livestock fodder because of relatively high nutrient concentrations compared with soils and terrestrial vegetation. (Coyle--Wisconsin)
W78-03831

LIMNOLOGICAL STUDIES IN A LARGE, DEEP OLIGOTROPHIC LAKE (LAKE OHRID, YUGOSLAVIA). A SUMMARY OF NUTRITIONAL RADIOBIOASSAY RESPONSES OF THE PELAGIAL PHYTOPLANKTON,
Dartmouth Coll, Hanover, NH. Dept. of Biological Sciences.
H. L. Allen, and B. T. Ocevski.
Hydrobiologia, Vol 53, No 1, p 49-54, 1977. 4 fig, 15 ref. NSF GB-35374.

Descriptors: *Primary productivity, *Phytoplankton, *Lake Ohrid(Yugoslavia), *Bioassay, *Plant growth stimulation, *Oligotrophy, Pelagial phytoplankton, Plant growth, Photosynthesis, Glucose, Acetate, Inorganic phosphorus, Eutrophication.

In a study of nutritional factors that have controlling or regulating influence on pelagial phytoplankton primary productivity rates in Lake Ohrid, Yugoslavia, more than 140 bioassays were conducted throughout the pelagial water column minimally to a depth of 100 m, and frequently to 150 m. Bioassay measurements showed strong depth of 100 m, and frequently to 150 m. Bioassay measurements showed strong stimulation to phytoplankton photosynthesis rates during most seasons in epilimnetic waters following microadditions of inorganic silica and iron. Photosynthetic stimulation was additive for individual elements and synergistic when simultaneous additions were made. Addition of nitrilotriacetic acid stimulated photosynthetic rates, frequently at a depth of 150 m, considerable below the optimal intensity of photosynthetic light. Inorganic phosphorus was more stimulative than nitrogen. However, its stimulation was restricted primarily to the periods of spring and summer production. Glucose, acetate, glycine, gibberellic and indoleacetic acids also produced positive responses. B12 was the only vitamin creating a response. Results of these bioassay measurements indicate that the pelagial phytoplankton productivity in Lake Ohrid is nutritionally severely restricted due to: (1) the specific seasonal and annual thermal stratification and light penetration characteristics, and (2) the availability of chelating agents as well as the availability of inorganic iron, silica, phosphorus, and possible vitamins. (Harris-Wisconsin)
W78-03832

DISSOLVED ORGANIC MATTER IN LAKE-WATER: CHARACTERISTICS OF MOLECULAR WEIGHT SIZE-FRACTIONS AND ECOLOGICAL IMPLICATIONS,
Dartmouth Coll., Hanover, NH. Dept. of Biological Sciences.
H. L. Allen.
Oikos, Vol 27, No 1, p 64-70, 1976. 2 fig, 2 tab, 31 ref. NSF 35374.

Descriptors: *Dissolved organic matter, *Molecular structure, *Decomposing organic matter, *Photosynthesis, *Star Lake(VT), *Nutrients, Lakes, Eutrophication, Weight, Lability, Sampling, On-site data collections.

Water samples were collected from Star Lake, Vermont to determine: (1) molecular weight size-fractions present; (2) their lability following exposure to high-intensity ultraviolet (UV) light, and their chelation-complexation capacity for inorganic iron; (3) bacterial chemo-organotrophic utilization of glucose and changes in dissolved organic carbon molecular weight size-fractions following bacterial release of extra cellular products. Results of fractioning 11 surface samples over a four month period show that the mean dissolved organic carbon concentrations were highest (2.79+or-1.80 and 2.49+or-1. 01 mg C per liter) in largest (greater than 100,000) and smallest (less than 500) molecular weight fractions, with minimum carbon concentrations present in fraction with molecular weight between 10,000 and 2000. High molecular weight fractions (greater than 50,000) and low molecular weight fractions (less than 500) were labile (about 50% decomposed in 4 hours) and showed increased chelation-complexation capacity for inorganic iron following exposure to the UV light. Intermediate fractions (50,000-2000) were refractory following UV exposure. Bacterial C14-labelled extracellular products decomposed at different rates in comparison with C12 organic compounds in individual weight fractions following UV light exposure, suggesting qualitative differences among the molecular weight fractions. (Harris-Wisconsin)
W78-03833

RECENT SEDIMENTATION AND RESUSPENSION OF ORGANIC MATTER IN EUTROPHIC LAKE ESROM, DENMARK,
Copenhagen Univ. (Denmark). Freshwater Biological Lab.
E. Lastein.
Oikos, Vol 27, No 1, p 44-49, 1976. 4 fig, 2 tab, 22 ref.

Descriptors: *Sedimentation, *Sedimentation rates, *Organic matter, *Lake Esrom(Denmark), Suspended solids, *Phytoplankton, Eutrophication, Seasonal, Lakes, Primary productivity.

A study was made to relate phytoplankton production to the rates of sedimentation and resuspension in eutrophic Lake Esrom, Denmark. Both primary phytoplankton production and sedimentation show very low values in winter. While the maximal phytoplankton production occurs in April and August-September, maximal sedimentation occurs in April-May after spring bloom and in October following the autumn overturn. Primary phytoplankton production was 460 g sq m per year. If 70% of the organic matter thus produced is consumed through respiration and mineralization of the water column, 140 g of organic matter is left for sedimentation. Organic matter is produced under the surface of the whole lake. However, it is probably sedimented only in the profundal area, which amounts to one half of the total lake surface. Therefore 280 g sq m per year of organic matter should be available for sedimentation. This value is in agreement with the measured sedimentation of 215 g sq m per year of organic matter. Resuspension contributed 155 g sq m per year of dry matter to the dry weight total of 635 g sq m sedimented annually in Lake Esrom. (Harris-Wisconsin)
W78-03834

INFLUENCE OF LOW TEMPERATURES ON THE SURVIVABILITY OF SELECTED SPECIES OF ALGAE,
Instytut Zootechniki, Zator (Poland).
M. Nowak, and T. Bednarz.
Acta Hydrobiologica, Vol 18, No 4, p 331-343, 1976. 2 fig, 8 tab, 15 ref.

Descriptors: *Algae, *Temperature, *Cold resistence, *Freezing, Research materials handling, *Basic data collections, *Chlorphyta, *Cyanophyta, Poland, Storage, Survival, Senedesmus acutus, Senedesmus quadricauda, Anabaena variabilis, Chlorella pyrenoidosa, Hormidium flaccidum, Stichococcus, Sampling, Quality control.

Eight green and blue-green algae were exposed to temperatures ranging from -6 to -196C in various preservatives to determine methods of maintaining the vitality of algae stored in collections. Deep freezing in liquid nitrogen at -196C is advised for long-term storage of the Polish freshwater chlorophytes Senedesmus acutus and S. quadricauda, and the freshwarter cyanophyte Anabaena variabilis, using 5% and 10% aqueous solutions of glycerol as preservatives. Almost unlimited storage can be achieved by this method. For other Polish freshwater chlorophytes--Chlorella pyrenoidosa, Hormidium flaccidum, and Stichococcus sp---the Best method is freezing at -6 to -8C with a 1% glucose solution as preservative, which permits storage up to 33 months. Two halophilous cyanophytes of foreign origin, Oscillatoria sp and Spirulina platensis, did not survive freezing at -6 to -8C. Only C. pyrenosa and S. Acutus were tested at -18 and -72C, and after 30 days attempts to revive them were unsuccessful. All algae subjected to freezing were cultured under optimal conditions, then centrifuged, washed with preservatives, suspended in fresh medium, incubated at room temperature for one hour, and transferred into Durham tubes. Samples were placed in a freezer to obtain -6 to -8C, in a vacuum flask with dry ice plus ethanol of -72C, and in a vacuum flask with liquid nitrogen for -196C. (Lynch-Wisconsin)
W78-03835

EVALUATION BY BIOASSAYS OF THE TOXICITY TO FISH OF SUGAR FACTORY AFFLUENTS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Zoology-Entomology.
H. S. Gill, and H. S. Toor.
Acta Hydrobiologica, Vol. 18, No. 4, p 323-329, 1976. 2 tab, 12 ref.

Descriptors: *Toxicity, *Fish, *Lethal limit, *Sugar industry effluents, *Bioassay, Carp, Water pollution effects, Industrial wastes, India, Probit analysis, Jagatjit Sugar Factory(Phagward Punjab India), Water pollution control.

Carp (Cyprinus carpio) exposed to effluents from the Jagatjit Sugar Factory, Phagwara, Punjab, India showed high mortality at all concentrations from 48-100%. Fish measuring 5.8-8.0 cm were tested in waste concentrations of 48%, 60%, 72%, and 100%, plus a control. Mortality was recorded at 24, 48, 72, and 96 hours to calculate the Median Tolerance Level (TLm), and the safe effluent concentration. Six fish were tested in each concentration. No mortality occurred in the control after 96 hours. In 48% waste concentration, there was 33.3% mortality in 24 hours, and 100% by 96 hours. In 60% concentration, 50% mortality was observed in 24 hours, and 100% in 72 hours. In 72% concentration, 66.7% died in 24 hours, and 100% in 72 hours. In 100% effluent, 50% died within 30 minutes and the rest within two hours. The pH value decreased from 7.85 in the control to 6.45 in 100% effluent. Using probit analysis, TLm values were estimated at 56.23% for 24 hours, and 49.45% for 48 hours. The safe concentration is established at 11.58% and effluents should be diluted below this level to eliminate directly harmful effects. Injury to the fish by the pollutants was due mainly to respiratory and circulatory failure through obstruction of gills with organic matter, and toxic action after absorption through gills, mouth lining, or gastro-intestinal tract. (Lynch-Wisconsin)
W78-03836

THE EFFECT OF ANAEROBIOSIS ON HETEROTROPHIC CULTURES OF THE ALGA CHLORELLA PYRENOIDOSA,
Instytut Zootechniki, Zator (Poland).
Z. Sikora
Acta Hydrobiologica, Vol. 18, No. 4, p 345-352, 1976. 8 fig, 11 ref.

Descriptors: *Algae, *Anaerobic conditions, *Growth rates, *Light intensity, *Chlorella pyrenoidosa, *Chlorophyta, Plant growth, Growth stages, Respiration, Mitochondria, Organelles, Glucose, Photoassimilation, Eutrophication.

A study of the effects of anaerobic conditions on the green alga Chlorella pyrenoidosa, grown on glucose in the photoassimilation of glucose phase in low light and in darkness, showed that in the presence of light the lack of oxygen does not limit growth nor affect cell organelle structure. In darkness, the lack of oxygen inhibits growth and results in destruction of cell organelles, especially of mitochondria, due to inhibition of cell respiration. Cultures of Chlorella pyrenoidosa were grown in test tubes on 5 ml of MM medium with 1% glucose, at a pH of 7.2 and a temperature of 27C. In experiments with light, intensity was 400 Lux. Three cultures were tested: (1) 25-cm test tubes plugged with cotton wool with normal air access and a volume of 20 sq cm over the culture; (2) small test tubes plugged with cotton wool with poor air access and a volume of 0.7 sq cm over the culture; and (3) small test tubes entirely filled with the medium, stopped with a cork and sealed with wax, with no air access. The number of cells was monitored at 48, 72, and 144 hours of culture. In light an almost identical growth was found in all cases, except that as the access of oxygen was limited, the length of lag of the growth phase increased. In darkness, as air access became more limited, growth was increasingly inhibited, and the lengthening of growth phase lag was even more pronounced. (Lynch-Wisconsin)
W78-03837

THE PROFUNDAL BENTHIC ENVIRONMENT OF TWIN LAKES, COLORADO,
Bureau of Reclamation, Denver, CO.
J. F. LaBounty, and J. J. Sartoris.
In: Studies of the Benthic Environment of Twin Lakes, Colorado, October 1976. p 1-28, 20 fig, 6 tab, 40 ref. REC-ERC-76-12.

Descriptors: *Distribution, *Benthic fauna, *Oligotrophy, *Larvae, *Twin Lakes(CO), Colorado, Lakes, Benthos, Limnology, Clams, Shrimp, Heavy metals, Anaerobic conditions, Trophic levels, Seasonal, Spatial distribution, Temporal distribution.

The first paper of a three-part study of the benthos of Twin Lakes, CO, focuses on composition, physical distribution, and seasonal distribution of benthic fauna, with a discussion of the growth of individual larvae. Twin Lakes is a pair of Rocky Mountain glacial lakes on Lake Creek, an Arkansas River tributary, in Lake County. The lakes are classified as relatively oligotrophic, second-class dimictic lakes, although the benthic fauna is more characteristic of mesotrophic lakes. The water temperature range is 0-20C; the lakes freeze over from December to May. Benthic samples were collected from both lakes during June 1974-April 1975. The ubiquitous mysis shrimp (Mysis relicta) was found on and within the bottom environment. Few benthic macrofauna were found, but were much more abundant in the lower lake than the upper lake, even though there is little limnological difference between the lakes. The upper lake presently has the most sparse benthic fauna of any lake reported, while the lower lake is about average. Mollusks included fingernail clams (Pisidium casertanum and P. pauperculum) and Diptera included midge-fly larvae (Chironomus sp, Phaenopsectra sp, and Dicrotendipes modestus). Chironomus was the most abundant group, increasing with depth; clams were found almost exclusively in the lower lake. A severe winter usually results in anaerobic bottom conditions and dissolved heavy metals in the upper lake. (See also W77-07806) (Lynch-Wisconsin)
W78-03838

AGING AND EVALUATION OF TWIN LAKES SEDIMENTS,
Colorado Cooperative Fishery Unit, Fort Collins
For primary bibliographic entry see Field 2J.
W78-03839

BACTERIOLOGICAL SURVEY OF TWIN LAKES, COLORADO,
Bureau of Reclamation, Denver, CO.
W. O. Deason.
In: Studies of the Benthic Environment of Twin Lakes, Colorado, October 1976. p 41-47, 1 fig, 4 tab, 19 ref. REC-ERC-76-12.

Descriptors: *Bacteria, *Coliforms, *Corrosion, *Twin Lake(CO), Lakes, Colorado, Water pollution sources, Recreation, Environmental effects, Pipes, Powerplants, Bioindicators.

Sampling of water for bacterial content at six stations in Twin Lakes, Colorado, indicated that the two lakes currently have low total fecal coliform densities. Samples were obtained during June-September 1975, prior to the opening of the Mt. Elbert Pumped-Storage Powerplant. Bottom samples from four permanent stations show that bottom muds are relatively free of coliform bacteria (less than 100 per gram), but contain high concentrations of iron bacteria (40-2400 MPN/g) and detectable amounts of sulfur bacteria. It is concluded that pipe corrosion could occur where buried pipe would be wet most of the time and anaerobic conditions exist. Large, high-velocity pipes highly aerobic water may not be affected unless stagnant areas develop near pipe walls and seams. Twin Lakes, a pair of glacial lakes in the Rocky Mountains, is a popular recreation area and thus susceptible to bacterial water pollution. Samples taken on the upper lake yielded higher total coliform counts (mean 3.1-6.4 than the lower lake; the highest counts on the upper lake (10-25) were recorded during September, probably due to higher air temperatures and increased visitor use. (See also W77-07806) (Lynch-Wisconsin)
W78-03840

CONCENTRATION OF TOTAL THIAMINE IN ORGANS AND TISSUES OF FISHES FROM THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
O. M. Arsan, and A. Ya. Malyarevskaya.
Gidrobiol Zh. 10(6), p 91-93, 1974.

Descriptors: *Cyanophyta, *Eutrophication, Water pollution effects, Algae, Bream, Fish, Intestine, *Kremenchug Reservoir(USSR), Liver, Loach, Muscle, Perch, Reservoirs, Rudd, *Thiamine(Fish).

The content of total thiamine in the liver, intestine and muscles of perch, rudd, loach and bream from the Kremenchug Reservoir on the Dnieper River (USSR) was determined in late June-early July and late Sept.-early Oct., i.e., when an intense bloom of blue-green algae was present and absent, respectively. The content of total thiamine in fishes caught from the reservoir was related to the algal bloom. The season also affects its content in the liver, intestine and muscles of the fishes.--Copyright 1975, Biological Abstract, Inc.
W78-03862

WASTE DISPERSION CHARACTERISTICS AND EFFECTS IN AN OCEANIC ENVIRONMENT,
Du Pont de Nemours (E.I.) and Co., Wilmington, DE. Engineering Dept.
L. L. Falk, T. D. Myers, and R. V. Thomann.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 157, Price codes: A14 in paper copy, A01 in microfiche. Environmental Protection Agency Cincinnati, Ohio, Office of Research and Development Re-

port No. EPA-600/2-77-112, June 1977. 318 p, 22 fig, 29 tab, 39 ref. EPA 12020 EAW.

Descriptors: *Waste disposal, *Dispersion, *Water pollution effects, Environmental effects, Mathematical models, Benthos, *Outer Continental Shelf, Echinarachnius parma.

Operation of a waste disposal system for oceanic dispersion offered an opportunity to develop a mathematical model of dispersion behind a moving barge. The model takes into account the vertical temperature-density structure of the ocean, and the density and settling characteristics of the wastes. It was verified with several sets of field data obtained behind the barge. Results show, and the model reproduces, that the wastes do not reach the ocean bottom when a thermocline is present. They are distributed from top to bottom (140 ft) when the ocean is isothermal. Studies on marine life of the disposal area showed no changes definitely attributable to the disposal operation. Additional information is needed to establish whether a seasonal fluctuation of dead sand dollars, Echinarachnius parma, a benthic organism, is a natural phenomenon or can be attributed to wastes reaching the bottom. Cost data on the barging operation are given. (Sinha - OEIS)
W78-03874

DREDGE DISPOSAL STUDY. SAN FRANCISCO BAY AND ESTUARY. MAIN REPORT.
Army Engineer District, San Francisco.
For primary bibliographic entry see Field 5E.
W78-03875

FLOW AND MAIN ELEMENTS OF BALANCE OF BIOGENIC SUBSTANCES AND MAIN IONS IN THE KIEV RESERVOIR, (IN RUSSIAN),
Akademiya Nauk USRS, Kiev. Inst. Hidrobiologii.
A. I. Denisova.
Gidrobiol Zh. 10(6), p 5-12, 1974.

Descriptors: *Iron, Sedimentation, Rivers, *Silicon, *Phosphorus, Water pollution effects, *Biogenic elements, *Eutrophication, Flow, *Ions, *Kiev, Reservoir(USSR), Ukrainian-SSR.

Calculation of the inflow of biogenic substances and main ions of the Kiev (Ukrainian SSR, USSR) water storage basin and outflow into the after bay showed that the sedimentation of Fe brought into the storage basin with surface outflow and its accumulation take place at the expense of inter-basin processes. Silicon and P are also accumulated. For the last 15 yr the content of mineral N has increased showing that these rivers have become eutrophic--Copyright 1975, Biological Abstracts, Inc.
W78-03878

MARINE STUDIES OF SAN PEDRO, CALIFORNIA. PART II. POTENTIAL EFFECTS OF DREDGING ON THE BIOTA OF OUTER LOS ANGELES HARBOR. TOXICITY, BIOASSAY AND RECOLONIZATION STUDIES.
University of Southern California, Los Angeles. Allan Hancock Foundation; and University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 858, Price codes: A15 in paper copy, A01 in microfiche. June 1976. 330 p, 4 append. Soule, D.F. and Oguri, M. (Eds.).

Descriptors: *Baseline studies, *Water pollution effects, *Pollutant identification, *Dredging, California, Harbors, Heavy metals, Resources development, Environmental effects, *Los Angeles Harbor(Calif).

This volume contains the following studies: Potential ecological effects of hydraulic dredging in Los Angeles Harbor: An overview; Resuspended sediment elutriate studies on the northern anchovy; Effects of Los Angeles Harbor sediment elutriate on the California killifish, Fundulus pravipinnis and white croaker, Genyonemus lineatus; Toxicity and heavy metals in three species of crustacea from Los Angeles Harbor sediments; Bioassay and heavy metal uptake investigations of resuspended sediment on two species of polychaetous annelids; Biomass and recolonization studies in the outer Los Angeles Harbor; and Water quality evaluation of dredged material disposal from Los Angeles Harbor. There is also data appended as: Computer mapping of pollutants in Los Angeles Harbor; Concentrations of trace elements and chlorinated hydrocarbons in marine fish; Concentrations of trace metals in marine organisms; and Primary productivity, chlorophyll a, and assimilation ratios in Los Angeles-Long Beach Harbor, 1973 and 1974. (See also W78-03883 thru W78-03389) (Sinha-OEIS)
W78-03882

POTENTIAL BIOLOGICAL EFFECTS OF HYDRAULIC DREDGING IN LOS ANGELES HARBOR: AN OVERVIEW,
University of Southern California, Los Angeles.
D. F. Soule, and M. Oguri.
In: 'Marine Studies of San Pedro Bay, California. Part II,' June 1976. p. 1-14, 2 fig, 17 ref.

Descriptors: *Dredging, *Water pollution effects, *Sediments, Baseline studies, Resources development, California, Biological effects, Los Angeles Harbor.

In Los Angeles Harbor, the main channel borders the Palos Verdes Hills at the western edge of the estuarine Los Angeles River depositional area, which is part of San Pedro Bay. Areas of the bay sheltered behind the federal breakwater are divided politically into the Port of Los Angeles on the west, The Port of Long Beach in the center aong with the U.S. Navy facility, and a City of Long Beach Harbor area lying to the east. Harbor channels were dredged to 35 feet a number of years ago, but subsidence due to pumping of the underlying oil fields caused parts of the Long Beach main channel and Cerritos Channel to sink about 60 foot depths. Both ports now require increased channel depths, as well as additional areas capable of handling containerized cargo, and gas and oil tankage or pumping facilities, but the Port of Los Angeles is especially handicapped by its shallow channels. The original estuarine channels and the flood plains draining the Los Angeles basin have long since been channelized, filled or blocked by development, so that recreating a natural estuary would be virtually impossible in the heavily urbanized area. (See also W78-03882) (Sinha-OEIS)
W78-03883

RESUSPENDED SEDIMENT ELUTRIATE STUDIES ON THE NORTHERN ANCHOVY,
University of Southern California, Los Angeles. Allan Hancock Foundation.
For primary bibliographic entry see Field 5A.
W78-03884

EFFECTS OF LOS ANGELES HARBOR SEDIMENT ELUTRIATE ON THE CALIFORNIA KILLFISH, FUNDULUS PARVIPINNIS AND WHITE CROAKER, GENYONEMUS LINEATUS,
University of Southern California, Los Angeles. Allan Hancock Foundation.
D. W. Chamberlain.
In: 'Marine Studies of San Pedro Bay, California, Part II', June 1976. p. 33-48, 5 fig, 1 tab, 8 ref.

Descriptors: *Toxicity, *Water pollution effects, Sediments, Dredging, Biological effects, *Fundulus parvipinnis, *Genyonemus lineatus.

California killifish, Fundulus parvipinnis, were held in 5-gallon aquaria for a period of 96 hours to test toxic effects of elutriate from sediments from three stations. One fish died during the 96 hours. Ten fish died in the subsequent 22 days of observation. Dissolved oxygen, pH, specific gravity, temperature and nitrite-nitrogen parameters in the water were monitored periodically. Fish were not fed during the experiment. Deaths were probably related to lack of food rather than to the presence of any toxic substances in the eluriate. The white croaker, Genyonemus lineatus, showed no toxic effects in 96-hour elutriate tests from one station. Deaths in the 28-day tests seemed attributable to primary or secondary effects of starvation. Tissue analysis after the 14-day exposure to elutriate indicated increases of 1.5-2 times over control fish levels of eight trace metals. (See also W78-03882) (Sinha-OEIS)
W78-03885

TOXICITY AND HEAVY METALS UPTAKE IN THREE SPECIES OF CRUSTACEA FROM LOS ANGELES HARBOR SEDIMENTS,
University of Southern California, Los Angeles. Allan Hancock Foundation.
J. R. McConaugha.
In: 'Marine Studies of San Pedro Bay, California, Part II', June 1976. p 49-67, 1 fig, 8 tab, 24 ref.

Descriptors: *Toxicity, *Heavy metals, *Water pollution effects, *Dredging, Sediment, *Crustaceans, California, Los Angeles Harbor, Acartia tonsa, Tisbe sp. Pachygrapeus crassipes.

Two species of crustaceans, Acartia tonsa and Tisbe sp., were subjected to the filtrate fraction of resuspended sediments from 12 stations in the Los Angeles Harbor. The 96 hour bioassays for A. tonsa produced significant reductions in the survival rates of test groups at stations LNG-6, LNG-7, 16, 17, 18, 24, and 27. In the Tisbe bioassays only station LNG-7 had singificantly lower survival in the test group than in controls, while test group survival at stations LNG-4, -25 and -27 were significantly higher than control survival. This data suggests that dredging operations could have an adverse effect on the A. tonsa population and consequently an effect on the plankton composition and food chain in the Los Angeles Harbor. However, the stations with poorest quality are in the area to be filled. Additional experiments were conducted to determine if the lined shore crab, Pachygrapsus crassipes, was capable of accumulating heavy metals from resuspended sediments. Following a 7 day exposure to the sediment elutriate the gill tissue was examined for 9 heavy metals. Because of extreme variations in the data no discernible trends were observed. (See also W78-03882) (Sinha-OEIS)
W78-03886

BIOASSAY AND HEAVY METAL UPTAKE INVESTIGATIONS OF RESUSPENDED SEDIMENT ON TWO SPECIES OF POLYCHAETOUS ANNELIDS,
University of Southern California, Los Angeles. Allan Hancock Foundation.
R. R. Emerson.
In: 'Marine Studies of San Pedro Bay, California, Part II', June 1976. p. 69-90, 1 fig, 10 tab, 16 ref.

Descriptors: *Bioassay, *Heavy metals, *Toxicity, *Water pollution effects, Sediments, Dredging, California, Los Angeles Harbor, Biological effects, Polychaetous annelids, Capitella capitata, Ophryotrocha sp.

Two species of polychaetous annelids (Capitella capitata and Ophryotrocha sp.) were used in a series of bioassays to determine the toxicity of resuspended sediments from fourteen stations in Los Angeles Harbor. Significant mortality did not occur in either short-term (96-hour) or long-term (28-day) bioassays using Ophryotrocha sp. Numbers of offspring were significantly reduced in all

sediments except the outermost harbor station (LNG-1), indicating sublethal effects. Development success of Capitella capitata larvae ranged from 40% to 95%. The more grossly contaminated sediments yielded lower numbers of successfully developing larvae but higher growth rates in the surviving larvae. Contamination levels of the sediments correlated more closely with sediment particle size than with distance from the outside harbor. Heavy metal concentrations in the tissues of Capitella capitata did not correspond with sediment contamination levels. Resuspended sediment may result in 'scavenging' which lowers the concentration of some heavy metals in the seawater. (See also W78-03882) (Sinha-OEIS)
W78-03887

BIOMASS AND RECOLONIZATION STUDIES IN THE OUTER LOS ANGELES HARBOR,
University of Southern California, Los Angeles. Allan Hancock Foundation.
D. F. Soule.
In: 'Marine Studies of San Pedro Bay, California, Part II', June 1976. p 91-153, 13 fig, 28 tab.

Descriptors: *Biomass, *Benthos, *Water pollution effects, *Baseline studies, Dredging, Outfall sewers, California, Los Angeles Harbor, Recolonization.

Benthic biomass sampling in areas of proposed dredging of a new chip channel and adjacent underwater landfill showed a zone near the shoreline and waste outfalls of low biomass and outer areas of higher standing stock. These data were compared with five years of monthly water column biomass sampling with settling racks. Recolonization studies were carried out using jars supplied with newly exposed sediments or existing site sediments. Few significant differences were found between the two types of sediments, but spatial and seasonal differences in species and biomass were observed. The dominant species in recolonizing were less prominent in mature communities at the sites. However, most species that dominate mature communities were present as early as within the six week exposure periods. (See also W78-03882) (Sinha-OEIS)
W78-03888

WATER QUALITY EVALUATION OF DREDGED MATERIAL DISPOSAL FROM LOS ANGELES HARBOR,
University of Southern California, Los Angeles. Environmental Engineering Program.
K. Y. Chen, and C. C. Wang.
In: 'Marine Studies of San Pedro Bay, California, Part II', June 1976. p 155-236, 16 fig, 34 tab, 24 ref.

Descriptors: *Water quality, *Water pollution effects, *Dredging, Waste disposal, Heavy metals, California, Los Angeles Harbor, Chlorinated hydrocarbons.

This study was initiated in December 1973 with special emphasis on the physico-chemical characterization of sediments from the Los Angeles Harbor area, and the evaluation of potential water quality degradation resulting from the disposal of dredged and fill material. The short-term and long-term effects on water quality were investigated in conjunction with several treatment procedures. (See also W78-03882) (Sinha-OEIS)
W78-03889

EFFECT OF SUBLETHAL METAL POLLUTANTS ON THE FIDDLER CRAB UCA PUGILATOR,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
W. B. Vernberg, and P. J. DeCoursey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 940, Price codes: A04 in paper copy, A01 in microfiche. Ecological Research Series. Report EPA-600/3-77-024, Feb. 1977, 57 p, 25 ref, 44 fig, 6 tab.

Descriptors: *Larval growth stage, *Cadmium, *Mercury, *Temperature, *Salinity, *Shellfish, *Crabs, *Absorption, *Metabolism, Animal behavior, Environmental effects, Enzymes, Crustaceans, Invertebrates, Metals, Laboratory tests, Bioassay, Stress, Growth stages, Biochemistry, Animal physiology, Water pollution effects, *Sublethal effects, Synergistic effects, Bioaccumulation.

Studies have been carried out on the synergistic effects of sublethal concentrations of mercury (Hg) and/or cadmium (Cd) in conjunction with temperature and salinity stress on larval and adult fiddler crabs, Uca pugilator. Six biological parameters of the adult organism were monitored including survival, tissue uptake, metabolism, behavior, microscopic anatomy, and enzymatic activity, using metal concentrations of 0.18 ppm Hg and 1.0 ppm Cd. Studies with larval stages (zoeal stages I, III, V and megalops) considered survival, metabolism and behavior under conditions of 1.8 ppb Hg and 1.0 ppb Cd. The effect of mercury or cadmium on Uca pugilator depends upon a number of factors, including stage of the life cycle, sex, thermal history, and environmental conditions. Data presented here suggest that the mode of action of the two metals is not the same. (Katz)
W78-03919

EFFECTS OF HYDROGEN SULFIDE ON FISH AND INVERTEBRATES PART I-ACUTE AND CHRONIC TOXICITY STUDIES,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries, and Wildlife.
L. L. Smith, Jr., D. M. Oseid, I. R. Adelman, and S. J. Broderius.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 410, Price codes: A14 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA-600/3-76-062a, 286 p, 1977. 8 fig, 136 tab, 39 ref.

Descriptors: *Toxicity, *Sulfides, *Hydrogen sulfide, *Freshwater fish, *Invertebrates, Path of pollutants, Suckers, Brook trout, Rainbow trout, Salmonids, Lethal limit, Mortality, Growth stages, Bioassay, Resistance, Growth rates, Temperature, Fish reproduction, Fish physiology, Fish behavior, *Environmental effects, Methodology, Seasonal, *Bioaccumulation, *Fathead minnows, Goldfish, Bluegill, Walleye, White sucker, Asellus, Crangonyx, Gammarus, Baetis, Hexagenia, Ephemera, Procambarus, Cambarus.

Acute and chronic toxicity of hydrogen sulfide to seven fish species and eight invertebrates were determined in continuous-flow bioassays. In 159 acute tests lethal threshold concentration for juvenile fish varied from 0.0087 mg/liter in rainbow trout to 0.0840 mg/liter in goldfish. Except in goldfish, the fry stage was up to three times more sensitive than the juvenile. For invertebrates the 96-hr LC50 ranged from 0.020 mg/liter in Baetis to 1.070 mg/liter in Asellus. Acute toxicity of H2S to fathead minnows varied 24-fold between 6.5 and 24.0C. Temperature effects were not as marked on invertebrates. In chronic exposure to H2S, maximum no-effect concentration to fish ranged from 0.0004 mg/liter in bluegills to 0.0100 mg/liter in goldfish. No-effect level was determined from growth, survival, reproduction, or swimming performance. Maximum safe levels ranged from 0.0012 mg/liter in Gammarus to 0.0152 mg/liter in Hexagenia. (See also W77-04552) (Klein)
W78-03920

ACUTE AND CHRONIC TOXICITY OF CHLORDANE TO FISH AND INVERTEBRATES,
Chemico Process Plants Co., El Monte, CA. Envirogenics Systems.
R. D. Cardwell, D. G. Foreman, T. R. Payne, and D. J. Wilbur.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 344 Price codes: A07 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-77-019, February 1977. 125 p, 50 tab, 1 fig, 99 ref.

Descriptors: *Bioassays, Laboratory tests, *Freshwater fish, Sunfish, *Brook trout, *Daphnia, Crustaceans, Zooplankton, *Aquatic insects, Mortality, *Chlorinated hydrocarbon pesticides, Insecticides, Amphipoda, Growth, Reproduction, *Bluegill sunfish, Lepomis, *Fathead minnow, Pimephales, Salvelinus, Daphnia magna, *Hyallela, Midges, Chironomus, Flow through bioassays, Whole body residues, *Chronic effects.

The acute and chronic toxicity of technical chlordane to bluegill, fathead minnow, brook trout, Daphnia, Hyallela, and Chironomus No. 51 were determined with flow-through conditions. The purpose was to estimate concentrations producing acute mortality and those having no effect on the long-term survival, growth, and reproduction of the various species. Whole body residues of technical chlordane components were measured in the three invertebrate species at the end of the chronic exposure tests. Concentrations of technical chlordane causing 50% mortality in 96 hr were 36.9 micrograms/l for fathead minnow, 47 micrograms/l for brook trout, and 59 micrograms/l for bluegill, while that causing 50% immobilization in the cladoceran, D. magna, was 28.4 microgram/l. The amphipod, H. azteca, was only slightly affected at 96 hr by the chlordane concentrations tested, and the 168 hr EC50 was 97.1 micrograms/l. Acute mortality of midges, Chrionomus No. 51, was not successfully evaluated. With respect to the test conditions employed and life cycle stages evaluated, the lowest concentrations of technical chlordane found to cause major chronic effects were 0.32 micrograms/l for brook trout, 1.22 micrograms/l for bluegill, 1.7 micrograms/l for midges, 11.5 micrograms/l for amphipods, and 21.6 micrograms/l for cladocerans. (Katz)
W78-03921

EFFECTS OF POLLUTANTS ON SUBMARINE PLANT SYNECOLOGY,
Western Washington State Coll., Bellingham.
M. A. Dube.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 675, Price codes: A04 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-77-020, February 1977. 44 p, 7 tab, 10 fig.

Descriptors: Water quality, Biomass, *Aquatic plants, Ecology, Marine algae, *Marine plants, *Industrial wastes, *Mineral industry, *Oil wastes, Plant groupings, Kelps, Water pollution effects, Methodology, Environmental effects, *Washington, Standing crops, Sedimentation, Cherry Point, Puget Sound, Nooksack River, *Oil refinery, *Aluminum reduction plant, Bull kelp, Nereocystis, Respiration rate.

Synecology of marine plant communities has been studied in Northern Puget Sound. Major sources of pollutants include the Nooksack River, an oil refinery and an alumina reduction plant. A method of analysis involving comparisons of standing crops of species within the communities, standing crop of groups of morphologically similar species, and standing crop of entire communities is described. Stable species of the community are distinguished as well as those which appear to be indicators of environmental change. The floating bull kelp, Nereocystis leutkeana, is shown to have a depressing effect of standing crop and on the presence of other elements of the community. An increased respiration rate in kelps exposed to aluminum plant effluent was measured. Physical factors of the environment were measured. Poorer conditions for growth of algae in the environs of the aluminum company following its expansion are indicated by the accumulation of silt, the decrease

in standing crop, and a loss of certain species. (Katz)
W78-03922

BEHAVIOR OF MERCURY, CHROMIUM, AND CADMIUM IN AQUATIC SYSTEMS,
Georgia Univ., Athens. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-03923

EFFECTS OF COPPER AND ZINC ON SMOLTIFICATION OF COHO SALMON,
Oregon Dept. of Fish and Wildlife, Corvallis.
H. W. Lorz, and B. P. McPherson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 304, Price codes: A05 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-77-032, March 1977. 68 p, 14 tab, 19 fig, 40 ref.

Descriptors: *Copper, *Zinc, *Metals, Water pollution effects, Salmon, Juvenile fish, Fish behavior, Fish physiology, Freshwater, Enzymes, *Fish migration, Bioassay, Methodology, Mortality, Seawater, Fish growth, *Coho salmon, Sublethal levels, *Osmotic control, *Ionic control, ATPase activity.

In this study, exposure of smolt age coho to sublethal levels of copper in freshwater interfered with normal osmotic and ionic control in blood plasma; when the copper exposed fish were transferred to seawater the plasma osmolarity and chloride concentrations increased significantly, compared to controls, and many died. These responses were attributed in part to an observed suppression of NA+ and K+ - activated ATPase activity in the gills of copper exposed fish. The most sensitive latent effect of exposure to sublethal levels of copper was the failure of copper exposed coho smolts to migrate successfully following release into a natural stream. All copper concentrations tested (5-30 micrograms/l produced adverse effects and were well below the 96-hr LC50 (60-74 micrograms/l). Exposure to sublethal levels of zinc produced no similar adverse effects. (Katz)
W78-03924

A CONTROLLED BIOASSAY SYSTEM FOR MEASURING TOXICITY OF HEAVY METALS,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 5A.
W78-03926

DISSOLVED OXYGEN TEMPERATURE, SURVIVAL OF YOUNG FISH AT FISH SPAWNING SITES,
North Dakota State Univ., Fargo. Dept. of Zoology.
J. J. Peterka, and J. S. Kent.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 139, Price codes: A03 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA-600/3-76-113, December 1976. 35 p, 15 tab, 8 fig, 6 ref.

Descriptors: Freshwater fish, Fish eggs, Fish reproduction, Fish hatcheries, Fish physiology, *Dissolved oxygen, *Temperature, Water temperature, *Mortality, Bioassay, *Bass, *Sunfishes, *Pikes, On-site-investigations, Fluctuations, Juvenile fish, *Dissolved gases, Northern pike, *Smallmouth bass, Natural habitat, *Dissolved oxygen fluctuations.

Fluctuations of dissolved oxygen concentrations and water temperatures in their natural spawning sites were measured during embryo through larva stages of northern pike (Esox lucius), and during embryo and sac larva stages of bluegills (Lepomis macrochirus), and pumpkinseeds (Lepomis gibbosus). At northern pike sites, dissolved oxygen concentrations from combined measurements 1 and 10 cm from the bottom ranged from 0.0-16.6 mg/liter, and water temperatures from 2.5-23.0C; average daily fluctuations were 3.0 mg/liter and 1.6C. For bluegill and pumpkinseed nests, dissolved oxygen concentrations 1 cm from the bottom ranged from 2.4-18.2 mg/liter and water temperatures from 15.0-27.5C, with average daily fluctuations of 4.4 mg/liter and 3.3C. In field experiments to determine acute effects of a single exposure to low dissolved oxygen concentrations, tolerance decreased from embryo to larva stages for northern pike and from embryo to sac larva stages from bluegills and smallmouth bass (Micropterus dolomieui). (Katz)
W78-03927

TRANSPORT OF GRANITIC SEDIMENT IN STREAMS AND ITS EFFECTS ON INSECTS AND FISH,
Cooperative Fisheries Research Unit, Moscow.
For primary bibliographic entry see Field 2J.
W78-03928

EFFECTS OF FEEDLOT RUNOFF ON FREE-LIVING AQUATIC CILIATED PROTOZOA,
Illinois Univ. at Urbana-Champaign. Dept. of Veterinary Pathology and Hygiene.
For primary bibliographic entry see Field 5B.
W78-03929

HEALTH SIGNIFICANCE OF KLEBSIELLA PNEUMONIAE IN DRINKING WATER EMANATING FROM REDWOOD TANKS,
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 5F.
W78-03933

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA: SUBPROJECT NO. 3. SOME EFFECTS OF SHORT-REACH CHANNELIZATION ON FISHES AND FISH FOOD ORGANISMS IN CENTRAL IOWA WARMWATER STREAMS,
Iowa Cooperative Fishery Unit, Ames.
L. R. King, and K. D. Carlander.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 078, Price codes: A11 in paper copy, A01 in microfiche. Fish and Wildlife Service, Report FWS/OBS-76-13, April 1976. 217 p, 51 tab, 6 fig, 29 ref.

Descriptors: Iowa, *Streams, Freshwater fish, *Channel improvement, Channel morphology, Channeling, *Channels, Fish populations, Fish food organisms, Fish harvest, Water quality, Dissolved oxygen, Invertebrates, Turbidity, On-site-investigations, *Bridge construction, *Brush shelter, *Unchannelized streams.

There was no evidence that dissolved oxygen, turbidity, or stream macro-invertebrates as measured by core, drift, or artificial substrate samples differed upstream, in the channel, or below. Reduction of brush substrate in the channel and downstream would mean reduction in invertebrate prodiction, however. More fish species were collected by electroshocking in unchannelized than in channelized localities in 5 of the 6 streams and in the 6th the number of species was the same in both localities. In 2 recently channelized streams that lacked cover in the channel, catches of fish were significantly less in the channelized than in the unchannelized localities, but in 3 streams channelized 10 to 15 years where some cover had developed, catches in the channel runs were similar or significantly greater than in unchannelized runs. In the unchannelized locations, however, more of the fish were in brush and total populations were not adequately represented by electroshocking in the runs. The most evident impact of short-reach channelization is the removal of cover in the altered area and the loss of stream length. (See also W76-12231) (Katz)
W78-03935

STUDIES OF THE ECOLOGICAL IMPACT OF REPETITIVE AERIAL APPLICATIONS OF HERBICIDES ON THE ECOSYSTEM OF TEST AREA C-52A, EGLIN AFB, FLORIDA,
Arment Development and Test Center, Eglin AFB, FL.; and Air Force Armament Lab., Eglin AFB, FL.
For primary bibliographic entry see Field 5A.
W78-03937

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS,
Syracuse Research Corp., NY. Center for Chemical Hazard Assessment.
S. S. Lande, J. Santodonato, P. H. Howard, D. Greninger, and D. H. Christopher.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 910, Price codes: A10 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 560/2-76-007, August 1976. 192 p, 54 tab, 10 fig, 353 ref.

Descriptors: *Phosphates, *Organophosphorous pesticides, *Toxicity, *Industrial wastes, *Insecticides, Path of pollutants, Environmental effects, Pesticides, Water pollution sources, Water pollution effects, Monitoring, Metabolism, Water quality standards, Haloalkyl phosphates, Mutagens, Carcinogens, Teratogens, Fire retardants, Cholinesterase inhibitors, Naled, Dichlorvos.

This report reviewed the potential environmental hazard from the commercial use of haloalkyl phosphate (HAP). Emphasis was placed mostly on the four tris(haloalkyl) phosphates which are used as fire retardants. Data on the two pesticide HAP's naled and dichlorvos, were used for comparison purposes. The tris-HAP's (1) are produced in significant quantities, (2) have several potential sources of environmental contamination, (3) have an unknown fate in the environment, (4) may act as cholinesterase inhibitors, and (5) are potentially carcinogenic and mutagenic. (Katz)
W78-03938

MARINE DIATOMS GROWN IN CHEMOSTATS UNDER SILICATE OR AMMONIUM LIMITATION. IV. TRANSIENT RESPONSE OF CHAETOCEROS DEBILIS, SKELETONEMA COSTATUM, AND THALASSIOSIRA GRAVIDA TO A SINGLE ADDITION OF THE LIMITING NUTRIENT,
Washington Univ., Seattle. Dept. of Oceanography.
H. L. Conway, and P. J. Harrison.
Marine Biology, Vol. 43, 1977, p 33-43, 7 fig, 8 tab, 15 ref.

Descriptors: *Bioassay, *Phytoplankton, *Diatoms, *Nutrients, Laboratory tests, *Ammonium compounds, Ammonium salts, Plant growth, Algae, *Plant physiology, Plant population, Water quality, Primary productivity, Silicates, Kinetic response, Ammonium limited, Silicate limited, Ammonium starved, Silicate starved, Limiting nutrients, Nutrient starvation, Nutrient depleted.

The kinetic response of ammonium- or silicate-limited and ammonium- or silicate-starved populations of Chaetoceros debilis, Skeletonema costatum, and Thalassiosira gravida was determined by a single addition of the limiting nutrient to a steady-state culture and subsequent monitoring of the nutrient disappearance of the limiting and non-limiting nutrients at frequent time intervals. The kinetic response of non-limited (nutrient) populations of these three species was also determined. Three distinct modes of the uptake of the

limiting nutrient were observed for ammonium- or silicate-limited populations of these three species, surge uptake (Vs), internally (cellular) controlled uptake (Vi), and externally (ambient limiting nutrient concentration) controlled uptake (Ve). In a number of parameters that were measured, T. gravida was clearly different from C. debilis and S. costatum and its recovery from nutrient starvation was the slowest. Recovery of all species from silicate limitation or starvation was slower than from ammonium limitation or starvation. Ammonium-starved populations maintained a maximal uptake rate at a substrate concentration an order of magnitude lower (0.1 NH4-N) than that observed for NH4- limited populations (1.0 NH4-N). Adaptation to the severity of the nutrient limitation occurred as changes in the magnitude of cellular characteristics, such as short-term uptake potential (Vs) and affinity for the substrate (Ks). (Katz)
W78-03940

ON MERCURY AND SELENIUM CONTAINED IN TUNA FISH TISSUES - II. TOTAL MERCURY IN MUSCLES AND VISCERA OF YELLOWFIN TUNA (IN JAPANESE),
Shimonoseki Univ. of Fisheries (Japan).
For primary bibliographic entry see Field 5A.
W78-03941

ON MERCURY AND SELENIUM IN TUNA FISH TISSUES - III. MERCURY DISTRIBUTION IN YELLOWFIN TUNA, (IN JAPANESE),
Shimonoseki Univ. of Fisheries (Japan).
For primary bibliographic entry see Field 5A.
W78-03942

THE TOXIC EFFECTS OF HYDROCARBONS UPON THE NAUPLIAR AND ADULT STAGES OF BALANUS (CRUSTACEA: CIRRIPEDIA),
Hong Kong Univ. Dept. of Zoology.
B. Morton, and R. S. S. Wu.
Marine Pollution Bulletin, Vol. 18, No. 10, p 232-236, 1977. 8 fig, 12 ref.

Descriptors: *Toxicity, *Mortality, *Organic compounds, *Oil spills, *Larval growth stage, *Mature growth stage, *Littoral, *Animal metabolism, Animal physiology, *Morbidity, Growth stages, Laboratory tests, Water pollution effects, Oil, Oil pollution, Crustacea oil, *Barnacles, Balanus, *Kerosene, Hydrocarbons, BP 1002.

This study investigated the comparative toxicity of 4 hydrocarbons (i.e. BP 1002, kerosene, 'Bukokleen,' 'Chemkleen') to two species of littoral barnacles. It was found that BP 1002 was the most toxic with a lower and similar toxicity found for Chemkleen and Bukokleen. The toxicity of kerosene is comparatively low. A second experiment using kerosene and BP 1002 studied effects on two growth stages. Both barnacle species had a similar susceptibility, the nauplii being killed at lower concentrations than the adult. (Katz)
W78-03943

COPPER SORPTION AND RELEASE BY CYCLOTELLA MENEGHINIANA (BACILLARIOPHYCEAE) AND CHLAMYDOMONAS REINHARDTII (CHLOROPHYCEAE),
Ohio State Univ., Columbus. Dept. of Botany.
K. S. Button, and H. P. Hostetter.
Journal of Phycology, Vol. 13, p 198-202, 1977. 5 fig, 3 tab, 20 ref.

Descriptors: *Copper, *Copper sulfate, *Algicides, *Chlamydomonas, *Aquatic algae, *Adsorbtion, Membrane processes, *Biological membranes, *Algal control, *Cytological studies, *Metabolism chemical analysis, Mode of action, Water pollution effects, Path of pollutants, *Cyclotella

Copper sulfate has been used extensively as a practical algicide in algal control programs. Algal control and growth studies have pointed out that different algal species have differing sensitivities to the toxic effects of copper ions. Experiments were performed on two species of algae to determine the rate and quantity of copper sorption, the intensity of binding (copper release), and whether the copper is adsorbed to cell walls and is therefore unavailable to the protoplasm. Levels of copper used in algal control programs were used in the experiments. (Katz)
W78-03945

THE EFFECT OF AMBIENT OXYGEN CONCENTRATION ON FILTERING AND RESPIRATION RATES OF DAPHNIA GALEATA MENDOTAE AND DAPHNIA MAGNA,
Michigan Univ., Ann Arbor. Div. of Biological Sciences.
D. Heisey, and K. G. Porter.
Limnology and Oceanography, Vol. 22, No. 5, p. 839-845, 1977. 4 fig, 1 tab, 28 ref.

Descriptors: *Oxygen, *Food webs, *Respiration, *Oxygen requirements, *Oxygen demand, *Metabolism, *Daphnia, Mortality, Eutrophication, Epilimnion, *Zooplankton, Predation, Hypolimnion, Crustacean, Methodology, Laboratory tests, Dissolved oxygen, Animal behavior, Hemoglobin, Reduced dissolved oxygen, Ambient oxygen concentration, Filtering rate.

Filtering and respiration rates for both species were measured in oxygen concentrations ranging from air saturation to near zero, using animals that had lived in air-saturated conditions so that facultative hemoglobin synthesis was not initiated. D. magna's filtering and respiration rates were independent of oxygen concentrations above 0.3 mg/liter; below this, the rates declined rapidly. D. galeata mendotae's filtering and respiration rates exhibited a linear dependence on oxygen concentrations. It was suggested that D. magna's relatively greater tolerance of low oxygen concentrations was due largely to its higher basal levels of hemoglobin. (Katz)
W78-03947

EFFECT OF DIETARY ASCORBIC ACID ON THE ACCUMULATION OF COPPER IN CARP,
Kyoto Univ. (Japan). Dept. of Fisheries.
Y. Yamamoto, T. Ishii, M. Sato, and S. Ikeda.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43, No. 8, p 989-993, 1977. 15 ref, 6 tab, 3 fig, In Japanese with English abstract.

Descriptors: *Copper, *Absorption, *Biochemistry, *Nutrients, *Fish diets, *Growth rates, Metals, Metabolism, Fish physiology, Enzymes, Laboratory tests, Freshwater fish, Fish, Water pollution effects, *Ascorbic acid, Tissue analysis, Bioaccumulation.

This paper deals with the effect of dietary L-ascorbic acid (AsA) on the accumulation of copper in tissues of carp exposed to the copper solution at a level of 0.05 ppm for 9 weeks. The copper content in the hepatopancreas of carp fed the AsA-supplemented diet significantly decreased as compared to that of carp fed the AsA-free diet. Prevention of copper accumulation by AsA intake was also observed in the gills, kidney, intestine, and vertebrae. The AsA content in the hepatopancreas was reduced in proportion to the amount of accumulated copper. Further, the accumulation of copper in the hepatopancrease caused a decrease in the hepatic L-gulonolactone oxidase activity. These results indicated that AsA prevents the accumulation of copper and that accumulated copper decreases the AsA level in the hepatopancreas by inhibiting the biosynthesis of AsA in carp. (Katz)
W78-03948

THE ACTIVITY OF DELTA 5-3 BETA HYDROXYSTEROID DEHYDROGENASE ENZYME IN THE INTERRENAL TISSUE OF RAINBOW TROUT (SALMO GAIRDNERI RICHARDSON) EXPOSED TO SUBLETHAL CONCENTRATIONS OF ZINC,
Guelph Univ. (Ontario). Dept. of Zoology
T. A. Watson, and B. A. McKeown
Bulletin of Environmental Contamination and Toxicology, Vol 16, No 7, p 173-181, 1977. 6 fig, 3 tab, 17 ref

Descriptors: *Salmonids, *Trout, *Rainbow trout, Fish physiology, *Enzymes, *Metals, *Toxicity, *Zinc, Path of pollutants, Mode of action, Metabolism, Biochemistry, Analytical techniques, Mortality, Lethal limit, *Hydrosteroid dehydrogenase enzyme, Tissue analysis, Bioaccumulation, Enzyme activity.

The effects of exposure of rainbow trout (Salmo gairdneri Richardson) to three sublethal concentrations of zinc on hydroxysteroid dehydrogenase (HSDH) enzyme activity in the head kidney tissue was investigated. The activity of this enzyme was localized by the reduction of a tetrazolium salt to formazan at the site of activity. Using subjective methods to indicate the degree of activity and indirectly assess the degree of corticosteroid production, the zinc-exposed rainbow trout showed a greater degree of HSDH activity compared to the control fish. This increase in enzyme activity has been associated with the stimulation of the pituitary-interrenal axis by the noxious stress of zinc. (Katz)
W78-03949

PROLONGED RETENTION OF METHYL MERCURY BY MALLARD DRAKES,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
For primary bibliographic entry see Field 5B.
W78-03950

APPLICATION OF VARIOUS MATHEMATICAL MODELS TO DATA FROM THE UPTAKE OF METHYL MERCURY IN BLUEGILL SUNFISH (LEPOMIS MACROCHIRUS),
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5B.
W78-03951

AN ENVIRONMENTAL INDEX BASED ON RELATIVE ABUNDANCE OF OLIGOCHAETE SPECIES,
California Univ., Santa Barbara.
For primary bibliographic entry see Field 5A.
W78-03954

SEASONAL CHANGES IN THE EFFECTS OF TEMPERATURE AND WATER FLOW RATE ON THE GROWTH OF JUVENILE PACIFIC OYSTERS, CRASSOSTREA GIGAS (THUNBERG),
Oregon State Univ., Newport. Dept. of Fisheries and Wildlife.
R. E. Malouf, and W. P. Breese.
Aquaculture, Vol. 12, p 1-13, 1977. 7 fig, 3 tab, 20 ref.

Descriptors: *Seasonal, *Water temperature, *Growth rates, *Growth stages, *Juvenile growth stage, *Oysters, *Flow rates, *Suspended load, *Suspended solids, *Nuclear powerplants, *Thermal pollution, *Food abundance, Commercial shellfish, Shellfish farming, Animal physiology, Animal metabolism, Aquiculture.

This study, initiated because of local interest in the feasibility of using heated power plant effluents in the culture of the Pacific oyster, sought to investigate seasonal changes in the effects of temperature and water flow rate on the growth of oysters. The results show profound seasonal

changes in the growth rate of immature Pacific oysters. These growth fluctuations are independent of temperature and appear to be related to changes in the quantity of particulate material suspended in the water. Hypothetical curves relating temperature, food availability and oyster growth are proposed. The form of these curves, which is based on observed relationships and on similar studies involving other aquatic organisms, suggest that under ideal conditions, and with high food availability maximum growth might be achieved at temperatures approaching 20C. (Katz)
W78-03956

THE EFFECT OF SALINITY UPON PHOTOTAXIS AND GEOTAXIS IN A LARVAL CRUSTACEAN,
Duke Univ., Beaufort, NC. Marine Lab.
M. I. Latz, and R. B. Forward, Jr.
Biological Bulletin, Vol. 153, p 163-179, 1977. 5 fig, 2 tab, 37 ref.

Descriptors: *Salinity, *Saline water, *Salt tolerance, *Larvae, *Larval growth stage, *Crabs, *Light intensity, Salts, Water properties, Metabolism, Resistance, Crustaceans, *Phototaxis, *Geotaxis, Rhithropanopens.

Larvae were exposed to sudden salinity changes and stimulated with various intensities of 500-wm light in the horizontal plane. Although the pattern of phototaxis of larvae exposed to 40% was unchanged from that at 20% (acclimation salinity), the level of positive phototaxis to higher intensities was significantly greater and the level of negative phototaxis to low intensities was significantly lower at 40%. Exposure to low salinity sea water (5%) generally reverses the sign of phototaxis, since a significantly higher level of negative phototaxis and lower level of positive phototaxis occurs at light intensities above 10-2Wm-2. Anesthetized larvae sink in both high and low salinity water. Thus, the ascent in high salinities does not result from floating due to the increased density of the water. A comparison of descent rates by anesthetized and unanesthetized larvae in 0.15 Wm-2 light directed from above and in low salinity water indicates that the normal descent results primarily from active downward swimming, although some larvae exhibit passive sinking. These behavioural responses to increases and decreases in salinity can act as a negative feedback system to keep larvae within the region of acclimatization salinity water in the vertical water column. (Katz)
W78-03957

BIOKINETICS OF NEPTUNIUM-237 IN MUSSELS AND SHRIMP,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
J. C. Guary, and S. W. Fowler.
Marine Science Communications, Vol. 3, No. 3, p 211-229, 1977. 5 fig, 1 tab, 15 ref.

Descriptors: *Radioactive wastes, *Radioisotopes, *Radiochemical analysis, *Shrimp, *Mussels, *Growth rates, *Nuclear wastes, *Growth stages, *Animal metabolism, Animal physiology, *Adsorption, Path of pollutants, Crustaceans, *Neptunium-237, Molting, Bioaccumulation, Lysmata, Tissue analysis.

Neptunium-237, kinetics were studied in marine shrimp and mussels using a thick source alpha counting technique. Bioaccumulation of 237 Np from water was relatively slow in both species, reaching whole body concentration factors of only 15 to 20 after three months. Surface adsorption was implicated in the initial uptake. Both uptake and loss of the radioisotope were not significantly affected by temperature. By virtue of the large amounts of accumulated 237Np associated with the exoskeleton of shrimp, molting will play an important role in the biogeochemical cycling of this transuranic in the marine environment. (Katz)
W78-03959

A STUDY ON THE ENVIRONMENTAL FACTORS IN AN EEL POND: III. LOW REDOX POTENTIAL OF THE POND SOIL IN MARCH 1972, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
For primary bibliographic entry see Field 2G.
W78-03960

DATA ON THE HYGIENIC STANDARDIZATION OF C2 - C5 POTASSIUM XANTHATES IN BODIES OF WATER, (IN RUSSIAN),
Novosibirsk Sanitary Research Inst. (USSR).
E. M. Trofimovich, S. M. Rykova, M. A. Molchanova, and L. B. Aleksandrovskaya.
Gig Sanit 6, p 95-97, 1976.

Descriptors: *Water quality standards, Public health, *Water pollution effects, Self-purification, Kidney, Liver, Mouse, Pathology, *Potassium xanthate, Stomach, Toxicity, *Xanthates.

Various effects of potassium xanthates, widely used in ore enrichment, were studied. On the basis of their effect on self-purification processes of water (biochemical O2 demand), threshold concentrations were 0.5 mg/l ethyl, 10 mg/l isopropyl, 0.5 mg/l isobutyl and 0.1 mg/l isoamyl potassium xanthate. Experiments in which mice and rats were given intragastric doses of these 4 compounds revealed the similarity of their toxic effects. The level of acute toxicity of the compounds increased with their molecular weight. In chronic experiments, ethyl and isoamyl potassium xanthates caused disturbances in tissue redox processed and pathological changes in the liver, kidneys, stomach and CNS. Their inactive doses were established at 0.5 mg/kg. For potassium xanthates, the limiting index of harmfulness should be the organoleptic index, and maximum permissible concentrations in bodies of water should be 0.1 mg/l ethyl, 0.05 mg/l isopropyl, and 0.005 mg/l isobutyl and isoamyl potassium xanthate. Copyright 1978, Biological Abstracts, Inc.
W78-03966

EFFECTS OF SELECTED WASTEWATER CHLORINATION PRODUCTS AND CAPTAN ON MARINE ALGAE,
Syracuse Research Corp., NY.
H. C. Sikka, and G. L. Butler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 100, Price codes: A03 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-77-029, March 1977, 37 p, 1 tab, 16 fig, 4 ref.

Descriptors: *Chlorination, Chlorine, Domestic wastes, Sewage, *Sewage treatment, *Algae, *Phytoplankton, *Water pollution effects, Algicides, Phenols, Bioassay, Sea water, Dunaliella, Skleltonema, Porphyridium, Chlorobenzoic acid, *Chlorophenol, Chlororesorcinol, *Captan, *Chloro-organic compounds, Marine unicellular algae.

Effects of stable chloro-organic compounds formed during chlorination of sewage effluents on growth of marine unicellular algae were determined. Captan suppressed growth of Dunaliella tertiolecta and Porphyridium cruentum at 5 ppm. Growth of Skeletonema costatum was inhibited by 0.25 ppm captan. 3-Chlorobenzoic acid inhibited growth of S. costatum at 10 ppm but had no effect on D. tertiolecta or P. cruentum. There was no effect of 1-10 ppm 5-chlorouracil on S. costatum, but growth of D. tertiolecta was stimulated initially. Growth of S. costatum was inhibited by 1 ppm 4-chlororesorcinol, and 10 ppm inhibited growth of P. cruentum. At 1 ppm, 3-chlorophenol stimulated growth of all three species, but growth of S. costatum was inhibited by 2.5 ppm. A combination of 3-chlorophenol and 4-chlororesorcinol interacted synergistically to reduce growth of S. costatum. It is concluded that chloro-organic compounds formed during chlorination of sewage effluent are not an immediate threat to marine unicellular algae. (Katz)
W78-03971

EFFECTS OF SUBLETHAL METAL POLLUTANTS ON THE FIDDLER CRAB UCA PUGILATOR,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
W. B. Vernberg, and P. J. DeCoursey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 940, Price codes: A14 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-77-024, February 1977, 58 p, 1 tab, 44 fig, 37 ref.

Descriptors: Crustaceans, *Crabs, *Toxicity, Bioassay, Mortality, *Metals, *Mercury, *Cadmium, Animal behavior, Oxygen, Oxygen demand, Animal physiology, Methodology, Heavy metals, Enzymes, Pathology, Temperature, Salinity, Laboratory tests, Synergistic effects, *Sublethal concentrations, *Fiddler crabs, Uca pugilator, Crab larvae, Oxygen consumption, Sublethal dosage, Tissue uptake, Metabolism, Microscopic anatomy, Enzymatic activity, *Mode of action.

Studies have been carried out on the synergistic effects of sublethal concentrations of mercury (Hg) and/or cadmium (Cd) in conjunction with temperature and salinity stress on larval and adult fiddler crabs, Uca pugilator. Six biological parameters of the adult organism were monitored including survival, tissue uptake, metabolism, behavior, microscopic anatomy, and enzymatic activity, using metal concentrations of 0.18 ppm Hg and 1.0 ppm Cd. Studies with larval stages (zoeal stages I, III, V and megalops) considered survival, metabolism, and behavior under conditions of 1.8 ppb Hg and 1.0 ppb Cd. The effect of mercury or cadmium on Uca pugilator depends upon a number of factors, including stage of the life cycle, sex, thermal history, and environmental conditions. Data presented here suggest that the mode of action of the two metals is not the same. (Katz)
W78-03972

SUSPENDED AND DISSOLVED SOLIDS EFFECTS ON FRESHWATER BIOTA: A REVIEW,
Utah State Univ. Foundation, Logan; and Utah Water Research Lab.
D. L. Sorenson, M. M. McCarthy, E. J. Middlebrooks, and D. B. Porcella.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 180, Price codes: A04 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-77-042, April 1977, 64 p, 1 fig, 7 tab, 185 ref.

Descriptors: Review, *Suspended solids, *Sediments, *Turbidity, *Dissolved solids, Salinity, Freshwater fish, Invertebrates, Zooplankton, Algae, Water supply, Livestock, Aesthetics, Nutrients, Chlorinated hydrocarbon pesticides, Erosion, *Standards, Research priorities, Lakes, Reservoirs, Streams, *Total dissolved solids, Conductivity.

It is widely recognized that suspended and dissolved solids in lakes, rivers, streams, and reservoirs affect water quality. In this report the research needs appropriate to setting freshwater quality criteria or standards for suspended solids (not including bedload) and dissolved solids are defined by determining the state of our knowledge from a critical review of the recent literature in this field. Although some 185 journal articles, government reports, and other references were cited herein, there is a dearth of quantitative information on the response of freshwater biota, especially at the community level, to suspended and dissolved solids. The major research need was

defined as the development and/or application of concepts of community response to suspended and dissolved solids concentrations and loads. These concepts need to be applied especially to the photosynthetic, the microfauna, and macrofauna levels. Fish studies are of lower priority since more and better research has been reported for these organisms. In addition, the role of suspended solids in transporting toxic substances (organics, heavy metals), aesthetic evaluation of suspended solids in aquatic ecosystems, and dissolved solids in drinking water, and economic aspects of dissolved solids in municipal-industrial water were defined as research needs. (Katz)
W78-03973

CHRONIC TOXICITY OF METHOXYCHLOR, MALATHION AND CARBOFURAN TO SHEEPSHEAD MINNOWS (CYPRINODON VARIEGATUS),
EG and G Bionomics, Pensacola, FL. Marine Research Lab.
P. R. Parrish, E. E. Dyar, M. A. Lindberg, C. M. Shanika, and J. M. Enos.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 102, Price codes: A06 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-77-059, May 1977, 36 p, 27 tab, 35 ref.

Descriptors: *Bioassay, *Toxicity, Mortality, Laboratory tests, Marine fish, *Chlorinated hydrocarbon pesticides, Pesticides, Fish eggs, Lethal limit, *Fish reproduction, Methodology, Water pollution effects, Lethal limit, Pollutant identification, *Methoxychlor, *Malathion, *Carbofuran, Cyprinodon, Maximum acceptable toxicant concentration, Juvenile fish.

Sheepshead minnows (Cyprinodon variegatus) were exposed to each of three pesticides--methoxychlor, malathion, and carbofuran--in flowing seawater to determine the acute and chronic (partial life-cycle) effects. Mortality of adult fish exposed to concentrations of methoxychlor greater than or equal to 23 microgram/l and hatching success of fry from eggs spawned by fish exposed to 23 microgram/l were significantly different from the control. The maximum acceptable toxicant concentration (MATC) was estimated to be greater than 12 and less than 23 microgram/l; application factor (AF) limits were 0.24-0.47. Mortality of adult fish exposed to concentrations of malathion greater than or equal to 18 microgram/l and mortality of fry hatched from eggs spawned by fish exposed to 9 and 18 microgram/l were significantly different from the control. The MATC was estimated to be greater than 4 and less 9 microgram/l; AF limits were 0.08-0.18. Mortality of adult fish exposed to concentrations of carbofuran greater than 49 microgram/l, hatching success of fry from eggs spawned by fish exposed to 49 microgram/l, and mortality of fry hatched from eggs spawned by fish exposed to 23 and 49 microgram/l were significantly different from the control. The MATC was estimated to greater than 15 and less than 23 microgram/l; AF limits were 0.04-0.06. (Katz)
W78-03974

TOXICITY OF DIAZINON TO BROOK TROUT AND FATHEAD MINNOWS,
Environmental Research Lab.-Duluth, MN.
D. T. Allison, and R. O. Hermanutz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 293, Price codes: A05 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-77-060, May 1977, 68 p, 15 tab, 22 ref, 4 append.

Descriptors: *Diazinon, *Insecticides, *Toxicity, Bioassay, Mortality, Methodology, Laboratory tests, Laboratory equipment, Freshwater fishes, *Brook trout, Water pollution effects, Fish physiology, Pathology, *Organophosphorous pesticides, Fish eggs, Sunfish, Pollutant identification, *Skeletal deformities, Scoliosis, Lordosis, *Fathead minnows, Pimephales, Salvelinus, *Acute toxicities, Flagfish, Bluegills.

Fathead minnows exposed to diazinon from 5 days through 24 weeks post hatch developed severe scoliosis. The incidence and degree of spinal deformity correlated to exposure level. Fish in 3.2 microgram/l (the lowest concentration tested) had 60% more deformities than controls (P=0.05). Hatch of eggs from fathead minnows exposed to 3.2 microgram/l was 30% lower than the controls. Yearling brook trout exposed to 4.8 microgram/l and above developed scoliosis and lordosis within a few weeks. Growth was substantially inhibited (P=0.05) during the first 3 months of exposure at 4.8 microgram/l and above. Exposure to 2.4 microgram/l and above caused frequently observed neurological symptoms for the first 4 to 5 months. Progeny of parents exposed 6 to 8 months to all levels tested (0.55 to 9.6 microgram/l) were smaller than controls at 122 days post hatch (P=0.05). Acute toxicity tests with diazinon yielded 96-hr LC50's of 7.8, 1.6, 0.77, and 0.46 mg/l respectively for fathead minnows, flagfish, brook trout and bluegills. (Katz)
W78-03975

TEMPERATURE CRITERIA FOR FRESHWATER FISH: PROTOCOL AND PROCEDURES,
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5G.
W78-03976

A RAPID ASSESSMENT OF THE TOXICITY OF THREE CHLORINATED CYCLODIENE INSECTICIDE INTERMEDIATES TO FATHEAD MINNOWS,
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5A.
W78-03977

SURVIVAL AND IMMUNE RESPONSE OF COHO SALMON EXPOSED TO COPPER,
Corvallis Environmental Research Lab., Oreg.
D. G. Stevens.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 291, Price codes: A03 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA-600/3-77-031, March 1977, 36 p, 10 tab, 14 fig, 43 ref.

Descriptors: *Aquiculture, *Fish diseases, Bacteria, *Copper, Metals, Bioassay, Toxicity, Mortality, Laboratory tests, Juvenile fish, *Salmon, Sea water, Fish physiology, Stress, *Coho salmon, *Vibrio anguillarum, Vaccination, *Seawater adaptation.

Vaccination with Vibrio anguillarum by oral administration during copper exposure and intraperitoneal injection prior to copper exposure was imployed to investigate the effects of copper upon survival and the immune response of juvenile coho salmon (Oncorhynchus kisutch). Following copper exposure the survivors were challenged under natural conditions to V. anguillarum, the causative agent of vibriosis in fish. Copper concentrations of 18.1 ug/liter and higher caused significant mortality among coho fry during 30 days of exposure. The exposure of copper bioassay survivors to a natural challenge against V. anguillarum in seawater caused significant mortality among those fish from concentrations of copper at 13.9 ug/liter and higher. The reduced number of dead fish positive for V. anguillarum from the challenge suggests that sublethal copper stress and difficulty with seawater adaptation may have caused several deaths. Significant mortality occurred among coho fingerlings exposed to 24.6 ug/liter copper and higher for 31 days. Most of the survivors of these concentrations were unable to adapt to seawater and died within the first three days of challenge. Significant mortality also occurred during adaptation of survivors from 18.2 ug/liter copper where the mean mortality resulting from 31 days exposure was only 2%. The antibody level against V. anguillarum, measured by agglutinin titer, was significantly reduced in fish exposed to this concentration of copper when compared to that developed in control animals. (Katz)
W78-03978

PLANKTON STUDIES IN A MANGROVE ENVIRONMENT: VIII. FURTHER INVESTIGATIONS ON PRIMARY PRODUCTION, STANDING-STOCK OF PHYTO- AND ZOOPLANKTON AND SOME ENVIRONMENTAL FACTORS,
Universidade Federal Sao Carlos, Sao Paulo (Brazil). Dept. of Biology.
J. Tundisi, T. M. Tundisi, and M. B. Kutner.
Int Rev Gesamten Hydrobiol. 58(6), p 925-940, 1973.

Descriptors: *Estuarine environment, Cananeia(Brazil), Seasonal, Climates, Environment, *Environmental effects, Eutrophication, *Mangrove, Nutrition, *Phytoplankton, *Primary production, Standing stock, *Zooplankton.

At one station in a mangrove region of the estuarine type (25 degrees S, Cananeia, Brazil) monthly studies of the primary production of phytoplankton, standing stock, and climatological and environmental factors were conducted from March 1967-Feb. 1968. The area is moderately to highly productive throughout the year (0.10-0.80 cal/m2/day). During the summer higher rates of primary production were obtained. The general hydrographic conditions indicate a possible eutrophication of the ecosystem during the summer. Nanophytoplankton constitutes the bulk of the phytoplankton standing stock during most of the year; in summer an increase of microphytoplankton occurs. The results for the standing stock of phyto- and zooplankton indicate a possible annual cycle. This would be the consequence of the temperature and better nutritional conditions during the summer. A comparison with other tropical or subtropical areas indicates relatively high production for the environment studied. Enrichment studies could be the key to understanding certain aspects of the seasonal cycle of phytoplankton and primary production in tropical waters.--Copyright 1975, Biological Abstracts, Inc.
W78-04017

METABOLISM AND MODEL OF AN ESTUARINE BAY ECOSYSTEM AFFECTED BY A COASTAL POWER PLANT,
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.
H. N. McKellar, Jr.
Ecological Modeling, Vol. 3, 1977, p 85-118, 11 fig, 6 tab, 46 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Water pollution, Estuaries, *Model studies, *Metabolism, Biomass, On-site investigations, Plankton, Powerplants, Discharge(Water), Biological communities.

Field measurements of community metabolism and biomass and an ecological model were used to evaluate the effect of the Crystal River Powerplant on an outer estuarine bay ecosystem. The discharge bay in comparison with control bays demonstrated lower biomass and slightly faster rates of organic turnover. Less than 10% difference in annual averages of total community metabolism was observed between the discharge and control bays. Annual average gross planktonic production was approximately 3 g 02/square m/day in the discharge bay and 2 g/square m/day in the control bays. The selection for smaller biomass and faster turnover was indicated in the selection for plankton populations over benthic components in the outer discharge bay. In the model, effects of increased temperature were in agreement with observations from field measure-

ments. Simulations of several levels of total water exchange indicated the importance of water exchange as a stabilizing factor. (Chilton-ORNL)
W78-04036

HEAVY METAL CONCENTRATIONS IN ONTARIO FISH,
Toronto Univ. (Ontario). Inst. for Environmental Studies.
J. R. Brown, and L. Y. Chow.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 2, p 190-195. 2 fig, 2 tab, 5 ref, 1977.

Descriptors: *Environmental effects, *Water pollution, *Heavy metals, Fish, Canada, *Lake Huron, Cadmium, Copper, Lead, Zinc, Mercury.

The study concerns the distribution of heavy metals in fish samples taken from Lake Huron at Baie du Dore and Toronto Harbour during 1973. Toronto Harbour represents a high level of pollution and Baie du Dore a minimum level. The ratios for cadmium, copper, lead, zinc and mercury in fish muscle between Baie du Dore and Toronto Harbour were 1:2, 1:4, 1:9, 1:8, and 1:4 respectively. The relative abundance of these metals in fish muscle from both areas was, in ascending order, cadmium, mercury, lead, copper and zinc, whereas, in sediment it was mercury, cadmium, copper, lead and zinc. (Chilton-ORNL)
W78-04039

MERCURY CONTENT IN SEVERAL SPECIES OF MARINE FISH,
Genoa Univ. (Italy). Ist. di Farmacologia e Farmacognosia.
For primary bibliographic entry see Field 5A.
W78-04041

BIOLOGICAL STUDY OF THE SUBMARINE SHELF OF CATALONIA, (IN SPANISH),
Barcelona Univ. (Spain). Catedra Botany.
For primary bibliographic entry see Field 2L.
W78-04043

EFFECTS OF CHEMICAL POLLUTION ON TELEMEDIATORS INTERVENING IN THE MICROBIOLOGICAL AND PLANKTONIC ECOLOGY IN A MARINE ENVIRONMENT, PART II, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
M. Aubert, M. Gauthier, and D. Pesando.
Rev Int Oceanogr Med. 37/38, p 69-88, 1975.

Descriptors: Water pollution effects, *Diatoms, Copper, Zinc, Chromium, Lead, Mercury, *Bacteria, Alteromonas, Asterionella japonica, *Chemical pollution, Ecology, Environment, Marine environment, *Microbiological ecology, Plankton, Pollution, Pseudomonas, *Telemediators.

The action of Cu, Zn, Cr, Pb and Hg on the growth and antibiotic function of a marine diatom, Asterionella japonica, and 2 bacteria isolated from sea water (Pseudomonas and Alteromonas) was studied. The toxicity of these metals towards the test organisms varies according to their chemical state. Some of these metals, whether complexed or not, inhibit or increase the production and release of the antibiotic mediators at sublethal concentrations. (See also W76-12922 and W73-10095) Copyright 1975, Biological Abstracts, Inc.
W78-04044

ON THE NUTRITION AND METABOLISM OF ZOOPLANKTON: IX. STUDIES RELATING TO THE NUTRITION OF OVER-WINTERING CALANUS,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
E. D. S. Corner, R. N. Head, C. C. Kilvington, and S. M. Marshall.
J Mar Biol Assoc U K. 54(2), p 319-331, 1974.

Descriptors: *Nitrogen, *Phosphorus, Sea water, Clyde sea coast(England), *Calanus-helgolandicus, Diatoms, Elminius-modestus, *Metabolism, *Nutrition, *Zooplankton.

Studies were made relating to the problem of how Calanus feeds during winter in the Clyde (England) sea-area. Different diets were assessed in terms of sustaining the levels of body N and P in Calanus helgolandicus (Claus) over a period of several days. The test diets, all equivalent to the same level of particulate N in sea water, were: (1) suspended matter collected from the Clyde sea-area in winter; (2) particulate material produced in a foam-tower by bubbling sea water enriched with soluble extracts of plant cells; (3) living nauplii of the barnacle Elminius modestus Darwin; 84) dead nauplii of this species. Neither body N nor body P was sustained by diet 1; that body N, but not body P, was sustained by diet 2; that both were sustained by either of diets 3 and 4. With living Elminius nauplii as the food, each Calanus captured the equivalent of 25% of its body nitrogen and 47.3% of its body P daily: with dead nauplii as the food the corresponding values were 34.4 and 44.5%. These rations are much higher than those found in an earlier study of Calanus grazing on a spring diatom increase in the Clyde and demonstrate that animal diets are readily captured. In general, the results indicate that Calanus could survive the winter in the Clyde sea-area by feeding carnivorously. (See also W71-0496 and W70-05997)--Copyright 1974, Biological Abstracts, Inc.
W78-04045

MERCURY IN CATFISH AND BASS FROM THE SNAKE RIVER IN IDAHO,
Idaho State Dept. of Health and Welfare, Boise. Epidemiologic Studies Program.
For primary bibliographic entry see Field 5A.
W78-04047

MULTIFARIOUS POWER PLANT WATER INTAKE STRUCTURE (MWIS) A DESIGN CONCEPT TO REDUCE THE ENVIRONMENTAL EFFECTS OF COOLING WATER INTAKE STRUCTURES,
New York State Energy Research and Development Authority, New York.
For primary bibliographic entry see Field 8I.
W78-04048

INVESTIGATIONS ON THE PROTECTION OF FISH LARVAE AT WATER INTAKES USING FINE-MESH SCREENING,
Tennessee Valley Authority, Norris. Div. of Forestry, Fisheries, and Wildlife Development.
For primary bibliographic entry see Field 8I.
W78-04049

THE PHYSICAL EFFECTS OF ENTRAINMENT - CURRENT RESEARCH AT ORNL,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 8I.
W78-04050

IMPACT OF COOLING WATERS ON THE AQUATIC RESOURCES OF THE PACIFIC NORTHWEST,
National Marine Fisheries Service, Seattle, WA.
D. R. Craddock.
Marine Fisheries Review, Vol 38, No 11, 1976. p 27-34, 4 fig, 29 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Water pollution, Powerplants, Aquatic environment, Discharge(Water), Water cooling, Nuclear powerplants, *Pacific Northwest, *Columbia River.

The paper reviews the physical and biological effects of cooling waters on the aquatic environment of the Pacific Northwest. A survey of the lower Columbia River revealed 19 thermal pollution outfalls between Bonneville Dam and the mouth of the river which it was calculated put sufficient heat into the river during the summer to raise the temperature of the entire flow by 0.3C. The impact of thermal effluent on marine resources is small at the present time but the bulk of electrical power in area is from hydropower generation. Predictions for future needs, which will be supplied mainly by thermal nuclear generation, are so great that it was concluded that if once-through cooling is employed, vast quantities of heated water will be added to the aquatic environment. It is suggested that the construction of 20 or more thermal nuclear plants may have a significant impact on marine resources in the area. (Chilton-ORNL)
W78-04052

THE EFFECTS OF STEAM ELECTRIC STATION OPERATION ON ENTRAINED PHYTOPLANKTON,
Maryland Univ., Solomons. Chesapeake Biological Lab.
D. Flemer, and J. A. Sherk, Jr.
Hydrobiologia, Vol 55, No 1, July 1977. p 33-44, 4 fig, 6 tab, 22 ref.

Descriptors: *Environmental effects, Powerplants, Cooling water, *Entrainment, *Phytoplankton, Temperature, Thermal stress, Photosynthesis, Chlorination, Intake structures, Mechanical stress.

The rate of C 14-uptake, an index of photosynthetic rate, and the concentration of chlorophyll a, a measure of standing crop, were measured to estimate the effects of entrainment on phytoplankton. The rate of carbon assimilation appeared to depend on the ambient water temperature and the temperature rise experienced by the entrained organisms. It was concluded that the reduction in carbon assimilation was greater than could be explained by the effects of mechanical and thermal stress and that chlorine was an important factor in the reduction. (Chilton-ORNL)
W78-04053

THE EFFECT OF SEWAGE ON THE INFESTATION OF KAMA RESERVOIR FINGERLINGS BY BROAD TAPEWORM PLEROCERCOIDS, (IN RUSSIAN),
All-Union Scientific Research Inst. of Medical Parasitology and Tropical Diseases, Moscow (USSR).
A. S. Artamoshin, and V. I. Khodakova.
Gidrobiol Zh 12(6), p 89-91, 1976.

Descriptors: *Sewage effluents, Water pollution effects, *Tapeworms, *Kama Reservoir(USSR), Chlorides, Nitrates, Hydrogen sulfide, Acerina cernua, Copepods, Diphyllobothrium latum, Esox lucius, *Parasites, Perca fluviatilis.

The invasion of Perca fluviatilis, Esox lucius and Acerina cernua fingerlings by Diphyllobothrium latum plerocercoids was studied in the Kama Reservoir and its tributaries near Solikamsk and Usol'e (Russian SFSR, USSR). The release of untreated domestic sewage into the water resulted in fish infectation, but the incidence of infestation was lower in areas where industrial waste were mixed with the domestic sewage. This is probably the result of the harmful effect of chemicals (e.g., Cl, N., hydrogen sulfide) on the eggs, intermediate hosts (copepods) and supplementary hosts (the studied fingerlings). Copyright 1978, Biological Abstracts, Inc.
W78-04055

EFFICIENCY OF NETS AND A NEW DEVICE FOR SAMPLING LIVING FISH LARVAE,
Lawler, Matusky, and Skelly, Tappan, NY.
For primary bibliographic entry see Field 8I.

W78-04056

THERMAL EFFECTS OF POWER PLANT ENTRAINMENT ON SURVIVAL OF LARVAL FISHES: A LABORATORY ASSESSMENT,
New York State Univ. at Stony Brook. Marine Sciences Research Center.
J. R. Schubel, C. F. Smith, and T. S. Y. Koo.
Chesapeake Science, Vol 18, No 3, September 1977. p 290-298, 2 fig, 5 tab, 25 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Water pollution effects, Entrainment, Fish, Larvae, Temperature, Powerplants, Laboratory tests, *Bass, *Herrings, Resistance, Shad.

Time-excess temperature studies were conducted using larvae of blueback herring, American shad, and striped bass. Striped bass showed the greatest thermal tolerance of the three species. Exposure to temperatures 20C above base temperature resulted in almost total mortality of all three species within two minutes of the initial exposure. Exposure of striped bass to a maximum excess temperature of up to 10C did not significantly increase their mortality. Exposure of American shad to a maximum excess temperature of 7C significantly increased mortality, while exposure to a maximum excess temperature of 8C did not. Exposure of blueback herring to maximum excess temperatures of 7 and 8C significantly increased mortality. It was concluded that thermal response is a dose response and that more research is required before thermal standards can be set. (Chilton-ORNL)
W78-04057

MICROBIOLOGICAL CHARACTERISTICS OF LAKES IN THE YAROSLAVL OBLAST, (IN RUSSIAN),
N. A. Lapteva, and S. V. Monakova.
Mikrobiologiya 45(4), p 717-723, 1976.

Descriptors: Lakes, Microbiology, Water pollution effects, *Bacteria, Carbon dioxide, Photosynthesis, *Phytoplankton, USSR, Yaroslavl Oblast(USSR).

Data was given on the activity of microflora in water and ooze deposits of lakes of the Yaroslavl region (Ukrainian SSR, USSR). Microbiological processes in water depend mainly on the rate of production of organic substances and phytoplankton photosynthesis, which varies from 0.18-6.3 gC/m2. Destruction of organic substance in water of most lakes exceeded production. Production of bacterial biomass was within limits of 0.2-5.8 gC/m2/day and lower, as a rule, than production of phytoplankton. The number of bacteria in different lakes varied from 1.7 to 35 x 10 to the sixth power/1 ml. Heterotrophic assimilation of CO2 was rather high and reached 34 mcgC/l per day, its ratio to biomass about 6.8%. The total number of bacteria in ooze deposits of lakes varied from 0.6 to 2.7 x 10 to the ninth power g/m2. Aerobic destruction varied from 0.3-0.78 gC/m2.--Copyright 1978, Biological Abstracts, Inc.
W78-04058

MORTALITY OF STRIPED BASS EGGS AND LARVAE IN NETS.
New York Univ. Medical Center, NY. Lab. for Environmental Studies.
A Special Report to Consolidated Edison Company of New York, Inc., July 1976. 21 p, 4 fig, 3 tab, 5 ref.

Descriptors: *Environmental effects, Powerplants, Discharge(Water), Plankton, *Bass eggs, Larvae, Mortality, Sampling, *Nets.

The combined effects of sampling nets and water velocity on striped bass eggs and larvae were determined by releasing living organism directly onto nets submerged in a water flow and observing survival. Immediate and latent observations of the organism's mortality were recorded along with retention of fish and eggs in the nets. It was concluded that only the velocity of the water being sampled had a significant effect on the survival of net-captured ichthyoplankton. It was suggested that mortality of ichthyoplankton in power plant discharges is a combination of net mortality and plant-induced stress and that if the contribution of net mortality is ignored, power plant impact on ichthyoplankton may be greatly overestimated. (Chilton-ORNL)
W78-04059

EFFECT OF SHEAR ON EGGS AND LARVAE OF STRIPED BASS, MORONE SAXATILIS, AND WHITE PERCH, M. AMERICANA,
Maryland Univ., Solomons. Chesapeake Biological Lab. and Estuarine Studies.
For primary bibliographic entry see Field 8I.
W78-04060

SHELL SIZE - FREQUENCY DISTRIBUTIONS OF CORBICULA MANILENSIS PHILIPPI FROM A CLAM--FOULED STEAM CONDENSER,
Texas Univ. at Arlington. Dept. of Biology.
For primary bibliographic entry see Field 8I.
W78-04061

AQUATIC IMPACT ASSESSMENT AT CALVERT CLIFFS,
Martin Marietta Environmental Technology Center, Baltimore, MD.
W. A. Richkus.
Record of the Maryland Power Plant Siting Act, Vol. 6, No. 1, April 1977, p 1-7, 4 fig, 1 tab, 8 ref.

Descriptors: *Environmental effects, *Powerplants, Cooling water, Populations, Monitoring, Design criteria, Assessments.

The primary goal of the assessment program at Calvert Cliffs is to find to what extent the plant operation damages the Bay's resources. The assessment provides factual bases for two pending regulatory decisions: (1) determining if cooling must be retrofitted to ensure the protection and propagation of balanced indigenous populations in the Bay; (2) deciding what changes in the operation or design of the once-through cooling system may be needed to minimize stress on organisms. From the major findings of the monitoring program it was concluded that the few measurable plant effects on important Bay species are too localized or transient to be consequential in a regional context. (Chilton-ORNL)
W78-04062

EFFECTS OF PULP INDUSTRY EFFLUENTS ON SALMON FRY AND GREEN ALGAE (EFFEKTER AV NOEN CELLULOSEINDUSTRIELLE AVLOPSVANN PA LAKSEYNGEL OG GRONNALGER),
Norsk Inst. for Vannforskning, Blindern.
M. Laake, and M. Grande.
Nordforsk Miljoevardssekretiariatet Publication, p 151-163, 1976. 3 fig, 13 ref, 5 tab.

Descriptors: *Pulp wastes, *Water pollution effects, *Salmon, *Algae, *Sulfite liquors, Wastes, Industrial waste, Effluents, Pulp and paper industry, Bleaching wastes, Hydrogen ion concentration, Aquatic life, Microorganisms, Fish, Aquatic animals, Water pollution sources, White water(Paper machine), Condensates, Spent sulfite liquors.

Studies are presented on the influence of spent sulfite liquor, condensate, pulp bleaching wash water (chlorination and alkaline extraction stages), and paper machine white water on receiving waters, particularly with respect to survival of salmon fry and green algae. Spent sulfite liquor had the strongest effect on the fish. Condensate and bleaching wash water had mainly a pH effect. Green algae were less sensitive to the effluents than salmon fry. (Speckhard-IPC)
W78-04083

RECLAMATION OF POLLUTED FARM PONDS,
Louisiana Tech Univ., Ruston. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-04098

ACID SNOW-MELT EFFECTS ON WATER QUALITY AND FISH SURVIVAL IN THE ADIRONDACK MOUNTAINS OF NEW YORK STATE,
Cornell Univ., Ithaca, NY. Dept. of Natural Resources.
C. L. Schofield.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 801, Price codes: A03 in paper copy, A01 in microfice. Completion Report, November 1977. 27 p, 9 fig, 6 tab, 17 ref. OWRT A-072-NY(1), 14-34-0001-7068.

Descriptors: *Snow, *Acid precipitation, Fish, *Aluminum, Water chemistry, *Snowmelt, Water quality, *Fish mortality, *New York(Adirondack Mountains), Water pollution effects, *Brook trout, *Toxicity, Hydrogen ion concentration, Nitrate-sulfate ratio, Pollutant identification.

Water quality changes associated with acid snow-melt episodes and effects on fish survival were investigated in the Adirondack Mountains of New York. Relatively high NO3/SO4 ratios observed in winter precipitation and snow-melt runoff suggested that nitric acid was a major strong acid component. Snow pack storage of strong acid, concentration by ion separation during thaws, and release in snow-melt led to severe changes in quality of lake and stream water. Decreased pH and high aluminum concentration in run-off were lethal to captive brook trout populations. Aluminum was the major toxic entity present in acid, snow-melt runoff. Aluminum concentrations of 0.25-1.0 mg/liter at pH 4.4-5.9 resulted in severe gill damage and mortality to brook trout fry. At pH 4.0, aluminum concentrations up to 1.0 mg/l had no toxic effects, but rather were antagonistic to hydrogen ion toxicity. Above pH 4.0, increasing pH enhanced the toxicity of aluminum to brook trout.
W78-04104

ASSESSMENT OF WATER QUALITY STATUS AND TRENDS IN MINNESOTA BY REMOTE SENSING TECHNIQUES,
Minnesota Univ., Minneapolis.
For primary bibliographic entry see Field 5A.
W78-04105

TRYING TO EXPLAIN AN EFFECT OF PER SE HYDROSTATIC PRESSURE ON HEART RATE IN FISH,
Universite de Bretagne-Occidentale, Brest (France). Lab. of Animal Physiology.
A. Belaud, L. Barthelemy, J. Le Saint, and C. Peyraud.
Aviation, Space, and Environmental Medicine, Vol 47, No 3, March 1976, p 252-257, 3 fig, 2 tab, 12 ref.

Descriptors: *Environmental effects, *Pressure, Water pressure, Hydrostatic pressure, Fish, Temperature, Animal physiology, Heart rate.

A quantitative study was performed to determine the increment of heart rate due to temperature rise resulting from compression. Specific effects of per se pressure were identified as bradychardia above 24.5C and as tachycardia below this temperature. It was shown that pressure acts through extrinsic mechanisms of heart control and through a direct

action on autonomic cardiac cells. The effect of pressure on cardiac cells is translated according to laws of chemical kinetics. The possibility of an effect of pressure through a direct molecular impact from which reversible structure modifications of some molecule would occur is suggested. (Chilton-ORNL)
W78-04110

RELATION OF WATER TEMPERATURE TO INFECTIONS OF COHO SALMON (ONCORHYNCHUS KISUTCH), CHINOOK SALMON (O. TSHAWYTSCHA), AND STEELHEAD TROUT (SALMO GAIRDNERI) WITH AEROMONAS SALMONICIDA AND A. HYDROPHILA,
Oregon State Univ., Corvallis. Dept. of Microbiology.
W. J. Groberg, Jr., R. H. McCoy, K. S. Pilcher, and J. L. Fryer.
Journal of the Fisheries Research Board of Canada, Vol 35, No 1, January 1978, p 1-7, 1 fig, 6 tab, 6 ref.

Descriptors: Environmental effects, *Water temperature, Fish diseases, Salmonids, Salmon, Chinook salmon, Mortality, Resistance, Water pollution effects, *Coho salmon, *Steelhead trout, *Aeromonas salmonicida, *Aeromonas hydrophila.

Groups of the three salmonid species containing 25 or 35 fish were tested at seven water temperatures from 3.9 to 20.5C in increments of 2.8C. Mortalities among the three species of fish infected with A. salmonicida ranged from 2 to 26% at 3.9 and 6.7C. Below temperatures of 6.7C, the fish survived for 12-23 days. 93-100% of the fish died within 2-3 days at 20.5C. Investigations using A. hydrophila were generally similar to those using A. salmonicida except that 64-100% mortality occurred at 20.5C and no deaths were reported below a temperature of 9.4C. It was concluded that higher temperatures accelerated the progress of infection by A. salmonicida and A. hydrophila, while lower temperatures retarded it. (Chilton-ORNL)
W78-04112

SEAWATER ADAPTATION AND PARR-SMOLT TRANSFORMATION OF JUVENILE ATLANTIC SALMON, SALMO SALAR,
Fisheries and Marine Service, Halifax (Nova Scotia). Resource Development Branch.
G. J. Farmer, J. A. Ritter, and D. Ashfield.
Journal of the Fisheries Research Board of Canada, Vol 35, No 1, January 1978, p 93-100, 3 fig, 2 tab, 22 ref.

Descriptors: Environmental effects, *Adaptation, Fish, Salmon, Salinity, *Atlantic salmon, Sea water, Smolt, Growth stages, Juvenile growth stage, *Parr-smolt transformation, Osmoregulatory mechanisms.

Changes in the osmotic concentration of serum, urine and intestinal fluid of Atlantic salmon was investigated as the fish were exposed to salinity increasing from 0.1 to 31%. 1- and 2-yr-old juvenile salmon were exposed to the increasing salinities during February-March as presmolts and again during May as smolts. Both age-classes adapted equally well and it was concluded that the marine osmoregulatory mechanisms function before completion of parr-smolt transformation. Fish in the parr stage whose fork length exceeded 12-13 cm were able to adapt to increasing salinity. (Chilton-ORNL)
W78-04113

RELATION BETWEEN TEMPERATURE AND INCUBATION TIME FOR EGGS OF CHINOOK SALMON (ONCORHYNCHUS TSHAWYTSCHA),
Fisheries and Marine Service, Nanaimo (British Columbia). Pacific Biological Station.
D. F. Alderdice, and F. P. J. Velsen.
Journal of the Fisheries Research Board of Canada, Vol 35, No 1, January 1978, p 69-75, 1 fig, 4 tab, 20 ref.

Descriptors: Environmental effects, *Water temperature, *Model studies, *Incubation, Eggs, Hatching, *Chinook salmon, *Salmon eggs.

The objectives of this inquiry were: (1) using available data from the literature and the models (the thermal sums hypothesis, Belehradek's equation and a form of the logistic curve), to select that model best satisfying the rules of minimum variance curve fitting in describing the relation between development time or rate and temperature and (2) using the model selected, to tabulate the resulting-rate-temperature relations for chinook eggs. Results using the log-inverse form of Belehradek's equation were found to be better than those from the other models. A table is included of predicted daily rates of development in relation to temperature which may be used to predict hatching time in a manner similar to that employing degree-days. It was concluded that there is a lack of data on development time at temperatures below 5C. (Chilton-ORNL)
W78-04114

FUNCTION OF THE SWIMBLADDER-INNER EAR-LATERAL LINE SYSTEM OF HERRING IN THE YOUNG STAGES,
Dunstaffnage Marine Research Lab., Oban (Scotland).
J. H. S. Blaxter, and E. J. Denton.
Journal of the Marine Biology Association the United Kingdom, Vol 56, 1976, p 487-502, 9 fig, 6 tab, 8 ref.

Descriptors: *Environmental effects, Pressure, Physiology, *Herrings, Larvae, *Larval growth stage, *Swimbladder-bullae-lateral line.

A description is presented of the swimbladder-bullae-lateral line system in the intermediate stages of development. The system is completely developed at a body length of 50-60 mm and before that size the bullae are filled with air by swallowing. The walls of the bullae and pro-otic membrane demonstrate a low permeability to gasses, resulting in very slow loss of gases to surrouding tissues. The gut and duct connecting the gut with the bullae are more permeable to gases. Changes in hydrostatic pressure resulted in a bowing in or out of the pro-otic membrane which showed very slow adaptation when change in pressure was maintained. Experiments showed an enhanced pressure sensitivity in larvae with gas-filled bullae and also the existence of sensitivity before the bullae were formed as well as while they are completely fluid-filled. Data showed that gas-filled bullae had little effect on buoyancy and sinking rate. (Chilton-ORNL)
W78-04115

EFFECTS OF AMBIENT LIGHT VARIATIONS ON BEHAVIOR OF YEARLING, SUBADULT, AND ADULT WALLEYES (STIZOSTEDION VITREUM VITREUM),
Ontario Ministry of Natural Resources, Thunder Bay. Fish and Wildlife Research Branch.
R. A. Ryder.
Journal of the Fisheries Research Board of Canada, Vol. 34, 1977, Part of the Proceedings of the Percid International Symposium convened at Quetico Centre, Ontario, September 24-October 5, 1976. p 1481-1491, 6 fig, 1 tab, 27 ref.

Descriptors: *Environmental effects, Behavior, *Fish behavior, Light, *Walleye, Fish, Fry, Growth stages, Mature growth stage, Feeding rates, Reproduction, *Ambient light, Stizostedion vitreum vitreum.

Results of underwater observations suggest that the diel and annual light regimes govern much of walleye metabolic activity, particularly that of feeding and reproduction. This influence on behavior is apparent at each stage of the life history and is related to the development and transformation of the retinal structure. At the fry stage, the retinal response is one of positive phototaxis which changes to a negative phototactic response before the 2nd yr. of life. Adult walleyes were observed to be active in turbid waters but to rest in contact with the substrate in clear waters. An inverse relationship was noted between number of walleyes sighted and the transparency of the water. The relationship between ambient surface light intensities and feeding rates was studied during open-water period by experimental angling and it was found that the greatest feeding activity occurred at the lower illuminations. (Chilton-ORNL)
W78-04120

ENVIRONMENTAL CONDITIONS OF PERCID WATERS IN CENTRAL EUROPE,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
B. Entz.
Journal of the Fisheries Research Board of Canada, Vol. 34, 1977, Part of the Proceedings of the Percid International Symposium convened at Quetico Centre, Ontario, September 24-October 5, 1976. p 1586-1591, 4 tab, 33 ref.

Descriptors: *Environmental effects, *Trophic level, *Mesotrophy, Lakes, Europe, Limnology, Primary production, *Eutrophication, Sediments, Bottom sediments, Water pollution effects, *Percids, Percidae.

The range of environmental conditions of central European lakes in which percids thrive, with emphasis on both abiotic and biotic properties of mesotrophic waters, is defined. Whereas mesotrophic waters on the basis of nutrients fit on a line between oligotrophic and eutrophic waters, certain characteristics point to the existence of optima (calcium content in the sediments as well as the existence of distinct mesotrophic communities of phytoplankton, invertebrates, and fishes) in mesotrophic lakes suggesting a real qualitative difference between mesotrophy on the one hand and eutrophy and oligotrophy on the other. These optima point to the existence of qualitatively different abiotic and biotic conditions in mesotrophic lakes rather than the expected quantitative intermediacy on the oligotrophic-eutrophic cline. (Chilton-ORNL)
W78-04121

LIMNOLOGICAL CHARACTERISTICS OF ONTARIO LAKES IN RELATION TO ASSOCIATIONS OF WALLEYE (STIZOSTEDION VITREUM VITREUM), NORTHERN PIKE (ESOX LUCIUS), LAKE TROUT (SALVELINUS NAMAYCUSH), AND SMALLMOUTH BASS (MICROPTERUS DOLOMIEUI),
Canada Centre for Inland Waters, Burlington (Ontario); and Fisheries and Marine Service, Ottawa (Ontario). Great Lakes Biolimnology.
M. G. Johnson, J. H. Leach, C. K. Minns, and C. H. Olver.
Journal of the Fisheries Research Board of Canada, Vol. 34, 1977, Part of the Proceedings of the Percid International Symposium convened at Quetico Centre, Ontario, September 24-October 5, 1976. p 1592-1601, 3 fig, 5 tab, 8 ref.

Descriptors: Environmental effects, *Limnology, Lakes, *Walleye, *Trout, *Bass, Fish, *Pikes, *Ontario, *Canada, Distribution, *Percids, Percidae.

This paper attempts to develop an objective classification, by means of limnological characteristics, of the 15 possible associations of four important game fish, species in Ontario lakes. Commonest types of the 15 combinations were walleye-pike (22%), pike only (19%), lake trout only (16%), and smallmouth bass only (10%). The variables of greatest significance is distinguishing lake

types were depth and area. Climatic factors were significant in explaining the general geographic distribution of smallmouth bass. Several hypotheses were advanced to explain the low density of walleye found in small lakes. These included low probability of successful coexistence of pike and walleye, wind conditions in spawning areas, and Lebenstraum requirements of walleye. (Chilton-ORNL)
W78-04122

TEMPERATURE REQUIREMENTS OF SOME PERCIDS AND ADAPTATIONS TO THE SEASONAL TEMPERATURE CYCLE,
Environmental Research Lab.-Duluth, Monticello, MN. Monticello Ecological Research Station.
For primary bibliographic entry see Field 2H.
W78-04124

RESULTS OF AN EXPERIMENTAL FISHERY ON THE CRAYFISH ORCONECTES VIRILIS,
Michigan Dept. of Natural Resources, Lewiston. Hunt Creek Fisheries Research Station.
For primary bibliographic entry see Field 2H.
W78-04125

CHEMISTRY AND EFFECTS OF CHLORINE IN AQUATIC SYSTEMS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
J. S. Mattice, H. A. Pfuderer, and B. N. Collier.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL/EIS-82, Price codes: A04 in paper copy, A01 in microfiche. Report ORNL/EIS-82, March 1976. Environmental Sciences Division Publication No. 808, 149 p. W-7405-eng-26.

Descriptors: Environmental effects, *Water pollution effects, *Bibliographies, Chemistry, *Chlorine, Aquatic environment.

This bibliography contains 191 references relating to the chemistry and effects of chlorine in aquatic systems and is part of an assessment of the literature on the effects of electric generating stations. References are arranged by subject category and indexes are included by author, keywords, scientific names of test organisms, geographic location of field research, and title (alphabetical listing of keywords-in-context). References are abstracted and indexed to reflect the information content of the documents and the interests of the researchers. An effort was made to record chlorine residuals, the systems in which the chlorine was assayed, methods of determination and physical conditions of experiments. All available research papers published prior to 1975 were included. (Chilton-ORNL)
W78-04127

ENERGY, WATER AND TRITIUM BUDGETS FOR PERCH LAKE: 1974,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
E. Robertson, D. P. Wildsmith, and P. C. Jay.
Available as AECL-5380, from Scientific Document Distribution Office, Atomic Energy of Canada Limited, Chalk River, Ontario, Canada, $2.00. Report AECL-5380, February 1976. 15 p, 4 fig, 8 tab, 3 ref.

Descriptors: *Environmental effects, *Energy, Tritium, Lakes, Canada, Model studies, *Perch Lake(Ontario).

The work described is a continuation of work done on energy, water and trituium budgets of Perch Lake in the years 1970-73. This paper gives results for 1974 and average values for 1970-74. It was concluded that five years is too short a time to establish statistically significant mean values of components of budget equations but that the 1974 results show little variation from the mean. Instrument failures and poor weather conditions made energy budget estimates of evaporation not possible for each month of each year. It is suggested that the data might prove useful in the development of energy and water budget models. (Chilton-ORNL)
W78-04128

DEVELOPMENT OF A UNIFIED TRANSPORT APPROACH FOR THE ASSESSMENT OF POWER-PLANT IMPACT,
Oak Ridge National Lab., TN. Enegy Div.
For primary bibliographic entry see Field 5B.
W78-04129

A CRITICAL EVALUATION OF THE NON-RADIOLOGICAL ENVIRONMENTAL TECHNICAL SPECIFICATION - VOL. 1. PROGRAM DESCRIPTION, SUMMARY AND RECOMMENDATIONS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 6G.
W78-04130

A CRITICAL EVALUATION OF THE NON-RADIOLOGICAL ENVIRONMENTAL TECHNICAL SPECIFICATIONS - VOL. 4, SAN ONOFRE NUCLEAR GENERATING STATION UNIT 1,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 6G.
W78-04131

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES, THE KEWAUNEE NUCLEAR POWER PLANT SITE,
Argonne National Lab. IL.
I. P. Murarka, J. G. Ferrante, A. J. Policastro, and E. W. Daniels.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/EIS-1, Price codes: A11 in paper copy, A01 in microfiche. Report ANL/EIS-1, August 1976. 212 p, 40 fig, 138 tab, 15 ref, 3 append. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Water pollution effects, *Nuclear powerplants, *Monitoring, Thermal pollution, Aquatic environment, Biological communities, Hydrothermal studies, Wisconsin, Data collections, *Lake Michigan, *Kewannee, Nuclear power plant site(Wisc), Aquatic assessment, Hydrothermal assessment, Plume mapping.

The matters considered in this report are those relating to the monitoring of phytoplankton, zooplankton and benthos in Lake Michigan near the plant site. Studies of the thermal plume measurements and models for making predictions for the Kewaunee Plant are evaluated and the results presented. Analysis of biological data did not show immediate effect on the biota of the lake. Local stimulation of certain phytoplankton groups and subsequent relative enhancement of the Cladocera in the discharge area were noted but no significance could be assigned regarding the effect on lakewide community. Some damage to the benthic community by dredging, the discharge, temperature rise, and velocity were observed. Plume mapping studies were conducted which were considered adequate to define the surface temperatures for higher isotherms under stratified conditions and the complete set of isotherms for unstratified conditions. Plume characteristics showed wide scatter due to different outfall and ambient conditions. (Chilton-ORNL)
W78-04132

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES - THE QUAD-CITIES NUCLEAR POWER STATION SITE,
Argonne National Lab., IL.
G. J. Marmer, I. P. Murarka, and F. Vaslow
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/EIS-2, Price codes: A04 in paper copy, A01 in microfiche Report ANL/EIS-2 August 1976, 54 p, 18 fig, 16 tab, 16 ref, 1 append. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Water pollution effects, *Thermal pollution, Powerplants, *Nuclear powerplants, Monitoring, Water quality, Water quality standards, Hydrothermal assessment, Illinois, *Quad-Cities Nuclear Power Plant site(Ill), Data collections.

The Quad-Cities Station began commercial operation in February of 1973. This report presents environmental monitoring data for the period 1972-1975. Hydrothermal assessment and water quality assessment of the monitoring data indicated that no significant immediate deleterious effects or violation of state water quality standards are apparent. Recommendations for improving monitoring techniques are presented. Included in the report is a description of different cooling methods used at the station. (Chilton-ORNL)
W78-04133

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES, THE ZION NUCLEAR POWER STATION SITE,
Argonne National Lab., IL.
I. P. Murarka, A. Policastro, E. Daniels, J. Ferrante, and F. Vaslow.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/EIS-5, Price codes: A17 in paper copy, A01 in microfiche. Report ANL/EIS-5, November, 1976. 370 p, 71 fig, 27 tab, 3 append, 36 ref. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Water pollution effects, Powerplants, *Nuclear powerplants, Hydrothermal assessment, Water quality, Water quality standards, Standards, Phytoplankton, Zooplankton, Benthos, Fish, Monitoring, Data collections, Illinois, *Zion Nuclear Power Station site(ILL), *Lake Michigan.

Environmental monitoring data was collected near the Zion Nuclear Power Station during the period 1972-1975. Assessment of hydrothermal data, water chemistry, and aquatic biota indicated that there were no significant immediate deleterious effects from operation of the station. Is was concluded, in relation to hydrothermal assessment, that the Pritchard model as developed and used for preoperational predictions failed to include such factors as reentrainment of plume water, recirculation of plume water into the intake, and the effects of stratification and that the model was satisfactory in only about 20% of the cases. The collection of data on distribution of biota followed a grid pattern with emphasis on depth effects. It was recommended that emphasis should be placed on collecting data from multiple station located in the maximum anticipated stress areas. (Chilton-ORNL)
W78-04134

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES - PRAIRIE ISLAND NUCLEAR GENERATING PLANT SITE,
Argonne National Lab., IL.
I. P. Murarka, J. G. Ferrante, E. W. Daniels, and E. E. Pentecost.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/EIS-6, Price codes: A06 in paper copy, A01 in microfiche. Report ANL/EIS-6, November 1976, 106 p, 47 fig, 11 tab, 5 ref, 3 append. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Water pollution effects, *Thermal pollution, Powerplants, *Nuclear power plants, Phytoplankton, Zooplankton, Benthos, Monitoring, Standards, Aquatic environment, Terrestrial habitats, Data collections, Minnesota, Prairie Island Nuclear Generating Plant site(Minn).

Environmental monitoring data collected near the Prairie Island Nuclear Generating Station during the period 1973-1975 was assessed. It was concluded that population densities vary from one year to the next and that several years of data are needed to adequately assess or detect trends in terrestrial systems. No immediate significant deleterious effects on the biota of the area from plant operation were detected. The effect of plant operation could not be distinguished from naturally occurring variability for the phytoplankton, zooplankton, and benthos groups of organisms. (Chilton-ORNL)
W78-04135

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES - A SYNTHESIS AND SUMMARY WITH RECOMMENDATIONS,
Argonne National Lab., IL.
I. P. Murarka, A. J. Policastro, J. G. Ferrante, E. W. Daniels, and C. J. Marmer.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/EIS-8, Price codes: A03 in paper copy, A01 in microfiche. Report ANL/EIS-8, November 1976, 23 p, 2 fig, 2 tab. W-31-109-Eng-38.

Descriptors: *Environmental effects, *Monitoring, Powerplants, *Nuclear powerplants, Hydrothermal assessment, Water quality, *Water quality standards, Aquatic environments, Terrestrial habitats, Statistical methods, *Sites, *Data collection, *Water pollution effects.

Field data collected during a monitoring program at seven nuclear power plant sites was analyzed and indicated that the plants had no significant ecological impacts. It was concluded that revisions need to made in monitoring shcemes in order that more precise conclusions could be drawn from fewer field measurements and in order that the data might be suited for modern statistical procedures. (Chilton-ORNL)
W78-04136

RESIDUAL TOXICITY OF SEVERAL DISINFECTANTS IN DOMESTIC WASTEWATER,
Grand Valley State Colleges, Allendale, MI.
R. W. Ward, and G. M. DeGraeve.
Journal Water Pollution Control Federation, Vol. 50, No. 1, January 1978, p 46-60, 13 tab, 18 ref.

Descriptors: *Environmental effects, *Water pollution effects, Effluents, Waste water(Pollution), Wastes, Water pollution sources, *Chlorine, *Bromine, *Ozone, Fish, Mortality, Growth rates, Reproduction, *Toxicity, *Disinfection, Fathead minnows, Pimephales promelas.

This life cycle study with fathead minnows was designed to test the toxicity of a nondisinfected effluent stream and the residual toxicity of identical effluent streams disinfected with chlorine, bromine chloride, or ozone, as well as a chlorinated stream dechlorinated with sulfur dioxide. Results showed that mean total residual chlorine concentrations as low as 0.045 mg/l in secondary effluent have the potential to negatively affect the survival of fathead minnows and levels as low as 0.033 mg/l can retard their growth. Adverse effects of residual chlorine on survival and growth can be elimanted with no undesireable side effects by dechlorination with sulfur dioxide. Mean residual bromine chloride concentrations as low as 0.034 mg/l inhibited growth of the minnows. Long-term exposure to ozonated effluent with mean residual ozone levels of 0.016 mg/l did not affect survival, growth or reproduction of fathead minnows. (Chilton-ORNL)
W78-04138

FEEDING ECOLOGY OF THE BLUEGILL, LEPOMIS MACROCHIRUS, IN TWO HEATED RESERVOIRS OF TEXAS, III. TIME OF DAY AND PATTERNS OF FEEDING,
Bangladesh Agricultural Univ., Mymensingh. Faculty of Fisheries.
For primary bibliographic entry see Field 2H.
W78-04139

ON THE DYNAMICS OF EXPLOITED POPULATIONS OF TISBE HOLOTHURIAE (COPEPOD, HARPACTICOIDAE), IV. THE TOXICITY OF CADMIUM: RESPONSE TO LETHAL EXPOSURE,
Biologische Anstalt Helgoland (West Germany).
M. Hoppenheit, and K.-R. Sperling.
Helgolander Wissenschaftliche Meeresuntersuchungen, Vol 29, p 328-336, 1977. 17 ref, 7 fig, 1 tab.

Descriptors: *Copepods, *Invertebrates, Exploitation, *Cadmium, *Toxicity, *Mortality, Population, *Lethal limit, Water pollution effects, Metals, Crustaceans, Reproduction, Laboratory tests, Zooplankton, Fish food, Tisbe, Harpacticoid copepods.

A total of 90, weekly exploited populations of the harpacticoid copepod Tisbe holothuriae were exposed to cadmium concentrations ranging from 148 to 1125 microgr/l, combined with exploitation rates from 10 to 90% under conditions of surplus food supply. All populations exposed to concentrations down to 500 microgr/l Cd and 3 populations (out of 15) exposed to 333 microgr/l Cd became extinct within the experimental period of 32 weeks. Survival time depended on concentration. A recovery phase from an initially high mortality preceeded eventual population extinction after adding 500 microgr/l Cd. In the initial phase, higher nauplii mortality prevailed. Experiments on the effects of stepwise increases in Cd concentration produced evidence that a relationship between survival and exploitation rate exists. In spite of increased mortality, no significant numbers of dead copepods were detected in weekly samples because of their rapid decomposition and cannibalism, which depends on the amount of food available. (Katz)
W78-04140

THE EFFECTS OF POLLUTION BY SEWAGE ON THE TOTAL NITROGEN, PROTEIN AND AMINO ACIDS OF THE MARINE PHANEROGRAM CYMODOCEA NODOSA (INFLUENCE DE LA POLLUTION PAR LES EAUX D'EGOUTS SUR LA COMPOSITION EN AZOTE TOTAL, EN PROTEINS ET EN ACIDES AMINES DE LA PHANEROGAME MARINE CYMODOCEA NODOSA),
Centre Univ. de Luminy, Marseille (France). Lab. de Biologie Vegetale Marine.
H. M. Augier, M. Santimone, and M. Vincentelli.
Environmental Pollution, Vol. 13, p 217-227, 1977. 4 fig, 1 tab, 12 ref. (In French with English abstract).

Descriptors: *Aquatic plants, *Proteins, *Biochemistry, *Nitrogen, *Chemical analysis, *Amino acids, Metabolism, Environmental effects, *Water pollution effects, Bioassay, Growth rates, Plant morphology, Plant physiology, Rhizomes, Root systems, Plant growth, Cytological studies, Cymodocea nodosa, *Marine phanerogam.

The amounts of total nitrogen, proteins and amino acids in the marine phanerogram Cymodocea nodesa were obtained through chromatography on an ion exchanger with an apparatus for automatic dosage. The experiments established that pollution was a factor of nitrogen enrichment in Cymodocea, since, in polluted media, plants showed higher rates of synthesis of nitrogen and protein than in non-polluted media. A comparative study of the different parts showed this increase in the total nitrogen and protein synthesis rates in polluted media to be more accentuated in the rhizomes and roots than in the leaves. This phenomenon also occurred with the amino acids but with specific variations in the leaves, rhizome and roots. The results obtained may permit a criterion to be established for the quality of marine waters. (Klein)
W78-04141

ACTION OF SUBLETHAL DOSES OF HEAVY METALS ON THE GROWTH CHARACTERISTICS OF THE DIATOM SKELETONEMA COSTATUM, (ACTION DE METAUX LOURDS A DES DOSES SUBLETALES SUR LES CARACTERISTIQUES DE LA CROISSANCE CHEZ LA DIATOMEE SKELETONEMA COSTATUM),
Centre d'Oceanographie, Marseille (France). Station Marine d'Endoume.
B. R. Berland, D. J. Bonin, O. J. Guerin-Ancey, V. I. Kankov, and D. P. Arlhac.
Marine Biology, Vol. 42, p 17-30, 1977. 6 fig, 3 tab, 35 ref.

Descriptors: *Heavy metals, *Mercury, *Cadmium, *Copper, *Diatoms, *Growth rates, *Growth stages, Environmental effects, Path of pollutants, Microorganisms, Toxicity, Algae, Cytological studies, Metabolism, Phytoplankton, Lethal limit, Skeletonema, Sublethal effects, Sublethal doses, Teratology.

Sublethal effects of mercury, cadmium, and copper on the diatom Skeletonema costatum (Grev.) Cleve, grown in batch and bacteria-free culture was studied. Division rate, maximum yield growth, mean cell volume, particulate carbon and nitrogen, and 14C-bicarbonate uptake was used as toxic impairment criteria. Division rate was the first-affected and most sensitive parameter, but algal responses vary according to the metal. Hg produces an acute decrease in division rate, followed by a temporary recovery of growth capacity within the first 48 h after metal addition. Cd, on the other hand, increases division rate, followed by an obvious decrease. Cu reduces division rate slowly or quickly, depending on the metal concentration. Cell synthesis capacity (cultural biovolume, particulate carbon and nitrogen, carbon assimilation) was less affected than division rate, especially with Hg. The C:N cell ratio was unchanged at sublethal concentrations, even when production was reduced. The mean cell volume was slightly affected: the variations were not greater than those of the control during its growth phases. Markedly teratological forms were never observed. In the author's opinion, these results confirm that many parameters and growth kinetic aspects must be considered to fully appreciate the effects of sublethal concentrations of heavy metals. (Katz)
W78-04142

COMPARATIVE STUDY OF THE PLUTONIUM LEVELS IN VARIOUS MOLLUSCS FROM SEVERAL FRENCH LITTORAL SITES, (ETUDE COMPAREE DES TENEURS EN PLUTONIUM CHEZ DIVERS MOLLUSQUES DE QUELQUES SITES LITTORAUX FRANCAIS),
CEA Centre de la Hague, Cherbourg (France). Lab. de Radioecologie Marine.
J. C. Guary, and A. Fraizier.
Marine Biology, Vol. 41, p 263-267, 1977. 1 fig, 1 tab, 16 ref.

Descriptors: *Metals, *Mollusks, *Invertebrates, *Animal physiology, *Path of pollutants, *Absorption, *Distribution patterns, Sampling, Water pollution sources, Nuclear wastes, Bioaccumulation, Tissue analysis, *Plutonium, France.

Plutonium contents of various species of molluscs sampled from several sites along the French coast were measured in order to reveal any distributional patterns of the plutonium levels. The influence of the La Hague nuclear fuel reprocessing plant was apparent in the immediate proximity of the waste-disposal outfall (Ecalgrain Bay), and to a lesser degree in an oyster farming center situated about 50 km east of the Bay of Ecalgrain (St. Vaast-la-Hougue). Plutonium concentrations in molluscs from the remaining sites were quite comparable to levels that have been measured in similar species subject only to plutonium derived from atmospheric fallout. All molluscs, except those from Ecalgrain Bay, displayed higher levels of plutonium in the shell than in the soft parts, a finding in agreement with similar studies which have been reported recently. However, those individuals sampled from the vicinity of the outfall consistently displayed shell:soft parts plutonium ratios of less than 1. This difference may reflect different physico-chemical forms of this isotope present at the different sampling stations. With the exception of Crepidula fornicata shell, the tissues of filter-feeding molluscs do not appear to concentrate plutonium above the level found in other types of molluscs. (Klein)
W78-04143

ON MERCURY AND SELENIUM CONTAINED IN TUNA FISH TISSUES-IV. METHYL MERCURY LEVEL IN MUSCLES AND LIVER OF YELLOWFIN TUNA, (IN JAPANESE),
Shimonoseki Univ. of Fisheries, (Japan). Dept. of Food Science and Technology.
For primary bibliographic entry see Field 5A.
W78-04144

PALAEOECOLOGICAL STUDIES OF THE RECENT DEVELOPMENT OF LAKE VAXJOSJON II. SETTLEMENT AND LANDSCAPE DEVELOPMENT,
Kvartarbiologiska Labs, Lund (Sweden).
G. Digerfeldt.
Archiv fur Hydrobiologie, Vol. 79, No. 4, p 465-477, 1977. 3 fig, 9 ref.

Descriptors: *Human population, *Urbanization, *Lake Vaxjosjon(Sweden), *Palaeocology, Drainage patterns, Lake stages, Paleolimnology, History, Land use.

An attempt is made to reconstruct human influence on the landscape around Lake Vaxjosjon, Sweden, from about 600 AD until present times. Exploitation of the landscape for settlement and livelihood has affected the existing vegetation and soils and knowledge of the landscape development is important for a correct interpretation of the lake development. Interpretation of development of the regional vegetation is based on pollen analysis; description of the settlement development pattern is based on available archaeological information. About 600 AD there was a distinct expansion of the settlement in the region. Since then it is likely that human interference became a progressively greater influence on the surrounding landscape and the lake. The thrust of the study is to return to a time when the lake was mainly uninfluenced by human activity, so that effects of the recent pollution can be assessed in relation to the preceding natural lake development. (Coyle-Wisconsin)
W78-04152

REPORT OF A WORKSHOP ON THE IMPACT OF THERMAL POWER PLANT COOLING SYSTEMS ON AQUATIC ENVIRONMENTS.
Sigma Research Inc., Richland, WA.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-750 980-2, Price codes: A02 in paper copy, A01 in microfiche. CONF-750 980, Report EPRI SR-38 of a Workshop held in Asilomar, Pacific Grove, California, September 28-October 2, 1975, Vol 2. Technical and Topical Papers. Prepared for Electric Power Research Institute, Palo Alto, California. 234 p.

Descriptors: *Environmental effects, *Water pollution effects, *Thermal pollution, Powerplants, *Cooling water, Aquatic environments, Conferences, Reviews, Heated water.

Vol. I (See W77-11123) of this series contains the deliberations of the workshop and a number of high priority research recommendations resulting from the deliberations. Vol. 2 contains 22 technical and topical papers which deal with the problems of power plant impact on aquatic systems from social, technological, and cost-benefit points of view as well as covering a broad spectrum of research interests. These interests include ecological design parameters for assessing impact; recovery of perturbed systems; site-specific studies; thermal physiological effects; fish behavior; hydrothermal modeling; entrainment, entrapment, impingement effects; water chlorination; thermoregulation in fish; radionuclides in aquatic ecosystems; aquatic monitoring; and thermal plume prediction. (See W78-04156 thru W78-04173) (chilton-ORNL)
W78-04155

TECHNOLOGY OF POWER PLANT COOLING,
Electric Power Research Inst., Palo Alto, CA. Fossil Fuel and Advanced Systems Dept.
J. S. Maulbetsch, and R. W. Zeren.
CONF-750 980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California, September 28-October 2, 1975, Vol 2. Technical and Topical Papers. p 21-37, 1 fig, 3 tab.

Descriptors: Environmental effects, *Water pollution, *Cooling water, Powerplants, *Thermal pollution, Evaluation, Technology, Reviews.

This paper provides an overview of the technological problems involved in power plant cooling systems and their impact on aquatic environments. Discussion centers around a definition of the need for cooling water; technical, economic, and legislative constraints within which the cooling problem must be solved; alternate cooling methods available or under development; water treatment requirements; and alternatives for modifying the physical impact on aquatic systems. It is recommended that the workshop should strive to identify ecological impacts of waste heat discharges to aquatic ecosystems, the shortcomings in current knowledge and research programs that should be undertaken to correct the shortcomings. (See also W78-04155) (Chilton-ORNL)
W78-04156

PROBLEMS IN DETERMINING THE IMPACT OF POWER PLANTS ON LARGE FRESHWATER SYSTEMS,
Wisconsin Univ., Milwaukee. Center of Great Lakes Studies.
A. M. Beeton.
CONF-750 980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California, September 28-October 2, 1975. Vol 2. Technical and Topical Papers. p 56-72, 11 fig, 2 tab.

Descriptors: *Environmental effects, *Water pollution effects, *Powerplants, Freshwater, Aquatic environments, Discharge(Water), Water quality, Oak Creek powerplant(Wisconsin).

The study reported upon was undertaken to evaluate the effect of the discharge from Oak Creek power plant on aquatic systems. Surveys showed that quality of near shore water was determined by discharge on water quality could be detected. A greater abundance of some plankters inshore was apparently the usual situation and the result of greater nutrient concentrations. The only direct effect of the power plant appeared to be the stimulation of primary production of algae which had passed through the plant and this effect was not of such a magnitude as to be detected by near plant surveys of nutrients and chlorophyll. (See also W78-04155) (Chilton-ORNL)
W78-04157

POWER PRODUCTION ON ESTUARIES AND TIDAL RIVERS,
Virginia Electric and Power Co., Richmond
M. L. Brehmer.
CONF-750 980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California September 28-October 2, 1975, Vol 2. Technical and Topical Papers. p 73-77.

Descriptors: *Environmental effects, Powerplants, *Estuaries, *Tidal waters, *Chesapeake Bay, *Power production.

The paper discusses the potential environmental impact of electrical generating facilities on tidal waters particularly as found on the Chesapeake Bay system. It was concluded that there are environmental costs involved but that on the Chesapeake Bay these are within acceptable limits. A high level of confidence is expressed that power station operation will not adversely affect either the composition or population of phytoplankton or zooplankton outside the 5C isotherm. An attempt is made to point out areas in need of additional research. (See also W78-04155) (Chilton-ORNL)
W78-04158

ECOLOGICAL DESIGN PARAMETERS FOR ASSESSING THE IMPACT OF HEATED WASTE WATER DISCHARGES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, Jr., and K. L. Dickson.
CONF-750 980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California, September 28-October 2, 1975, Vol. 2. Technical and Topical Papers. p 78-84, 15 ref.

Descriptors: *Environmental effects, *Powerplants, Sites, *Water pollution, *Thermal pollution, Thermal stress, Waste water(Pollution), Effluents, Ecosystems, Evaluation.

In view of the fact that ecosystems vary in their ability to resist perturbations caused by waste discharges and other stresses, extensive surveys are necessary for precise estimates of environments impact of individual sites. This paper discusses factors which can be useful in making preliminary estimates of sites. The paper suggests that preliminary site evaluations should include the determination of the ability of the ecosystem to resist pollutional stress; determination of the ability of the system to recover from pollutional displacement; an ecological baseline survey and evaluation of heated discharges on community structure; and evaluations of the temperature requirements of important aquatic species. (See also W78-04155) (Chilton-ORNL)
W78-04159

ON THE RECOVERY OF PERTURBED ECOSYSTEMS,
California Univ., Santa Barbara. Dept. of Biological Sciences.
J. H. Connell.
CONF-750980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California, September 28-October 2, 1975, Vol. 2. Technical and Topical Papers. p 85-91, 1 fig, 8 ref.

Descriptors: *Environmental effects, *Ecosystems, Population, Management, Model studies, Stability, Forest ecosystem, Recovery(Perturbed ecosystems).

Various theories concerning the mechanisms involved in the process of species composition recovery of an ecosystem following different scales of perturbation are discussed in some detail. A forest ecosystem is used as an example and it is pointed out that the principles are applicable to aquatic systems as well. Implications of the various theories for population dynamics and ecosystem management are presented. (See also W78-04155) (Chilton-ORNL)
W78-04160

THE NEED TO ASSESS COOLING WATER USE ON A WATERBODY BASIS,
Great Lakes Fishery Commision, Ann Arbor, MI.
C. M. Fetterolf, Jr.
CONF-750980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Silomar, Pacific Grove, California, September 28-October 2, 1975, Vol. 2. Technical and Topical Papers. p 92-100, 6 ref.

Descriptors: Environmental effects, *Water pollution, *Cooling water, Powerplants, Ecosystems, Biological communities, Management, Water allocation(Policy), Protection, *Thermal pollution, Allocation, Biological value, Species composition, Representative species.

The author presents a concept identified as biological value allocation. It is suggested that this concept involves individuals or groups whose activity is related to the environment accepting responsibility to the environment, to those making use of the environment and to the people. Some of the major basic components of the mechanism related to this concept are agreement on uses to be protected, identification of important species, selection of species representative of the ecosystem, biological mapping of the waterbody, assignment of numerical biological value to zones on basis of importance of ecosystem function, identification of loss levels in each zone as well as total waterbody, selection of protection level, calculation of biological value available for allocation, and allocation to present dischargers and reservation for future dischargers. (See also W78-04155) (Chilton-ORNL)
W78-04161

THERMAL PHYSIOLOGICAL EFFECTS IN AQUATIC SYSTEMS,
Toronto Univ., (Ontario). Inst. for Environmental Studies.
E. E. J. Fry.
CONF-750980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California, September 28-October 2, 1975. Vol. 2. Technical and Tropical Papers. p 101-117, 7 fig, 28 ref.

Descriptors: *Environmental effects, *Water pollution, *Thermal pollution, *Thermal stress, *Aquatic environment, Temperature, Mortality, Physiological ecology, *Ecology.

The present paper was prepared to bring attention to thermo-physiological findings which have surfaced since the publication of Water Quality Criteria, 1972. It is stated that temperature not only limits the range for existence, but that it also governs the capacity to be active within that range. Examples of these restrictions imposed by temperature are presented for various organisms. In addition to the direct effects of temperature on existence and activity and the direct regulatory response or thermokinesis, indirect effects such as the interaction between temperature and the toxic effects of deleterious materials are discussed. (See also W78-04155) (Chilton-ORNL)
W78-04162

THE REACTION OF SMALL FISH TO PERFORATED PLATES,
California Univ., Berkeley. Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 8I.
W78-04163

HYDROTHERMAL MODELING,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering; and Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 5B.
W78-04164

EFFECTS OF ENTRAINMENT, ENTRAPMENT AND IMPINGEMENT,
Ecological Analysts, Inc., Baltimore, MD.
For primary bibliographic entry see Field 8I.
W78-04165

MECHANISMS OF BEHAVIORAL THERMOREGULATION IN FISHES,
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.
W. H. Neill.
CONF-750 980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California, September 28-October 2, 1975, Vol 2. Technical and Topical Papers. p 156-169, 3 fig, 18 ref.

Descriptors: *Environmental effects, *Water pollution, *Thermal pollution, Powerplants, Cooling water, *Fish behavior, Temperature, *Thermoregulation(Fish behavior).

Two concepts of fish behavior, predictive behavioral thermoregulation and reactive behavioral thermoregulation, are discussed. It was concluded that fish distribution in nature could not be predicted on the basis of fishes' environmental tolerance and preferences alone, but that predictively and reactively thermoregulating fish will distribute themselves very differently in a given environment, even though the two types of fish are identical in other respects including temperature preference. It was also suggested that fish distributions are strongly persistent despite temporal changes in thermal structure of the environment. (See also W78-04155) (Chilton-ORNL)
W78-04166

RADIONUCLIDES IN AQUATIC ECOSYSTEMS ASSOCIATED WITH POWER PLANTS,
Northeast Utilities Service Co., Hartford, CT. Environmental Program Branch.
For primary bibliographic entry see Field 5B.
W78-04167

PROBLEMS ASSOCIATED WITH AQUATIC MONITORING AND RESEARCH AT OPERATING POWER STATIONS,
Consumers Power Co., Jackson, MI. Environmental Planning.
For primary bibliographic entry see Field 5B.
W78-04168

THE EFFECTS OF POWER PLANTS ON FISH POPULATIONS,
Rhode Island Univ., Kingston. Dept. of Oceanography.
S. B. Saila.
CONF-750 980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California, September 28-October 2, 1975. Vol 2. Technical and Topical Papers. p 182-186, 7 ref.

Descriptors: *Environmental effects, *Powerplants, Nuclear powerplants, *Fish populations, Thermal stress, Entrainment, Life history studies, Mortality, Stock identification.

The paper reviews several aspects of electrical production by nuclear power plants and suggests that, contrary to general opinion, thermal pollution does not appear to be the leading adverse environmental treat from power plants but that the more critical problem is entrainment. It is suggested that two major aspects of fish population dynamics which have not received adequate attention in power plant related fishery studies are stock identification and early life history mortality estimation. (See also W78-04155) (Chilton-ORNL)
W78-04169

WHAT CAN WE LEARN FROM THERMAL PLUME PREDICTION,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5B.
W78-04170

INVESTIGATIONS INTO MINIMIZING FISH LOSS AT STEAM ELECTRIC GENERATING STATIONS,
Southern California Edison Co., Rosemead.
For primary bibliographic entry see Field 8I.
W78-04171

AQUATIC LIFE IN TEXAS RESERVOIRS,
Texas Electric Service Co., Fort Worth.
J. E. Tilton.
CONF-750 980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California, September 28-October 2, 1975, Vol 2. Technical and Topical Papers. p 219-228, 1 fig, 1 tab.

Descriptors: *Environmental effects, *Water pollution, *Thermal pollution, Powerplants, Cooling water, Fish, Phytoplankton, Zooplankton, Benthos, Populations, Reservoirs, *Texas.

Studies of reservoirs used for cooling water supplies for steam-electric generating stations are reviewed. These studies include a reservoir with a thermal discharge for 50 years, several with heat release and daily chlorination for longer than 20 years and many with 5 to 20 years of power plant operation. Data from these studies indicate that the thermal effluents do not affect the phytoplankton, zooplankton, benthos or fish population in a detrimental manner. Total fish and game fish productivity in 20 reservoirs is tabulated. (See also W78-04155) (Chilton-ORNL)
W78-04172

POWER PLANT CHLORINATION: REGULATORY CONSIDERATIONS,
Michigan Water Resources Commission, East Lansing.
J. G. Truchan.
CONF-750 980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California, September 28-October 2, 1975, Vol 2. Technical and Topical Papers. p 229-234, 5 ref.

Descriptors: *Environmental effects, *Water pollution, *Chlorination, Water quality, Water quality standards, Standards, Permits, National Pollutant Discharge Elimination System.

Chlorine limitations imposed in National Pollutant Discharge Elimination System permits in Minnesota, Michigan, Wisconsin, Ohio, Indiana and Illinois are discussed. The technical and legal basis for restrictive limitations have been challenged by utilities throughout the region for the following reasons: regulations limit free-residual not total-

residual chlorine and limits on materials other than those in guidelines cannot be applied; higher concentrations of chlorine are allowed in municipal wastewater treatment plant permits; plants cannot operate at these reduced concentrations due to condenser fouling; too many units to chlorinate individually in two hours total application time/day; titration method is too complicated and expensive; lack of available, reliable, automatic control technology; biological data base not sufficient to justify concentrations; limits not needed to protect fish because discharge water velocity prevents their entering discharge areas and water quality too low for their presence. (See also W78-04155) (Chilton-ORNL)
W78-04173

THE CONNECTICUT RIVER ECOLOGICAL STUDY, THE IMPACT OF A NUCLEAR POWER PLANT.
American Fisheries Society, Bethesda, MD.
Available from the American Fisheries Society, Bethesda, Maryland, 20014. Monograph No. 1, 1976, Merriman, D. and Thorpe, L. M. (eds). 252 p, Append.

Descriptors: *Environmental effects, *Water pollution, *Thermal pollution, Effluents, Ecology, Reviews, Hydrography, Chemistry, Benthos, Plankton, Fish, *Connecticut River, *Nuclear power plants.

This monograph presents a detailed description of the results of an ecological study, 1965-1973, of the effects of the warm-water effluent from the Connecticut Yankee Atomic Power Company's electric generating plant at Haddam Neck on the lower reaches of the Connecticut River. The study, which embodies hydrography, the benthos, and the resident and anadromous fishes, is characterized by the fact that it was begun while the plant was still in the early stages of construction and the field work was only terminated six years after the inception of commercial operation. The monograph contains nine papers dealing with the areas of hydrography and chemistry, benthic fauna, entrainment of zooplankton, fishes of the lower Connecticut River, ichthyoplankton and entrainment, juvenile shad, adult shad and fish kills. One section carries summary and conclusions of the study. (See also W78-04183) (Chilton-ORNL)
W78-04174

OXYGEN BALANCE IN THE CONDENSER-COOLING WATER SYSTEM OF THE CONNECTICUT YANKEE PLANT,
Essex Marine Lab., CT.
P. M. Jacobson.
In: The Connecticut River Ecological Study, The Impact of a Nuclear Power Plant, American Fisheries Society, Monograph No. 1, 1976, Merriman, D., and Thorpe, L. M., (Eds.). p 35-38, 3 tab, 11 ref.

Descriptors: Environmental effects, *Water pollution, *Thermal pollution, *Cooling water, Powerplants, *Nuclear powerplants, *Oxygen balance, Dissolved oxygen, Condensers, *Connecticut River.

This study of oxygen balance in the condenser-cooling water system was undertaken to determine the extent and nature of any changes in dissolved oxygen concentrations that might occur in the water during its passage through the plant and down the canal to its discharge. Measurements were made at the point of intake of the system, the outfall from the plant above the weir, and near the top and bottom of the effluent canal. Estimates were also made of the production and consumption of oxygen by the plants and animals in the canal. It was concluded that plant operation has no meaningful effect on dissolved oxygen levels in the heated water discharged to the river. (See also W78-04174) (Chilton-ORNL)
W78-04175

RECURRENT MASS MORTALITIES OF THE BLUEBACK HERRING, ALOSA AESTIVALIS, IN THE LOWER CONNECTICUT RIVER,
Essex Marine Lab., CT.
S. A. Moss, W. C. Leggett, and W. A. Boyd.
In: The Connecticut River Ecological Study, The Impact of a Nuclear Power Plant, American Fisheries Society, Monograph No. 1, 1976. Merriman, D., and Thorpe, L. M., (eds.). p 227-234, 4 fig, 2 tab, 9 ref.

Descriptors: *Environmental effects, Powerplants, Nuclear powerplants, *Thermal pollution, Mortalities, Dissolved oxygen, Temperature, Spawning, *Herrings, *Connecticut River, Fishkill, Spawning run, Blueback herrings.

Five mass mortalities of blueback herring occurred in the lower 48 km of the Connecticut River in the latter part of June and/or the first half of July in 1965, 1966, 1967, and 1971. The mortalities occurred in the early morning when dissolved oxygen fell in the ranges below 1.3 mg/l at 24.6C and 3.6 mg/l at 27.6C. Only one of these mortalities occurred in years in which the plant was in operation. (See also W78-04174) (Chilton-ORNL)
W78-04176

THE AMERICAN SHAD (ALOSA SAPIDISSIMA), WITH SPECIAL REFERENCE TO ITS MIGRATION AND POPULATION DYNAMICS IN THE CONNECTICUT RIVER,
Essex Marine Lab., CT.
W. C. Leggett.
In: The Connecticut River Ecological Study, The Impact of a Nuclear Power Plant, American Fisheries Society, Monograph No. 1, 1976, Merriman, D., and Thorpe, L. M., (eds.). p 169-225, 27 fig, 40 tab, 91 ref.

Descriptors: *Environmental effects, Powerplants, *Nuclear powerplants, Water pollution, Thermal pollution, *Fish migration, *Migration patterns, *Connecticut River, *American shad.

The geographical range, relationship of shad to other members of genus Alosa, and their life history are reviewed. 34,000 adult shad were tagged with darts in the lower Connecticut River. Over 20% of the tags were returned with full data on the time and place of recapture. An additional 239 shad were fitted with ultrasonic tags and were tracked continuously for several days. Data showed that no thermal block to the upriver passage of shad exists as a result of the plant operation. Population trends of shad in the Connecticut River over the past three decades are presented. (See also W78-04174) (Chilton-ORNL)
W78-04177

BENTHIC FAUNA: 1965-1967 VERSUS 1968-1972,
Essex Marine Lab., CT.
R. R. Massengill.
In: The Connecticut River Ecological Study, The Impact of a Nuclear Power Plant, American Fisheries Society, Monograph No. 1, 1976, Merriman, D., and Thorpe, L. M. (eds.). p 39-53, 3 fig, 5 tab, 8 ref.

Descriptors: *Environmental effects, *Water pollution, *Thermal pollution, Powerplants, *Nuclear powerplants, *Benthos, Populations, Invertebrates, Discharge(Water), Effluents, *Connecticut River, *Benthic fauna.

This study was made to assess changes in benthic invertebrate populations in the vicinity of the Connecticut Yankee plant. More than 4,700 samples and 550,000 organisms involving 72 species were collected. Four general benthic biotopes, each possessing distinctive biological characteristics, were found in the vicinity (gravel, rock, sand, and silt). Rocky areas extended along the shore opposite the plant and heated water sometimes reached these areas but no biological changes were noted. High current velocities at the water intake depopulated invertebrates from the substratum when the plant went into operation. Heat did not reach the bottom and the bottom was repopulated during intervals of shutdown. In sediments near the discharge, diversity indices reflected an increase in number of species, but a reduction in number of individuals, as operation of the plant continued. The sand substratum became overlain by silt and the kinds and numbers of species decreased. Approximately 2.2 million organisms was the estimated population decrease from the area in direct contact with the plume. At stations not affected by the plume, the number of species and individuals increased continuously throughout the study. (See also W78-04174) (Chilton-ORNL)
W78-04178

ENTRAINMENT OF ZOOPLANKTON AT THE CONNECTICUT YANKEE PLANT,
Essex Marine Lab., CT.
R. R. Massengill.
In: The Connecticut River Ecological Study; The Impact of a Nuclear Power Plant, American Fisheries Monograph No. 1, 1976, Merriman, D., and Thorpe, L. M., (eds.). p 55-59, 4 tab, 11 ref.

Descriptors: *Environmental effects, *Water pollution, Thermal pollution, Powerplants, Nuclear powerplants, *Entrainment, Plankton, *Zooplankton, Mortality, Temperature, *Connecticut River.

Zooplankton in the river, (dominated by entomostracan crustacea) were generally more abundant in the region of the channel and showed a strong diurnal trend in vertical distribution. Of the zooplankton in the vicinity of the plant, the numbers entrained at the intake averaged about 4%. Mortalities of cladocerans and cyclopoid copepods (the dominant forms in warmer months) attributable to mechanical damage in passing through the condenser-cooling system were negligible. Mortalities of these organisms due to heat were essentially 100% when temperatures were above 31C, a period of about 120 days a year; but during cooler periods most of the population appeared to survive. (See also W78-04174) (Chilton-ORNL)
W78-04179

EARLY LIFE HISTORY STUDIES OF AMERICAN SHAD IN THE LOWER CONNECTICUT RIVER AND THE EFFECTS OF THE CONNECTICUT YANKEE PLANT,
NUS Corp., Pittsburg, PA. Ecological Sciences Div.
B. C. Marcy.
In: The Connecticut River Ecological Study, The Impact of a Nuclear Power Plant, American Fisheries Society, Monograph No. 1, 1976, Merriman, D., and Thorpe, L. M., (eds.). p 141-168, 14 tab, 9 fig, 164 ref.

Descriptors: *Environmental effects, *Water pollution, Powerplants, *Nuclear powerplants, Life history studies, Eggs, Larvae, Juveniles, *Connecticut River, *American shad.

All stages of the life history of the American shad were investigated to determine possible adverse effects of the power plant. These studies were primarily concerned with the distribution and abundance of eggs and young shad and with downstream migration. Eggs were stripped from ripe fish and reared in the laboratory to determine development rate. A developmental timetable was established to make possible the aging of eggs collected in the river. Calculations indicated that most eggs travelled only 1.6 to 6.4 km from the point of spawning. It was suggested that differences in time and place of spawning that the eggs of shad in the lower Connecticut River ranked eighth in abundance and larvae ranked twelfth. When estimates of natural mortality are taken into consideration in relation to the estimated number of

shad would have been lost in entrainment, it was concluded that only approximately one adult shad would have been lost by this means in 1968 and 1969. No evidence was obtained to indicate that the plant exerted any harmful effects on the occurrence, distribution, and abundance of juvenile shad. (See also W78-04174) (Chilton-ORNL)
W78-04180

PLANKTONIC FISH EGGS AND LARVAE OF THE LOWER CONNECTICUT RIVER AND THE EFFECTS OF THE CONNECTICUT YANKEE PLANT INCLUDING ENTRAINMENT,
NUS Corp., Pittsburgh, PA. Ecological Sciences Div.
B. C. Marcy.
In: The Connecticut River Ecological Study, The Impact of a Nuclear Power Plant, American Fisheries Society, Monograph No 1, 1976, Merriman, D., and Thorpe, L. M., (eds.) p 115-139, 20 tab, 3 fig, 164 ref.

Descriptors: *Environmental effects, *Water pollution, *Entrainment, Thermal pollution, *Fish eggs, *Larvae, *Plankton, Temperature, Mortality, *Connecticut River, Mechanical damage.

Eggs and larvae representing 16 species of fish were collected in 690 biweekly plankton tows at 16 sampling stations. Alewife, blueback herring, white perch and yellow perch made up 98% of the total egg production. 77% of the egg production occurred above the plant with the number of eggs collected near the intake representing only 0.2% of production. For this reason, the potential effect of entrainment on fish eggs at the intake appeared to be minimal. Data showed that all fish larvae and early juveniles of nine fish species that passed through the plant were dead by the time they reached the end of the discharge canal. Sampling during June and July, when 95% of the non-screenable fish were present near the intake, showed at approximately 80% of the total mortality in the canal had been caused by mechanical damage and 20% by heat shock. It was concluded that any estimate of the effect of mortality from entrainment on the total fish population must take into account the natural mortality that occurs during specific life stages of each species. (See also W78-04174) (Chilton-ORNL)
W78-04181

FISHES OF THE LOWER CONNECTICUT RIVER AND THE EFFECTS OF THE CONNECTICUT YANKEE PLANT,
NUS Corp., Pittsburgh, PA. Ecological Sciences Div.
B. C. Marcy, Jr.
In: The Connecticut River Ecological Study, The Impact of a Nuclear Power Plant, American Fisheries Society, Monograph No 1, 1976 Merriman, D., and Thorpe, L. M., (eds.). p 61-113, 20 fig, 48 tab, 164 ref.

Descriptors: Environmental effects, *Water pollution, *Thermal pollution, Powerplants, *Nuclear powerplants, *Fish populations, Discharge(Water), Effluent, *Connecticut River.

This study describes changes in the population dynamics and the sport fishery of fishes in the vicinity of the Connecticut Yankee Plant in the years 1965-1972. Some 229,933 fish representing 44 species and 21 families were collected in 1,398 bag-seine and trawl hauls. The study details the composition and relative and seasonal abundance of fish species regularly sampled at frequent intervals at eight stations for both young and adults. Life-history data are presented for the four most abundant species: white perch, spottail shiner, brown bullhead, and white catfish. After the plant began to operate, there was a significant reduction in the number of these species at the heated stations as well as a significant reduction in the number of white catfish and spottail shiners at the control stations. Two distinct seasonal peaks occurred in the fish population in the canal, one in March and April and another in November and December with the number of fishes remaining relatively constant from May through October. (See also W78-04174) (Chilton-ORNL)
W78-04182

HYDROGRAPHY,
Essex Marine Lab., CT.
W. A. Boyd.
In: The Connecticut River Ecological Study, The Impact of a Nuclear Power Plant, American Fisheries Society, Monograph No. 1, 1976. Merriman, D., and Thorpe, L. M., (Eds.). p 25-34, 15 fig, 1 tab, 8 ref.

Descriptors: *Environmental effects, *Water pollution, Thermal pollution, Powerplants, *Nuclear powerplants, *Hydrography, Discharge(Water), Effluents, Oxygen.

This paper on lower case hydrography outlines the operating history of the Connecticut Yankee plant 1967-1972, discusses the Connecticut River discharge and climatological conditions, and describes the hydrographic monitoring system. Normal upstream limit of significant salinity from seawater incursion was found to be well below the maximum downstream extent of the thermal plume from the plant. Proximity of brackish water permits the occasional presence of holeuryhaline species. Long- and short-term studies of oxygen concentrations showed no measurable effect attributable to the operation of the plant. The area and extent of the thermal plume varied so widely under the broad spectrum of conditions imposed by river discharge and tidal flow that averages are mere indicants but, under normal or low-flow conditions surface temperatures usually showed elevations up to 8C at least once each day. (See also W78-04174) (Chilton-ORNL)
W78-04183

EFFECTS OF LIGHT INTENSITY AND TEMPERATURE ON CRYPTOMONAS OVATA (CRYPTOPHYCEAE) GROWTH AND NUTRIENT UPTAKE RATES,
Washington State Univ., Pullman. Dept. of Zoology.
J. E. Cloern.
Journal of Phycology, Vol. 13, No. 4, December 1977, p 389-395, 8 fig, 1 tab, 42 ref.

Descriptors: Environmental effects, *Light intensity, *Temperature, *Growth rates, Algae, Nutrients, Nutrient requirements, Nitrates, Phosphates, Ammonium compounds, Absorption, *Cryptomonas ovata, Cryptomonads, Uptake rates, *Nutrient uptake kinetics.

The response of Cryptomonas ovata growth to light is described by Steele's function at 8 and 26 C where light inhibition was observed but the organism was found to be more tolerant of higher light intensities in the range of 14-20C. Both maximum growth rate and optimum light intensity were depressed at 26C, suggesting a temperature inhibition. The optimum growth temperature was found to be between 20 and 26C. Nutrient uptake studies showed that substrate-saturated nitrate uptake was slow in the dark and stimulated by increase in temperature and light; ammonium uptake proceeded at a basal rate at 8 and 14C and was stimulated by increase of temperature and light. Ammonium uptake rates were higher than nitrate uptake rates at all light-temperature combinations. C. ovata was found to take up phosphate over a wide range of light-temperature conditions. (Chilton-ORNL)
W78-04185

RELATION OF WATER TEMPERATURE TO BACTERIAL KIDNEY DISEASE IN COHO SALMON (ONCORHYNCHUS KISUTCH), SOCKEYE SALMON (O. NERKA), AND STEELHEAD TROUT (SALMO GAIRDNERI),
Oregon State Univ., Corvallis. Dept. of Microbiology.
J. E. Sanders, K. S. Pilcher, and J. L. Fryer.
Journal of the Fisheries Research Board of Canada, Vol. 35, No. 1, January 1978, p 8-11, 3 tab, 9 ref. EPA 18050 DIJ and R 800171.

Descriptors: Environmental effects, *Water temperature, Disease, Fish diseases, Salmonids, Bacteria, Mortality, Salmon, Sockeye salmon, Trout, *Thermal stress, *Bacterial kidney disease(Fish), Coho salmon, *Steel head trout.

The strains of the Corynebacterium species causing kidney disease were injected into the three species of fish at varying temperatures from 3.9 to 20.5C. Mortality was essentially 100% in sockeye salmon at all temperatures from 6.7 to 20.5C and was greatest in coho salmon and steelhead trout at 6.7-12.2C. Mortality in these two species declined at temperatures above 12.2C. Mean number of days between infection and death an was shortest in all three species at higher temperatures, varying from 21-34 days at 15.0-20.5C. Mean number of days between infection and death at 6.7C ranged from 60-71 days in the three species. (Chilton-ORNL)
W78-04186

USE OF OPERATIVE INFORMATION ON SANITARY VIOLATIONS OF THE ENVIRONMENT, (IN RUSSIAN),
Municipal Sanitary Epidemiology Station, Novokuznetski (USSR).
O. I. Samuilo, E. M. Deeva, ZZ. F. Karpova, and N. A. Kozlova.
Gig Sanit 1, p 95-97, 1977.

Descriptors: *Public health, *Water quality standards, Environment, Diseases, Water pollution effects, Bacteria, *Human diseases, Infection.

A system of information for environmental damage with goal of isolating potential dangers for humans was discussed. Critical situations were environmental violations defined in terms of possible harmful changes in the environment. Accidents with technological equipment, changes in bacterial evaluations of food or water, occupational diseases, food poisoning, and infections illnesses were all included. Monitoring this type of information could allow prognoses on health of people to be made. Copyright 1978, Biological Abstracts, Inc.
W78-04188

PHYTOPLANKTON SUMMER STANDING CROP AND ANNUAL PRODUCTIVITY AS FUNCTIONS OF PHOSPHORUS LOADING AND VARIOUS PHYSICAL FACTORS,
Cornell Univ., NY. Dept. of Natural Resources.
R. T. Oglesby.
Journal of the Fisheries Research Board of Canada, Vol 34, 1977, p 2255-2270. 13 fig, 4 tab, 93 ref.

Descriptors: Environmental effects, Lakes, *Productivity, *Standing crop, *Phytoplankton, *Phosphorus, Trophic level, Eutrophication, Primary productivity, Lake morphology, Summer, Seasonal, Water pollution effects, Morphoedaphic index.

Lakes ranging over a wide spectrum of morphologies, trophic states, hydrologies and light regimes are represented in the study. When mixing of the water column was taken into account, it was found that standing crop was highly correlated with dissolved phosphorus loading. In lakes with a mean depth > 25 m, areal loading accounted for 97% of the variance in summer phytoplankton standing crop. In shallower lakes, phosphorus inputs were adjusted to give a simple approximation of the influence of mixing processes and the ratio of bot-

tom area to overlying water volume. Annual primary productivity was a more complex and variable function of phosphorus loading than was summer standing crop. (Chilton-ORNL)
W78-04189

RELEASE OF MERCURY AND ORGANICS FROM RESUSPENDED NEAR-SHORE SEDIMENTS,
Florida State Univ., Tallahassee.
S. E. Lindberg, and R. C. Hariss.
Journal Water Pollution Control Federation, December 1977, p 2479-2487. 4 fig, 2 tab, 32 ref.

Descriptors: *Environmental effects, *Sedimentation, Suspension, Mercury, Estuaries, Rivers, Mobile Bay, Everglades National Park(Fla), Deposition(Sediments), Sediment-water interfaces, Dredging, *Mobile Bay(Ala), Florida, Alabama, Resuspension, Redeposition.

A field study was designed to examine the kinetics of mercury sediment-water interaction during periods of intense sediment-water mixing, using near-shore marsh sediments and dredge spoil sediment collected from Mobile Bay and riverine and estuarine organic-rich sediments from the Everglades National Park. Similar behavior of mercury during resuspension of sediments from each of the environments was noted. The mechanisms controlling the patterns of mercury release and redeposition were related to variations in pH, redox potential, total dissolved sulfide and dissolved organic carbon concentration, but, in no case, was a consistent pattern of any of these measured variables observed. Results suggest that large-scale resuspension of estuarine sediments by processes such as dredging operations causes a temporary release of dissolved mercury into the surrounding water followed by a decrease to levels close to those predicted by ideal dilution calculations. The results also illustrate the problems associated with assessing the environmental impact of dredging. (Chilton-ORNL)
W78-04192

SEDIMENT CONTAMINATION AND BENTHIC MACROINVERTEBRATE DISTRIBUTION IN A METAL-IMPACTED LAKE,
Purdue Univ., Lafayette, Ind. Dept. of Bionucleonics.
R. Wentsel, A. McIntosh, and V. Anderson.
Environmental Pollution, Vol. 14, 1977, p 187-193, 2 fig, 1 tab, 8 ref.

Descriptors: Environmental effects, *Water pollution, Effluents, Heavy metals, *Toxicity, *Benthos, *Invertebrates(Distribution), Populations, Cadmium, Zinc, Chromium, Sediments, Lakes, *Lake sediments, Industrial wastes, *Metals.

The study site, Palestine Lake, Indiana, was contaminated by effluents from an electroplating plant. Samples of the upper 3 cm of sediment were collected from five sites for metal analysis. Levels ranged from a high of 969 ppm Cd, 14,032 ppm Zn and 2106 ppm Cr near the effluent to lows of 4 ppm Cd, 139 ppm Zn and 38 ppm Cr in a distant portion of the lake. Numbers of the oligochaete Limnodrilus sp were highest at stations near the effluent and decreased at distant stations while chironomid populations were near zero at sites near the effluent and increased at distant stations. It was suggested that elimination of competitors probably accounts for the high population number of the oligochaete Limnodrilus sp near the effluent. No mechanism enabling these organisms to survive in such areas is apparent. (Chilton-ORNL)
W78-04193

OCCURRENCE OF METHYL MERCURY IN PIKE AND BALTIC HERRING FROM THE TURKU ARCHIPELAGO,
Turku Univ. (Finland). Inst. of Biochemistry.
R. R. Linko, and K. Terho.
Environmental Pollution, Vol. 14, 1977, p 227-235, 1 fig, 3 tab, 35 ref.

Descriptors: Environmental effects, *Water pollution, *Mercury, Fish, *Finland, *Herrings, *Pikes, Turku Archipelago(Finland), Baltic Sea, Baltic pike, Bioaccumulation, *Methyl mercury.

The mean level of methyl mercury found in pike from the Turku archipelago was 0.27 mg/kg but the concentrations varied considerably between individuals from the same fish population. There was evidence of a linear relationship between the methyl mercury concentration and the weight (and age) of fish. Highest methyl mercury level was found in pike from the inner archipelago near the city of Turku. Herring from the Turku archipelago contained markedly lower concentrations of methyl mercury than pike, the mean value, 0.09 mg/kg, being only about one-third that found in pike. (Chilton-ORNL)
W78-04194

EFFECTS OF METHANOL ON THE FERTILISATION OF CHUM SALMON (ONCORHYNCHUS KETA) OVA,
Aquatic Environments Ltd., Nanaimo (British Columbia).
P. C. Craig, F. C. Withler, and R. B. Morley.
Environmental Pollution, Vol. 14, 1977, p 85-91, 3 tab, 8 ref.

Descriptors: Environmental effects, *Water pollution effects, Reproduction, *Salmon, Antifreeze, Eggs, Hatching, Fertilization, *Chum salmon, *Methanol, Gametes.

Both gametes and fertilized eggs were subjected to methanol concentrations of 0.001, 0.01, 0.1, 1.0 and 10.0% by volume. Results showed that methanol concentrations up to and including 1.0% did not significantly affect fertilization success, survival to hatching, hatching time, alevin size at hatching or physical deformities among alevins. A 10.0% concentration of methanol was lethal in most cases even for short exposures. It was concluded that while these results suggest that a short exposure to spilled methanol diluted in a receiving stream would not affect the viability of deposited ova and sperm, the methanol used in these tests was reagent grade and that the combined effects due to contaminants which vary in kind and proportion in industrial grade antifreeze (from which some methanol spillage occurs) are not known. (Chilton-ORNL)
W78-04195

THE EFFECT OF ROAD DEICING SALT ON THE DRIFT OF STREAM BENTHOS,
Waterloo Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-04196

THE EFFECTS OF SEWAGE SLUDGE ON THE GROWTH RATE OF CARP, CYPRINUS CARPIO L.,
Chinese Univ. of Hong Kong. Dept. of Biology.
S. W. Yip, and M. H. Wong.
Environmental Pollution, Vol. 14, 1977, p 127-132, 1 fig, 3 tab, 10 ref.

Descriptors: Environmental effects, *Water pollution, *Sludge disposal, Fish, Fish farming, Heavy metals, Toxicity, *Carp, *Growth rates, *Sewage sludge.

Carp reared in tap water to which sludge had been added to give a sludge concentration of 0.2%, or in sewage effluent, had higher growth rates than carp reared in tap water alone. Fish in 0.6 and 0.8% media appeared unhealthy during the culture period. It was suggested that this might be due to accumulation of sludge particles containing high concentrations of heavy metals in the vicinity of the gills and that these accumulations may have been the cause of observed mortalities. (Chilton-ORNL)
W78-04197

THE OCCURRENCE OF SOME HEAVY METALS IN POPULATIONS OF THE FRESHWATER MUSSEL ANODONTA ANATINA (L.) FROM THE RIVER THAMES,
Kingston Polytechnic, Kingston upon Thames (England). School of Chemical and Physical Sciences.
For primary bibliographic entry see Field 5B.
W78-04198

WATER QUALITY IN THE FORTH ESTUARY: A DISCRIMINANT FUNCTIONAL ANALYSIS,
Napier Coll. of Commerce and Technology, Edinburgh (Scotland).
For primary bibliographic entry see Field 5A.
W78-04199

5D. Waste Treatment Processes

DREDGED MATERIAL DENSIFICATION AND TREATMENT OF CONTAMINATED DREDGED MATERIAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5G.
W78-03750

SWINE LAGOON EFFLUENT ON A SOIL-PLANT ENVIRONMENT: AN IMPACT ASSESSMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
E. R. Collins, Jr., E. T. Kornegay, and D. C. Martens.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 124, Price codes: A03 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 110, January 1978. 38 p, 34 tab, 1 fig, 12 ref. OWRT A-063-VA(1).

Descriptors: Farm wastes, *Swine waste treatment, *Farm lagoons, Hogs, *Biological treatment, *Aerated lagoons, Heavy metals, Waste water disposal, *Waste water treatment, Oxidation lagoons, Land disposal, Swine waste irrigation.

Two biological treatment units for a swine production unit were evaluated. One unit was maintained as an anaerobic system, the other as a mixed aerated unit by means of a floating mechanical aerator. Wastes were flushed into each unit by recirculation of effluent. Analysis of the supernatant of both systems showed that, with time, accumulations of heavy metals and other elements increased. Effluent from both treatment systems was irrigated on fescue plots, and effects on soil, soil water, and plant tissue were determined. While no visible deleterious effects were noted over a period of one and one half years, accumulation or high uptake of Na, Cu, and Zn was recorded in both plant tissue and soils; over extended periods, these effects could be serious if not controlled. Nitrate leaching from plots was minimal. Other waste constituents measured did not appear to be limiting factors in land disposal of swine lagoon effluent.
W78-03755

THE PHASED CLEAN-UP PROGRAM, KANAWHA RIVER,
For primary bibliographic entry see Field 5G.
W78-03821

ALGAE HARVESTING FROM SEWAGE.
Caldwell Connell Engineers Pty. Ltd, Canberra (Australia).

For primary bibliographic entry see Field 5G.
W78-03843

WATER CONSERVATION IN INDUSTRIAL FILTRATION OPERATIONS,
Arkansas Univ., Fayetteville. Coll. of Engineering.
J. L. Turpin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 356, Price codes: A04 in paper copy, A01 in microfiche. Arkansas Water Resources Research Center, Fayetteville, Publication No. 53, September 1977. 50 p, 20 fig, 2tab, 9 ref, 3 append. OWRT A-035-ARK(1).

Descriptors: *Filter cake washing, *Saturated washing, *Unsaturated washing, Industrial wastes, Water conservation, Filtration, Computer program, Mathematical models, *Waste water treatment.

The washing of a solute from filter cakes was investigated for both saturated and unsaturated washing conditions. Systems used in this experimental study were 0.065 NaCl solution as the filtrate in an aluminum hydrate filter cake and 0.1 Normal HCl solution as the filtrate in a column packed with glass beads. The filtrate concentration as a function of the flow rate of wash water and of the volume of effluent from the pack bed was measured. The amounts of filtrate removed from the bed during saturated washing and washing employing repetitive steps of saturation followed by evacuation were compared. Also, the amounts of wash water required to lower the filtrate concentration to essentially zero were contrasted. The saturated wash condition was more efficient in removing the filtrate from compressible cakes, while the reverse was true for porous, incompressible cakes. Computer programs were developed to simulate both saturated and unsaturated washing conditions.
W78-03932

CHEMICAL AND BIOLOGICAL STUDIES ASSOCIATED WITH THE RECOVERY OF THE RIVER EBBW FAWR (1970-74),
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
For primary bibliographic entry see Field 5G.
W78-03953

FEEDLOT RUNOFF AND SEWAGE EFFLUENT AS POTENTIAL WATER POLLUTANTS WITH EMPHASIS ON NITROGEN AND PHOSPHATE LEVELS AND OXYGEN DEPLETION,
New Mexico Inst. of Mining and Technology, Socorro. Dept. of Chemistry; and New Mexico Inst. of Mining and Technology, Socorro. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-03968

THE JAPANESE REGIONAL WASTEWATER TREATMENT SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering; and Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
E. D. Brill, Jr., and M. Nakamura.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 531, Price codes: A03 in paper copy, A01 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 129, October 1977. 40 p, 5 tab, 4 fig, 4 ref. OWRT A-082-ILL(1).

Descriptors: Management, Pollution, *Sewage treatment, *Waste water treatment, *Japan, *Treatment facilities, *Water pollution control, Cost effectiveness, Institutional arrangements, Regional planning, Social issues.

The Japanese government is undertaking a major program to provide additional sewage collection and treatment because of the severe water pollution that has resulted from rapid urbanization and industrialization. The program is characterized by strong regional planning and by the utilization of central treatment plants serving many communities and, in some cases, industries. Through a study carried out in Japan many important planning issues were identified, including: (1) cultural and historical factors; (2) cost effectiveness, including economies of scale, treatment effectiveness, and short-run and long-run flexibility; (3) potential interrelationships with drainage, water supply, and land use; (4) interactions between planning agencies and local citizens; and (5) institutional arrangements between governmental bodies. The Japanese experience is a significant one in the history of planning wastewater treatment systems and provides some guidance as similar programs are initiated in other developed and developing countries throughout the world.
W78-03969

HIGH-RATE DISINFECTION: CHLORINE VERSUS CHLORINE DIOXIDE,
O'Brien and Gere Engineers, Inc., Syracuse, NY.
D. F. Geisser, and S. R. Garver.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 103, No EE6, p 1089-1103, December 1977. 10 fig, 5 tab, 17 equ, 14 ref. EPA Y005141.

Descriptors: *Water pollution control, *Disinfection, *Optimization, *Mixing, *Intensity, *Chlorine, *Chlorine dioxide, Cost-benefit analysis, Multiple regression analysis, Cost minimization, Mathematical models, Equations, *Overflow, *Combined sewers, Environmental engineering, Sewage treatment, Sanitary engineering, Systems analysis, Rochester(NY), New York.

High-rate disinfection of combined sewer overflows with chlorine and chlorine dioxide is evaluated using multiple regression analysis. Mathematical methods of both systems are developed and a performance comparison of the two disinfectants is presented. The performance models indicate that disinfection by chlorine is more sensitive to mixing intensity and detention time than is chlorine dioxide. Using cost-benefit analysis, cost equations and the performance models are employed to derive minimum cost systems for conditions typical of Rochester, New York. The optimizations indicate that, although chlorine dioxide permits the use of lower detention time facilities, chlorine results in lower overall system costs. (Bell-Cornell)
W78-03992

DECISIONS ABOUT WASTEWATER TECHNOLOGY: 1850-1932,
Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of History, Technology, and Urban Affairs.
J. A. Tarr, and F. C. McMichael.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 103, No WR1, p 47-61, May 1977. 47 ref.

Descriptors: *Sewage treatment, *Sewers, *Water treatment, *Regulation, *History, Water supply, Sewerage, Sewage disposal, Households, Tap water, Public works.

This paper focuses upon key turning points in the evolution of methods of collecting and treating domestic wastes during the period 1850 to 1932 and suggests that there are many analogies between today's water quality movement and that of the past. The 1850-1932 time span can be divided into three periods: 1850-1880, 1880-1900, and 1900-1932. Each of these periods was dominated by the marking of a critical decision in terms of dealing with domestic wastes. The three decisions examined herein are the adoption of a system of sewers using water for transport of wastes, the decision to build combined rather than separate sewers, and the decision to treat raw water supplies rather than to treat waste before disposal to waterways. These decisions led to unanticipated results, results that necessitated new technologies and that led to an expansion of governmental regulation in the area of water quality. (Bell-Cornell)
W78-03996

PURIFICATION OF SULFITE MILL EFFLUENTS BY THE ELECTROCHEMICAL METHOD (OCHISTKA PROMYSHLENNYKH STOKOV SUL'FITNO-TSELLYULOZNOGO PROIZVODSTVA ELEKTROKHIMICHESKIM SPOSOBOM),
Vsesoyuznyi Nauchnyi Planovii Otdel Bumazhnoi Promyshlennosti, Moscow (USSR).
A. D. Venderevskii, G. N. Galyatin, R. F. Ofengeim, V. I. Pershin, and T. P. Pershina.
Bumazhnaya Promyshlennost, No. 5, p 23-24, May, 1977. 1 tab.

Descriptors: *Pulp wastes, *Sulfite liquors, *Waste water treatment, *Electrochemistry, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Aluminum, Electrodes, Direct currents, Chemical oxygen demand, Color, Hydrogen ion concentration, Energy, Chemical reactions, Sulfite pulp mills.

Model sulfite mill effluent (COD of 2000-2500, pH of 3-4) was purified by the electrochemical process in a 10-liter column under static and dynamic conditions. The column contained Al electrodes, and the process was carried out with direct current of different strength. A 20-min process reduced COD at least 50% and color at least 80%. The pH increased to 5-6 and the energy consumption was 3-4 kw-hr/cu m. The experiments were repeated with actual mill effluent (COD of 500-1500, pH 3-4, fiber content 100-150 mg/liter) obtained in the production of unbleached sulfite pulp and wrapping paper. The purification effectiveness and energy consumption were about the same as with the model effluent. Chemical reactions taking place during the electrochemical purification process are discussed. The construction of experimental equipment for electrochemical effluent purification is recommended. (Stapinski-IPC)
W78-04065

STATUS REPORT ON ABATEMENT OF WATER POLLUTION FROM THE CANADIAN PULP AND PAPER INDUSTRY - 1976.
Department of the Environment, Ottawa (Ontario). Water Pollution Control Directorate.
Environmental Protection Service, Economic and Technical Review, Report EPS 3-WP-77-9, 35 p, September, 1977. 2 fig, 10 tab, append.

Descriptors: *Water pollution control, *Canada, *Pulp and paper industry, Pulp wastes, Wastes, Industrial waste, Water pollution treatment, Water pollution sources, Suspended solids, Biochemical oxygen demand, Costs, Capital costs, Foreign countries, Energy, Sludge disposal, Nutrients, Pollution abatement, Sulfite pulp mills, Newsprint mills, Spent sulfite liquors.

During the period 1974 to 1976, pulp and paper production remained essentially unchanged. Total suspended solids (TSS) were reduced by 6% and BOD by 15%. Two-thirds of the reduction in BOD was due to the closure of a sulfite mill at Prince Rupert, B.C. Although many mills (83% of production for TSS and 71% of production for BOD) presently have compliance programs, there are still some with no programs. In the period 1960 to 1976, inclusive, expenditures for abatement facilities amounted to ca. $450,000,000. Effluent abatement at integrated newsprint/sulfite mills continues to pose the most difficult problem. These

mills are centered in the Québec, Ontario, and Atlantic regions, and many are old and small in size. Abatement facilities, such as liquor recovery and incineration, have not been installed. Alternative abatement measures, such as biological treatment of spent sulfite liquor, are undesirable because they could result in high energy consumption, serious sludge disposal problems, high nutrient loads on the receiving streams and, more importantly, only the biodegradable portion of the dissolved organic materials discharged from the process would be removed. At a few specific sites, one potential solution may involve consolidation of several small mills into a large operation. Process changes, such as the use of thermomechanical pulp, may be other possible solutions. Several mills have shut down their sulfite operations and are using purchased kraft pulp as their chemical furnish. (Witt-IPC)
W78-04066

ESTIMATE OF COSTS FOR WATER POLLUTION CONTROL MEASURES IN THE PULP AND PAPER INDUSTRY.
Department of the Environment, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5G.
W78-04067

ABITIBI (PAPER COMPANY LTD.) IN SMOOTH ROCK FALLS (ONTARIO) REAPS THE BENEFITS OF IMPROVED WASTE TREATMENT,
For primary bibliographic entry see Field 3E.
W78-04069

SOLIDS-HANDLING PROCESS STUDIES -- ALASKA LUMBER AND PULP (INC.),
Edde (Howard), Inc., Bellevue, WA.
H. J. Edde.
Canadian Pulp and Paper Association, Technical Section, 63rd Annual Meeting (Montreal), February, 1977, Preprint, p A113-A117. 8 ref, 7 tab.

Descriptors: *Pulp wastes, *Sulfite liquors, *Waste water treatment, *Biological treatment, *Waste treatment, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Biochemical oxygen demand, Alaska, *Sludge treatment, *Dewatering, Centrifugation, Filtration, Activated sludge, Sludge disposal, Incineration, Effluents, Pulp and paper industry, Sulfite pulp mills.

Process design studies were conducted at a sulfite (dissolving-grade) pulp mill owned by Alaska Lumber and Pulp Inc. in Sitka, Alaska, to reduce the 5-day BOD of its organic waste discharges from 175,000 to 48,000 lb BOD/day. biological sludge dewatering by thickening, centrifugation, vacuum filtration, pressure filtration, or solvent extraction was studied at 3 secondary-treatment pilot plants, viz., air-activated sludge (AAS), high-purity oxygen-activated sludge, and rotating biodisk systems. Inplant controls reduced the BOD to 110,000 lb/day, thus reducing the BOD load to be removed by the biological treatment plant and the amount of biological waste solids by one-half. Sludge generated in the AAS plant under construction will be mixed with primary sludge with or without the use of bark fines for conditioning. This mixture will be directed to the existing vacuum coil filter followed by a Reitz V-Press for dewatering. The dewatered sludge will then be burned in the existing hog fuel boiler. (Swichtenberg-IPC)
W78-04071

BIODEGRADABILITY OF TOXIC COMPOUNDS IN PULP MILL EFFLUENTS,
B. C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5B.
W78-04072

BIODEGRADATION OF SPENT BISULFITE LIQUOR IN A TWO-STAGE IN-SERIES REACTOR (EPURATION BIOLOGIQUE DE LA LIQUEUR AU BISULFITE DANS UN REACTEUR A DEUX STAGES EN SERIE),
Laval Univ., Quebec.
M. G. Tricart, S. N. Lo, J. J. Garceau, and A. Cholette.
Canadian Pulp and Paper Association, Technical Section, 63rd Annual Meeting (Montreal), February, 1977, Preprint, p B23-B30. 7 fig, 15 ref, 1 tab.

Descriptors: *Pulp wastes, *Sulfite liquors, *Activated sludge, *Waste water treatment, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Waste treatment, Dissolved solids, Biochemical oxygen demand, Biological treatment, Time, Pulp and paper industry, Effluents, Sulfite pulp mills, Spent sulfite liquor.

Biodegradation of spent liquor from high-yield bisulfite pulping was carried out on a laboratory scale, using an activated sludge reactor made up of two stages in series. The influence of incoming dissolved solids concentration and residence period on sludge concentration and system yield was examined. BOD removals of more than 66% were obtained at residence periods of more than 24 hr in each stage. Such two-stage activated sludge treatment shows a better yield than one-stages, it permits meeting BOD removal standards in processing only the concentrated portion of the liquor. This mode of treatment thus appears to be a short-term solution for mills producing less than 300 tons/day of high-yield bisulfite pulp. In addition, the system is well suited to periodic expansion as required by progressively more stringent pollution control standards. (Speckhard-IPC)
W78-04073

MEMBRANE FILTRATION OF SSL (SPENT SULFITE LIQUOR) FOR RECOVERY OF BY-PRODUCTS AND POLLUTION CONTROL,
DDS RO Div. (Denmark). Dept. of Pulp and Paper.
P. H. Claussen.
Canadian Pulp and Paper Association, Technical Section, 63rd Annual Meeting (Montreal), February, 1977, Preprints, p B125-B130. 3 illus, 8 fig, 3 tab.

Descriptors: *Pulp wastes, *Sulfite liquors, *Waste water treatment, *Reverse osmosis, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Membrane processes, Separation techniques, Foreign countries, Europe, Water reuse, Costs, Water pollution control, Byproducts, Pulp and paper industry, Effluents, Lignins, Sulfonates, *Ultrafiltration, Spent sulfite liquor, Norway, Sulfite pulp mills.

Brief descriptions are given of ultrafiltration and reverse osmosis membrane modules developed by a Danish company for the treatment of pulp and paper mill effluents. The purification of lignosulfonates from spent sulfite liquor (SSL) by ultrafiltration and the reverse osmosis treatment of dilute SSL and wash waters are discussed. A reverse osmosis plant has been operating at a Norwegian sulfite mill since September, 1976. This plant, processing 14 cu m/hr of dilute SSL, increases the solids concentration 6 to 12%. Permeate discharge rate is 7 cu m/hr. The permeat has a sulfur dioxide content of 0.75% and is reused in the bleaching plant for neutralization after the hypochlorite stage. Several suggestions are offered for using membrane filtration equipment as parts of larger integrated systems for the treatment of pulp mill effluents. Tabulated data are presented showing the mass balance, concentration data, capacity, and cost of ultrafiltration and reverse osmosis treatment of SSL using coarse and dense filtration membranes. (Witt-IPC)
W78-04074

STUDIES ON THE APPLICATIONS OF MEMBRANE TECHNIQUES IN WASTE EFFLUENT TREATMENT FOR WATER AND CHEMICAL RECLAMATION ALONG WITH POLLUTION ABATEMENT,
Indian Inst. of Tech., Bombay (India). Dept. of Chemical Engineering.
S. Basu.
Chemical Age of India, Vol 27, No 12, p 1086-1091, December, 1976. 7 fig, 11 ref, 5 tab.

Descriptors: *Electrodialysis, *Reverse osmosis, *Waste water treatment, *Pulp wastes, *Sulfite liquors, Waste treatment, Water pollution treatment, Wastes, Industrial wastes, Water pollution sources, Costs, Membrane processes, Osmosis, Separation techniques, Pulp and paper industry, Effluents, Water pollution control, Spent sulfite liquors, Black liquors.

Following an introduction to the principles of reverse osmosis and electrodialysis, the electrodialytic regeneration fo spent pulping liquors is reviewed. Covered are the barrier-anolyte-liquor-catholyte (BALC) system and the transport-depletion process for treating spent sulfite liquors, as well as electromembrane systems applicable to kraft black liquor. Also presented is a cost-benefit analysis of membrane systems for effluent treatment. The techno-economic feasiblity of electrodialytic regeneration of spent sulfite liquor and of membrane techniques as advanced waste-water treatment processes is examined. (Speckhard-IPC)
W78-04075

ABSORPTION OF OXYGEN IN AQUEOUS SOLUTIONS OF SODIUM SULFIDE IN THE PRESENCE OF ACTIVATED CARBON AS CATALYST,
Bombay Univ. (India). Dept. of Chemical Engineering.
K. Chandrasekaran, and M. M. Sharma.
Chemical Engineering Science, Vol 32, No 6, p 669-671, 1977. 4 fig, 10 ref, 1 tab.

Descriptors: *Activated carbon, *Oxidation, *Catalysts, *Pulp wastes, Oxygen, Diffusion, Chemical reactions, Waste water treatment, Water pollution sources, Water pollution treatment, Sodium compounds, Sulfides, Inorganic compounds, *Absorption, *Sodium sulfide, Black liquors.

The influence of activated carbon as catalyst in the oxidation of sodium sulfide in aqueous solution was studied under conditions corresponding to industrial oxidation of kraft black liquor. The activated carbon was found to catalyze the reaction markedly and to cause it to be controlled by diffusion of oxygen into the liquid phase. (Speckhard-IPC)
W78-04077

MEASURING THE COST OF INDUSTRIAL WATER POLLUTION CONTROL,
For primary bibliographic entry see Field 5G.
W78-04079

RECENT TREND OF EFFLUENT TREATMENT,
Sanyo-Kokusaku Pulp Co., Ltd., Tokyo (Japan).
A. Yamaguchi.
Japan Pulp and Paper, Vol. 15, No. 1, p 38-41, April, 1977. 1 fig, 3 tab.

Descriptors: *Pulp wastes, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Activated carbon, Electrolysis, Sludge, Chemical oxygen, Biochemical oxygen demand, Color, Suspended solids, Bark, Wood wastes, Foreign countries, Pulp and paper industry, Effluents, Biological treatment, *Japan.

Effluent treatment methods (activated carbon treatment and electrolysis) are reviewed and possi-

ble uses for sludge are outlined. The efficiency of various effluent treatment systems (physicochemical and biological) for removing COD, BOD, color, and suspended solids is shown, and a flowsheet of the activated carbon process (tons/year) and disposal in the Japanese pulp and paper industry are indicated. (Buchanan-IPC)
W78-04080

ABSORPTION METHOD FOR DETERMINING ACTIVATED SLUDGE CONCENTRATIONS DURING PURIFICATION OF EFFLUENTS FROM VISCOSE PRODUCTION (ABSORBTSIONNOE OPREDELENIE KONTSENTRATSII AKTIVNOGO ILA PRI BIOKHIMICHESKOI OCHISTKE STOCHNYKH VOD VIZKOZNOGO PROIZVODSTVA),
For primary bibliographic entry see Field 5A.
W78-04081

THE SIGNIFICANCE OF THE (GERMAN) WASTEWATER DISCHARGE TAX LAW AND ITS FEE-COMPUTING FORMULA FOR THE PULP INDUSTRY (DIE BEDEUTUNG DES ABWASSERABGABENGESETZES NACH MASSGABE DER BEMESSUNGSFORMEL FUER DIE ZELLSTOFFINDUSTRIE),
Papierwerke Waldhof-Aschaffenburg A. G., Raubling (West Germany).
For primary bibliographic entry see Field 5G.
W78-04082

PULP AND PAPER MANUFACTURE: ENERGY CONSERVATION AND POLLUTION PREVENTION,
Noyes Data Corp., Park Ridge, NJ.
M. Sittig.
Pollution Technology Review No. 36/Energy Technology Review No. 17. September 15, 1977. 430 p.

Descriptors: *Pulp and paper industry, *Energy, *Conservation, *Pollution abatement, *Reviews, Fuels, Coals, Oil, Bark, Wood wastes, Water consumption(Except consumptive use), Water pollution, Water pollution control, Waste water treatment, Biochemical oxygen demand, Color, Mercury, Sludge treatment, Dewatering, Sludge disposal, Air pollution, Bleaching wastes, Odor, Water pollution sources, Byproducts, Patents, Pulp wastes, Pulpwood, Barking, Chipping, Mechanical pulping, Thermomechanical pulping, Chemical pulping, Neutral sulfite semichemical pulping, Waste paper, Black liquors, Kraft mills, Sulfite pulp mills.

The technical details presented in this review are based largely on information reported in government-funded studies and U.S. patents. The subject matter is organized into the following main chapters and sub-chapters: paper and paperboard industry process descriptions (pulpwood acquisition, barking, chipping, groundwood and thermomechanical pulping, neutral sulfite semichemical and chemical pulping, waste paper pulping, pulp bleaching, paper and board production, and converting); types of fuels used (oil, gas, coal, bark and hogged fuel, black liquor); energy consumption patterns; factors affecting energy efficiency; energy conservation approaches and targets; water requirements; water pollution problems; in-house wastewater control (spill containment, by-product recovery, etc.); external wastewater treatment (solids removal, BOD reduction, color removal, mercury removal, sludge dewatering and disposal, compatibility with municipal systems, etc.); air pollutant emissions and their control; kraft process and sulfite mill air emissions and their control; and miscellaneous mill air emissions and control (bleach plant gases, wastewater treatment gases, odor problems, power boiler flue gases). (Brown-IPC)
W78-04084

SOME INFORMATION ON EVAPORATOR INSTALLATIONS (EINIGES UEBER VERDAMPFERANLAGEN),
H. G. Frank.
Der Papiermacher, Vol. 27, No. 9, p 149-151, 155-158, September 24, 1977. 6 fig, 2 illus.

Descriptors: *Evaporators, *Pulp wastes, *Design, Automatic control, Evaporation, Heat transfer, Pressure, Temperature, Equipment, Water pollution sources, Pulp and paper industry, Effluents, *Spent pulping liquors.

Design principles of multiple-effect evaporators for concentrating spent pulping liquors are reviewed. Heat transfer and efficiency and relationship between pressure and temperature are examined. Details discussed include the maximum possible number of stages, the flow of the liquor through the installation, evaporator systems using either forced recirculation of liquor within each stage or compression and recycling of vapors, elimination of noncondensible gases from the system, low-temperature condensation of the vapors from the last stage, and system control. The latter involves level control in the individual stages, determination of the concentration of the concentrated liquor, measurement of the temperature and pressure of the hot steam, and control of the pressure and temperature of the vapors from the last stage. (Speckhard-IPC)
W78-04085

BIOLOGICAL INVESTIGATIONS ON JOINT TREATMENT OF MUNICIPAL SEWAGE AND PULP MILL EFFLUENT,
Research Institute for Environmental Development, Warsaw (Poland).
L. Kalisz.
Polskie Archiwum Hydrobiologii, Vol. 23, No. 1, p 155-171, 1976. 6 fig, 15 ref, 4 tab.

Descriptors: *Pulp wastes, *Sulfite liquors, *Activated sludge, *Municipal wastes, *Waste water treatment, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Aeration, Bacteria, Effluents, Pulp and paper industry, Waste treatment, Water pollution control, Biological treatment, Microorganisms.

Laboratory studies on conditions and possibilities of joint treatment of municipal sewage and sulfite pulp mill effluent were carried out using the activated sludge method with varying aeration time. In order to establish optimum process parameters, the properties of the activated sludge at various aeration times were determined. Aeration times of 9 and 12 hr were found to be optimum as regards microfaunal composition of the sludge and degree of bacteriological purification. Admixture of pulp mill effluent to the municipal sewage was conducive to abundant development of filamentous bacteria. (Speckhard-IPC)
W78-04086

DECOLORIZATION OF EFFLUENTS FROM PULP MILLS,
Rohm and Haas Co., Philadelphia, PA. (Assignee).
S. L. Rock.
United States Patent No. 4,049,546. September 20, 1977. 5 p, 9 claims.

Descriptors: *Lignins, *Patents, *Waste water treatment, *Pulp wastes, *Color, Ion exchange, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Hydrogen ion concentration, Anion exchange, Resins, Pulp and paper industry, Effluents, Separation techniques, Kraft mills.

A process for removing lignin and lignin by-product color bodies from an unbleached kraft pulp mill effluent stream comprises passing the stream at a pH of 6-8.5 through a mass or bed of macroreticular aliphatic weak anion exchange resin possessing a high pK(a) value of 5-10 in the free base form. The resin can be a functionalized methyl acrylate/divinylbenzene copolymer. The resin can be regenerated by contact with a pulp mill process stream containing NaOH, and the resultant stream can be used in pulping. (Lynch-IPC)
W78-04087

ADSORPTION CLARIFICATION PLANT OF BAIENFURT PAPER MILL FOR BLEACH-PLANT EFFLUENTS (ADSORPTIONSKLAERANLAGE DER PAPIERFABRIK BAIENFURT FUER BLEICHEREIABWAESSER).
Wochenblatt fuer Papierfabrikation, Vol. 105, No. 14, p 557-558, July 31, 1977. 1 fig, 2 illus, 1 tab.

Descriptors: *Bleaching effluents, *Pulp wastes, *Adsorption, Wastes, Industrial wastes, Water pollution treatment, *Waste water treatment, Water pollution sources, Foreign countries, Biochemical oxygen demand, Chemical oxygen demand, Pulp and paper industry, Effluents, *Aluminum oxide, Germany.

The pulp-bleaching effluents from Feldmuhle AG., Baienfurt (Germany), have not responded well to biological clarification. The system of effluent treatment described calls for adsorption of the impurities on activated alumina. Such adsorption is shown to reduce 5-day BOD from 275 to 175 and COD from 1800 to less than 350. (Ward-IPC)
W78-04088

EFFLUENT FROM MANUFACTURING OF THERMOMECHANICAL PULPS AND THEIR TREATMENT,
IVL-Consulting Ltd., Stockholm (Sweden).
E. Stenberg, and G. Norberg.
In: Proceedings EUCEPA International Mechanical Pulping Conference, June 6-10, 1977, Helsinki, Finland, Volume II, Paper No. 14, 23 p. 10 fig, 11 ref, 7 tab.

Descriptors: *Pulp wastes, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Biochemical oxygen demand, Chemical oxygen demand, Pulp and paper industry, Effluents, Organic matter, Biological treatment, Costs, Pine trees, Aerated lagoons, Evaporation, Coniferous trees, Softwood, Bleaching wastes, Lignins, Costs, *Thermomechanical pulping, White water(Paper machines), Spruce trees(Picea), Mechanical pulping.

In the thermomechanical pulping (TMP) process about 27-37 kg of 7-day BOD/ton is generated compared to 22-27 kg and 12-20 kg for refiner and stone groundwood pulping, respectively. The major part (22-27 kg BOD/ton) is dissolved out of the chips in the first-stage refining of the TMP process, the rest in the chip washers and barkers. If the pulp is peroxide bleached, the additional amount of BOD is about 15-20 kg BOD/ton. About 2/3 of these amounts are discharged to waste waters, and about 1/3 follow the pulp. Pine, sapwood, and fresh wood generate more BOD than do spruce, corewood, and stored wood, respectively. The dissolved substance increases with increasing temperature in the preheater, especially with pinewood and above 120C. No simple relation between pulp freeness and specific BOD has been found. The BOD/COD and BOD/total organic carbon (TOC) ratios for wet unbleached pulp were similar in the 4 mills studied, viz., about 0.6 and 1.6, respectively. In the white water, BOD/COD was about 0.45 and BOD/TOC was about 1.7. Effluents from TMP and groundwood pulps of Picea abies were analyzed before and after biological treatment in an aerated lagoon. BOD reductions were 90% for TMP and unbleached groundwood and 80% for peroxide-bleached groundwood. The effluent from bleached pulp production has a high content of lignins, low-molecular acids, and ash and is readily biodegradable. The transfer of dis-

solved organic substances, due to closure of the systems (5 cu m/ton), from pulp mill to paper mill may be reduced by ca. 80% if a washing stage or pressing system is installed. The concentrations of organic substances in the effluent is then increased, and evaporation may become an alternative to the biological treatment of waste waters at the same cost of ca. 35-45 Swedish crowns/ton of pulp. Various BOD and COD reduction measures are compared. (DuVall-IPC)
W78-04090

METHANE FERMENTATION OF EXCESS ACTIVATED SLUDGE (PROBLEMATYKA FERMENTACJI METANOWEJ NADMIERNEGO OSADU CZYNNEGO),
A. Lewandowska-Suschka.
Przeglad Papierniczy, Vol. 33, No 6, p 220-225, June, 1977. 8 fig, 14 ref.

Descriptors: *Methane, *Fermentation, *Activated sludge, *Sludge treatment, *Waste treatment, Wastes, Water pollution sources, Pulp wastes, Industrial wastes, Nitrogen, Carbon, Hydrogen sulfide, Sulfides, Phosphorus, Energy, Gases, Effluents, *Sulfate pulp mills.

Results are presented of experiments on methane fermentation of excess activated sludge from biological purification of sulfite mill effluents. The experiments were carried out under laboratory and pilot plant conditions, and the effectiveness of the fermentation process was evaluated by the amount of gas produced, reduction of the organic substances, and the N/C ratio. The results indicate that methane fermentation can be a suitable method of processing excess activated sludge, and thus prevent its accumulation. The amount of fermentation gas produced averaged 1500 cu cm/g of organic solids eliminated for a short retention time (12-30 days). Sulfides and hydrogen sulfide present in the fermented sediment inhibited fermentation. The conversion of organic nitrogen into ammonia nitrogen during fermentation makes it possible to recycle a part of nitrogen to the activated sludge process. Similarly, the phosphorus contained in the sediment could be recycled. Methane fermentation consumes less energy than the process of oxygen stabilization of excess sludge. (Stapinski-IPC)
W78-04092

IN-PLANT TECHNOLOGY FOR THE PREVENTION OF AIR AND WATER POLLUTION (ZAKLADOWE TECHNOLOGIE ZAPOBIEGANIA ZANIECZYSZCZANIU POWIETRZA I WODY),
IVL-Consulting Ltd., Goeteborg (Sweden).
For primary bibliographic entry see Field 5G.
W78-04093

ELECTROMAGNETIC FILTER PURIFICATION OF PAPER MILL CONDENSATE,
Thilmany Pulp and Paper Co., Kaukauna, WI.
R. C. Arnold, R. S. Kopish, D. W. Koch, and G. T. Zirps.
Tappi, Vol. 60, No. 9, p 107-109, September, 1977. 7 fig, 2 tab.

Descriptors: *Water purification, *Filters, *Boilers, *Pulp and paper industry, Electromagnetic waves, Steam, Water treatment, Industrial water, Boiler feed water, Cleaning, Filtration, Corrosion, Maintenance, Wisconsin, Foreign countries, Chemicals, Filtration, *Electromagnetic filters, *Paper mill condensates, Finland.

The sphere-matrix electromagnetic filter (EMF) is proven to be highly effective in purifying condensate. This filter (licensed to the Babcock and Wilcox Co. by Kraftwerk Union AG. of W. Germany) consists of a pressure vessel of nonmagnetic material filled with magnetizable spheres and surrounded by a magnet coil and coil-cooling assembly. Large magnetic gradients in the interstices between the spheres attract magnetic particles which collect on the spheres. The EMF provides increased boiler availability and efficiency, because the higher-quality feedwater results in cleaner internal heat transfer surfaces. With this filter the period between chemical cleaning of the boiler can be increased from once every 2-3 yr to once every 6 yr. The quantities of internal boiler water treatment chemicals are also reduced. The EMF has reduced maintenance of the zeolite softeners and reduced feedwater makeup. Favorable operating experiences are reported by Thilmany Pulp and Paper Co. (Kaukauna, Wisconsin) and Kyro Paper Mill (Kyroskoski, Finland). (DuVall-IPC)
W78-04094

SOLIDS CONTENT DETERMINATION OF SPENT SULFITE LIQUORS,
Cellulose Attisholz A.G., (Switzerland).
For primary bibliographic entry see Field 5A.
W78-04095

EVALUATION OF THE EFFECTIVENESS OF SEWAGE DEHELMINTHIZATION BY MECHANICAL PURIFICATION IN SMOLENSK, (IN RUSSIAN),
Regional Sanitation and Epidemiological Station, Smolensk (USSR).
S. Ya. Asnin, and L. S. Lagutina.
Med Parazitol Parazit Bolezni 45(5), p 609-611, 1976.

Descriptors: *Sewage treatment, Waste water treatment, *Dehelminthization, *Mechanical purification(Water), Ascarid eggs, *Trichurid eggs.

Unpurified sewage contained ascarid and trichurid eggs, an average of 5.7/1. Mechanical clearing provided only 50% dehelminthization. Sewage sediment contains an average of 60 eggs/kg. Keeping the sediment on irrigation fields for 2 yr did not dehelminthize it. Discharging sewage into water bodies and utilization in agriculture are epidemiologically dangerous.--Copyright 1978, Biological Abstracts, Inc.
W78-04096

COLOR REMOVAL IN KRAFT MILL WASTEWATERS WITH MAGNESIUM,
British Columbia Univ., Vancouver.
W. K. Oldham, and R. J. Rush.
Journal Water Pollution Control Federation, Vol. 50, No. 1, January 1978, p 40-45, 2 fig, 5 tab, 7 ref.

Descriptors: Water pollution, Effluent, Waste water(Pollution), *Waste water treatment, Color, Pulp wastes, *Color removal, *Magnesium.

The chemical removal of color from pulp mill effluent is an objective of regulatory agencies in United States and Canada. The chemicals used in this study were reagent grade Ca(OH)2, MgSO4.7H20 and an anionic polymer. Results of the investigation showed conclusively that the addition of relatively small concentrations of Mg+2 can reduce substantially the amount of lime required to achieve a given level of color removal. The choice of which treatment scheme holds the most promise for full-scale use will depend on the relative economics of removing the required amount of color. (Chilton-ORNL)
W78-04111

TECHNOLOGICAL SYSTEMS OF THE DUNAUJVAROS CORRUGATING MEDIUM MILL. PART 3. WATER MANAGEMENT (A DUNAUJVAROSI HULLAMVERTIKUM TECHNOLOGIAI RENDSZEREI. 3. RESZ. VIZGAZDALKODAS),
M. Toth.
Papiripar, Vol. 21, No. 2, p 51-57, 1977. 6 fig, 3 ref.

Descriptors: *Waste water treatment, *Water treatment, *Sludge disposal, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Sludge, Pulp and paper industry, Effluents, Industrial water, Foreign countries, Europe, Discharge(Water), *Corrugating medium(Fluting paper) mills, Danube River, White water(Paper machines), Hungary, Fiber recovery.

Schematic descriptions are given of the corrugating medium (fluting paper) mill's water supply, process water treatment (precleaning), white water and brown waste water treatment, fiber recovery, sludge handling and disposal, and effluent discharge into the Danube River. (Brown-IPC)
W78-04137

LEARN MORE ABOUT VARIABLE SPEED PUMPING/2,
For primary bibliographic entry see Field 8C.
W78-04154

THE DISTRIBUTION OF HEAVY METALS IN ANAEROBIC DIGESTION,
Notre Dame Univ., IN.
For primary bibliographic entry see Field 5A.
W78-04190

CARBONATE PRECIPITATION FOR HEAVY METALS POLLUTANTS,
Illinois Inst. of Tech., Chicago.
J. W. Patterson, H. E. Allen, and J. J. Scala.
Journal Water Pollution Control Federation, December 1977, p 2397-2410. 17 fig, 10 tab, 6 ref.

Descriptors: *Water pollution, Pollutants, *Heavy metals, Wastes, *Waste water treatment, Nickel, Zinc, Cadmium, *Lead, Chemical precipitation, Carbonates.

Based upon the studies described, it was concluded that there is no benefit in using the carbonate system for zinc or nickel precipitation. Minimum soluble zinc concentrations achieved were approximately 0.25 mg/l at pH 9.5 and about 0.3 to 0.5 mg/l for nickel at pH 9.5 to 11. No advantage in denser sludges for better filtration was observed in the zinc or nickel carbonate systems over that for the corresponding hydroxide systems. Treatment nearly equivalent to that for cadmium hydroxide is obtained with cadmium carbonate. The cadmium carbonate system precipitate had relative filtrative rates approximately twice that of the cadmium hydroxide system. Treatment equivalent to that for lead hydroxide at pH 10.5 was obtained with lead carbonate at pH 7.5. The lead carbonate system yielded a denser precipitate than lead hydroxide with improved filterability characteristics. Treatment results for a solution containing all four metals were equivalent to those observed for the single-metal hydroxide and carbonate systems. (Chilton-ORNL)
W78-04191

5E. Ultimate Disposal Of Wastes

MANAGEMENT OF BOTTOM SEDIMENTS CONTAINING TOXIC SUBSTANCES, PROCEEDINGS OF THE SECOND U.S.-JAPAN EXPERTS MEETING, OCTOBER 1976--TOKYO, JAPAN.
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5G.
W78-03735

CHEMICAL STABILIZATION OF SOFT SOILS,
Port and Harbour Research Inst., Kanagawa (Japan). Soil Stabilization Lab.
For primary bibliographic entry see Field 5G.
W78-03744

A METHOD FOR DISPOSING OF WASTE WATER AT DREDGED MATERIAL RECLAMATION SITES,
Japan Dredging and Reclamation Engineering, Tokyo.
E. Satoh.
In: Management of Bottom Sediments Containing Toxic Substances: Proceedings of the Second U.S.-Japan Experts' Meeting-October 1976, Tokyo, Japan. EPA-600/3-77-083, July 1977, p 169-190. 3 tab, 13 fig.

Descriptors: *Landfills, Environmental engineering, *Dredging, *Turbidity, *Pollution control, *Methodology, *Waste water disposal, *Dehydration, *Suspended solids, Design, Waste treatment, Desilting, Waste water treatment, Spillways, Public health, Environmental control, Flocculation, *Land reclamation, *Dredge spoils.

This report introduces a method for disposing of the waste water that continuously flows in huge amounts from dredged materials as they are removed, transported, and dumped in reclamation sites. This method is characterized by its attempt to reduce the quantity of flocculants and to establish a stable and reliable system for disposal of large volumes of waste water by taking advantage of the natural conditions at the site to be reclaimed. The rectifying sedimentation pond method uses a flocculant. A stable and economic mass waste water disposal system is achieved by adjusting the amount of chemicals in proportion to the water quality and quantity flowing into the rectifying sedimentation pond. A trough spillway method of waste water purification is described which uses no flocculants. It is useful for reclaimed material that is not polluted. (See also W78-03735) (Katz)
W78-03745

LEGAL AND ADMINISTRATIVE ASPECTS OF BOTTOM SEDIMENT MANAGEMENT,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5G.
W78-03746

SWINE LAGOON EFFLUENT ON A SOIL-PLANT ENVIRONMENT: AN IMPACT ASSESSMENT,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W78-03755

LEACHATE PLUMES IN GROUND WATER FROM BABYLON AND ISLIP LANDFILLS, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-03759

EVALUATION OF SCINTILLATION PROBE PROFILES FROM 200 AREA CRIB MONITORING WELLS,
Atlantic Richfield Hanford Co., Richland, WA. Research Dept.
For primary bibliographic entry see Field 5B.
W78-03860

THE REPORT TO CONGRESS: WASTE DISPOSAL PRACTICES AND THEIR EFFECTS ON GROUND WATER: EXECUTIVE SUMMARY.
Environmental Protection Agency, Washington, DC. Office of Water Supply.
For primary bibliographic entry see Field 5B.
W78-03864

DREDGE DISPOSAL STUDY. SAN FRANCISCO BAY AND ESTUARY. MAIN REPORT.
Army Engineer District, San Francisco.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 727, Price codes: A06 in paper copy, A01 in microfiche. Army Corps of Engineers Main Report, February 1977. 121 p, 34 fig, 21 tab, 39 ref, 13 append.

Descriptors: *Dredging, *Waste disposal, *Estuaries, *Baseline studies, Water pollution, California, *Outer Continental Shelf, San Francisco Bay, Ocean dumping.

The basic concept of the overall study was to address to the greatest extent possible the mechanisms involved and the interrelationships of the various physical, chemical and biological parameters being influenced by the dredging activities. The study was set up to be problem specific and to San Francisco Bay, recognizing that it may have value to other areas. The first study category, dealing with dredging with open water disposal in the Bay, involves ten of thirteen study elements. These elements are: pollutant distribution, water column (characterize physical factors), oxygen sag, material release biological comunity (characterize biota), crystalline matrix (characterize sediment chemistry), physical impact (relate physical and biological), pollutant uptake (relate chemical and biological), dredging technology (relate physical and equipment), and pollutant availability (integration of factors). The second study category deals with alternative disposal methods. The three study elements in this category are: land disposal, marsh development, and ocean disposal. (Sinha - OEIS)
W78-03875

PRELIMINARY REPORT ON IN SITU MEASUREMENTS OF THE EFFECTS OF SEWAGE DISCHARGE FROM NAVY SHIPS OPERATING WITHIN THE 12-MILE LIMIT,
Naval Ship Research and Development Center Bethesda, MD.
A. Talts, E. M. Stanley, T. H. Voisinet, and W. van Hees.
Available from the National Technical Information Service, Springfield, VA 22161 as AD- 908 992, Price codes: A03 in paper copy, A01 in microfiche. Preliminary Report No. 28-585, April 1973. 41 p, 17 fig, 10 tab, 6 ref.

Descriptors: *Dispersion, *Monitoring, *Sewage, *Water pollution sources, *Waste Water disposal, Ships, Virginia, Coliforms, *Outer Continental Shelf, Coastal zone.

The first of four planned field trials to be conducted as part of the study of the detectability and dispersion of sewage from Navy ships operating with the coastal zone is reported. The trial was conducted in the waters off Norfolk, Virginia, between 16 and 27 October 1972. Rhodamine WT was added to 5,000 gallons of untreated sewage to serve as a marker dye and for future dispersion modeling. This mixture was discharged from a stationary point source at approximately 10.5 miles off shore. Under these conditions, coliform bacteria in excess of background levels were detected by laboratory analysis of samples collected from the translocated and dispersed dye plume at greater than 7 hours after discharge. Other wastewater constituents in the sewage mixture could not be similarly detected, although this may in part be due to the low initial concentration of the waste. (Sinha - OEIS)
W78-03877

REMOTE SENSING OPERATIONS (MULTISPECTRAL SCANNER AND PHOTOGRAPHIC) IN THE NEW YORK BIGHT, SEPTEMBER 22, 1975,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5B.
W78-03881

MARINE STUDIES OF SAN PEDRO, CALIFORNIA. PART II. POTENTIAL EFFECTS OF DREDGING ON THE BIOTA OF OUTER LOS ANGELES HARBOR. TOXICITY, BIOASSAY AND RECOLONIZATION STUDIES.
University of Southern California, Los Angeles. Allan Hancock Foundation; and University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
For primary bibliographic entry see Field 5C.
W78-03882

METHANE FERMENTATION OF EXCESS ACTIVATED SLUDGE (PROBLEMATYKA FERMENTACJI METANOWEJ NADMIERNEGO OSADU CZYNNEGO),
For primary bibliographic entry see Field 5D.
W78-04092

TECHNOLOGICAL SYSTEMS OF THE DUNAUJVAROS CORRUGATING MEDIUM MILL. PART 3. WATER MANAGEMENT (A DUNAUJVAROSI HULLAMVERTIKUM TECHNOLOGIAI RENDSZEREI. 3. RESZ. VIZGAZDALKODAS),
For primary bibliographic entry see Field 5D.
W78-04137

THE EFFECTS OF SEWAGE SLUDGE ON THE GROWTH RATE OF CARP, CYPRINUS CARPIO L.,
Chinese Univ. of Hong Kong. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-04197

5F. Water Treatment and Quality Alteration

SOURCES OF EMERGENCY WATER SUPPLIES IN SANTA CLARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-03772

THE SAFE DRINKING WATER ACT: A DOLLARS AND SENSE PERSPECTIVE,
Ecodyne Corp., St. Paul, MN. Lindsay Div.
For primary bibliographic entry see Field 5G.
W78-03846

DRINKING WATER STANDARDS: PRINCIPLES AND HISTORY 1914 TO 1976,
Environmental Protection Agency, Boston, MA. Water Supply Branch.
For primary bibliographic entry see Field 5G.
W78-03847

EVALUATION OF THE FLORIDA WATER SUPPLY PROGRAM.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 441, Price codes: A10 in paper copy, A01 in microfiche. 1973, 193 p, 7 append.

Descriptors: *Water supply, *Potable water, *Florida, *Water quality control, *Water treatment, Project planning, Water management(Applied), Water analysis, Evaluation, Legal aspects, Regulation, Bacteria, Budgeting, Reviews, Laboratories.

This study presents the findings, conclusions, and recommendations, with supporting data and explanatory text, resulting from EPA's evaluation of the Florida Water Supply Program. The study recommends improvements in the bacteriological surveillance program; improvement and expansion of the engineering surveillance of public water

supply systems; improved statutory authority for the Water Supply Program enforcement procedures; improved implementation procedures whereby responsibility for review and approval of plans and specifications would be separated from responsibility for engineering surveillance; improved water quality analysis capability; improved surveillance of small public water supplies; policies, guidelines and procedures for system design, operation, and surveillance be compiled and made available; an increase in the professional staff; expansion of the bacteriological and chemistry laboratory capability; the creation of two regional offices to facilitate surveillance activities; and preparation of a comprehensive inventory of all public and small public water systems. This evaluation assessed the present condition of public water supply operations, especially conditions relating to safety and reliability. The adequacy of the water supply program's legal basis, budget, manpower resources, regulations and policies, and surveillance activities were examined. The effectiveness of the program was interpreted in light of the condition of the state's supplies. (Nessa-NC)
W78-03898

SYSTEM FOR NUMERICALLY RATING WATER SUPPLY SYSTEMS,
Hittman Associates, Inc., Columbia, MD.
J. P. Overman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 321, Price codes: A13 in paper copy, A01 in microfiche. Prepared for the Water Supply Division, Office of Air and Water Programs, Environmental Protection Agency, Washington, D.C., February 1973, 280 p, 3 fig. 68-01-0193.

Descriptors: *Potable water, *Water quality, *Water quality control, *Water supply, Cities, Equipment, Data, Personnel, Legal aspects, Population, Reliability, *Federal Drinking Water Standards, *Urban water supply systems failure rate, *Rating system.

The study's purpose is to determine the feasibility of developing a rating system for predicting the ability of an urban water supply system to produce water consistently meeting the constituent limits of federal drinking water standards. The feasibility of the rating system was demonstrated by applying it to an existing water supply system. The rating concept is based upon determining the reliability of system equipment, the probability that the system furnishes water meeting federal drinking water standards, the effect of equipment failure on system water quality and the relative ability of the system to remove constituents from raw water that exceed the drinking water standards. In its present form the rating system is too complex to be practical for general application in the field. The concept requires simplification and preparation of a procedural type manual for field application. In developing a firm rating system, data should be analyzed to determine the probable effects of component failure on water quality, to develop a data bank of failure rate data for components, to determine and quantify effects of personnel skill levels on water quality, and to determine the effects of population, industrial environments, and legal controls on the reliability of water systems. (Nessa-NC)
W78-03901

HEALTH SIGNIFICANCE OF KLEBSIELLA PNEUMONIAE IN DRINKING WATER EMANATING FROM REDWOOD TANKS,
Oregon State Univ., Corvallis. Water Resources Research Inst.
R. J. Seidler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 355, Price codes: A05 in paper copy, A01 in microfiche. Report No. WRRI-54, October 1977, 81 p. OWRT A-038-ORE(1), 14-34-0001-7078.

Descriptors: Water quality, *Redwood tanks, Health problems, *Coliforms, *Potable water, *Public health, *Klebsiella pneumoniae, E coli, Enterobacter, *Oregon, Water pollution, Water supply.

Ramifications of the presence of Klebsiella coliforms in drinking water emanating from redwood tanks are discussed. Results are presented of a field survey of 33 public and private water systems in Oregon which use drinking water stored in redwood tanks. During this survey some systems were found which exceed coliform limits some 10- to 40-fold and specific suggestions are offered to correct water supplies which are poorly designed. Cultural reactions are listed of Klebsiella and Enterobacter isolated from these drinking water systems and a survey of Klebsiella responses in conforming to the operational definition of a fecal coliform. A comparative study of virulence in mice is made using clinical and environmentally derived Klebsiella isolates. The health significance of oral ingestion of Klebsiella is quantitatively evaluated by determining the dosage levels in normal and stressed mice necessary to colonize the intestinal tract. The latter study derives its significance from human clinical reports which demonstrate a correlation between the presence of Klebsiella in the intestinal tract and a subsequent manifestation of a clinical infection.
W78-03933

DECISIONS ABOUT WASTEWATER TECHNOLOGY: 1850-1932,
Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of History, Technology, and Urban Affairs.
For primary bibliographic entry see Field 5D.
W78-03996

THE BACTERICIDAL ACTION OF FREE AND COMBINED CHLORINE WITH RESPECT TO THE REQUIREMENT OF THE SOVIET STATE STANDARD 2874-73 'DRINKING WATER', (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Inst. (I).
A. A. Semenova.
Gig Sanit 1, p 15-18, 1977.

Descriptors: *Water quality standards, *Potable water, Public health, E coli, *USSR, *Bactericides, *Chlorine, Chlorination, Water treatment, Disinfection.

Experimental investigation data on the bactericidal (Escherichia coli) action of free and combined chlorine is presented. The period of contact and the amount of residual active chlorine necessary for safe disinfection and the water were determined. The effect of pH, temperature and initial contamination on the bactericidal action of free and combined chlorine was investigated.--Copyright 1978, Biological Abstracts, Inc.
W78-04054

IODINE TO CONTROL MICROBIOLOGICAL GROWTH IN FUEL STORAGE BASIN WATER,
Allied Chemical Corp., Idaho Falls, ID. National Engineering Lab.
M. W. Wilding.
Available from the National Technical Information Service, Springfield, VA 22161 as ICP-1109, Price codes: A02 in paper copy, A01 in microfiche. Report ICP-1109, February 1977. 15 p, 9 fig, 2 tab, 9 ref. EY-76-C-07-1540.

Descriptors: Biocontrol, Bacteria, Algae, Storage tanks, Reservoir storage, Chlorine, *Iodine, *Microbial growth, *Water treatment, *Chlorination, Turbidity.

Water in the Fuel Storage Basin which consists of three 20-foot-deep basins connected by a canal had been treated with chlorine to prevent the growth of microorganisms. Chloride buildup in the basins caused turbidity. Laboratory, pilot scale and full-scale tests were performed using iodine as a biocide. Results of test indicated that iodine in concentrations greater than 0.75 ppm will effectively control the growth of bacteria. The iodine formed by reducing the iodine is readily reoxidized to iodine. The presence of iodine in these concentrations did not appreciably affect the visibility through the water. (Chilton-ORNL)
W78-04108

PERMISSIBLE LEVELS OF MIGRATION OF CHEMICALS FROM PLASTICS INTO WATER, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Gigieni i Toksikologii Pestitsvidov, Kiev (USSR).
For primary bibliographic entry see Field 5G.
W78-04126

USE OF OPERATIVE INFORMATION ON SANITARY VIOLATIONS OF THE ENVIRONMENT, (IN RUSSIAN),
Municipal Sanitary Epidemiology Station, Novokuznetski (USSR).
For primary bibliographic entry see Field 5C.
W78-04188

5G. Water Quality Control

RELATIONSHIPS BETWEEN POTASSIUM PERMANGANATE TREATMENT AND WATER QUALITY,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
C. S. Tucker, and C. E. Boyd.
Transactions of the American Fisheries Society, Vol 106, No 5, p 481-488, 1977. 14 ref, 9 tab, 3 fig.

Descriptors: *Dissolved oxygen, *Potassium compounds, *Pesticides, *Fish diseases, *Pest control, *Water quality control, *Water treatment, *Biochemical oxygen demand, *Toxicity, *Aquatic bacteria, Aquiculture, Oxidation, Minnows, Sunfishes, Bacteria, Oxygen sag, *Potassium Permanganate.

The effect of potassium permanganate (KMn04) on some factors regulating dissolved oxygen concentrations in fish ponds was evaluated. Addition of 2,4, and 8 mg/liter KMn04 slightly decreased the chemical oxygen demand of pond water samples. Treatment of samples with 4 and 8 mg/liter KMn04 decreased the biochemical oxygen demand but did not prevent depletion of dissolved oxygen within the 4-day test period. Addition of 4 and 8 mg/liter KMn04 to water in plastic pools decreased phytoplankton abundance and gross photosynthesis and did not prove beneficial in increasing dissolved oxygen concentrations when oxygen concentrations were near 0 mg/liter. Potassium permanganate was also highly toxic to bacteria in laboratory studies. However, pond waters often contain large amounts of organic matter which express a KMn04 demand, rendering the chemical less effective as a bactericide. This implies that in treating bacterial fish diseases, enough KMn04 should be added to satisfy the KMn04 demand plus a bactericidal residual. The amount of KMn04 per application can be increased without harm to fish as toxicity to fish also decreased with increasing KMn04 demand. (Katz)
W78-03707

FINAL REPORT: RESEARCH AND DEVELOPMENT ASSESSMENT ON SAFETY AND POLLUTION CONTROL FOR OUTER CONTINENTAL SHELF OPERATIONS,
Harry Diamond Labs., Adelphi, MD.
M. F. Funke, and B. A. Weber.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 727, Price codes: A04 in paper copy, A01 in microfiche. Report No. HDL-TR-1780, December 1976. 51 p, 2 tab, 52 ref.

Descriptors: Research and development, *Water pollution control, *Oil industry, *Exploration, *Safety, *Continental shelf, Equipment, *Technology, *Subsurface investigations, Methodology, On-site investigations, Oil fields, Oil wastes, Drilling, Offshore platforms, Evaluation, Environmental engineering, Transportation, Marine geology.

An investigation has been made of the research, development, and data gathering that would provide some of the tools, both information and hardware, that could be used to increase safety and decrease pollution hazards associated with offshore oil and gas exploration and production. Methods have been identified for reducing the dangers to which both workers and structures are exposed during drilling, subsurface production, and transportation operations. These dangers include fire and explosion, asphyxiation, blowout, pollution, and unsafe rig conditions. (Katz)
W78-03720

ASSESSMENT OF EFFECTS OF ALTERED STREAM FLOW CHARACTERISTICS ON FISH AND WILDLIFE. TASK 3: ANALYSIS OF CASE STUDY FINDINGS, IDENTIFICATION OF PROBLEMS, AND RECOMMENDATION OF REMEDIES,
Enviro Control, Inc., Rockville, MD.
For primary bibliographic entry see Field 5C.
W78-03722

SETTLER'S CABIN PARK: ENVIRONMENTAL ASSESSMENT OF MINE DRAINAGE POLLUTION,
Ackenheil and Associates Geo Systems, Inc, Pittsburgh, PA.
W. E. Gooding, R. C. Witt, and M. T. Dougherty.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 593, Price codes: A05 in paper copy, A01 in microfiche. Report No. ARC 76-39-CO-4468 to Appalachian Regional Commission, Wash., D.C., August 1976. 86 p, 11 ref, 7 tab, 14 fig.

Descriptors: *Mine drainage, *Mine wastes, *Water pollution sources, *Water quality control, *Environmental engineering, *Pollution abatement, *Recreation facilities, Water pollution effects, Mine water, Water quality, Land reclamation, Mining, Land management, Pennsylvania, *Settler's Cabin Park(Penn).

A study was performed to document existing environmental constraints upon land and water resources in the Settler's Cabin Park and Pinkertons Run Watershed resulting from coal mining and mine drainage pollution. The findings show that mine drainage pollution has obviated beneficial use of the stream and that unreclaimed strip mines and mine subsidence has discouraged asethetic appreciation and recreation facilities development. A mine drainage abatement and land reclamation plan was developed based upon technical water quality criteria, cost effectiveness, land use planning and minimization of adverse impact upon the terrestrial ecosystem of Settler's Cabin Park. (Katz)
W78-03723

MANAGEMENT OF BOTTOM SEDIMENTS CONTAINING TOXIC SUBSTANCES, PROCEEDINGS OF THE SECOND U.S.-JAPAN EXPERTS MEETING, OCTOBER 1976--TOKYO, JAPAN.
Corvallis Environmental Research Lab., OR.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 684, Price codes: A14 in paper copy, A01 in microfiche. Environmental Protection Agency, Report No. EPA 600/3-77-083, July 1977, 295 p. Peterson, S.A. and K. K. Randolph, editors.

Descriptors: *Dredging, *Bottom sediments, *Metals, *Mercury, *Legal aspects, *Environmental engineering, Polychlorinated biphenyls, Water quality control, Public health, Benthos, Eutrophication, Toxicity, Oil, Oil pollution, Bays, Tokyo Bay, Seto Inland Sea(Japan), Osaka Bay, Hiroshima Bay, Minimata Bay, Methyl mercury, Sediment disposal.

Sixteen papers were presented at the Second U.S. Japan Experts Meeting, Oct. 1976, Tokyo, Japan. The subject was the Management of Bottom Sediments Containing Toxic Substances. The removal of bottom sediments contaminated by organic wastes, methyl mercury, heavy metals, PCB's in estuaries and freshwater lakes were discussed. The effects on aquatic organisms as well as on the environments were discussed. Hydraulic dredging as a lake restoration technique was proposed. (See W78-03736 thru W78-03751) (Katz)
W78-03735

DREDGING OF CONTAMINATED BED SEDIMENT IN JAPAN,
Ministry of Transport, Kobe (Japan). Bureau of Ports and Harbors.
R. Sameshima.
In: Management of Bottom Sediments Containing Toxic Substances: Proceedings of the Second U.S.-Japan Experts' Meeting-October 1976. Tokyo, Japan, EPA-600/3-77-083, July 1977, p 1-19. 3 fig, 5 tab.

Descriptors: *Dredging, *Bottom sediments, *Metals, *Oil wastes, Cost allocation, Legal aspects, *Industrial wastes, Environmental engineering, *Polychlorinated biphenyls, *Water quality standards, Water quality control, Pollution abatement, Sediments, Costs, Legislation, Public health standards, *Japan.

The first dredging of contaminated bed sediment for the purpose of water pollution control was undertaken in 1958. In 1972-73 the problem of fish contamination was recognized and bed sediments were investigated all over the country. Concurrently, legal and administrative systems concerning pollution control were gradually formulated, and removal of contaminated bed sediments has been extensively undertaken. This paper discusses the progress of dredging, present status of dredging, and the legal and administrative issues concerning pollution control, especially the cost allocation system which has promoted pollution control efforts. (See also W78-03735) (Katz)
W78-03736

COUNTERMEASURES FOR POLLUTION IN TOKYO BAY,
Ministry of Transport, Yokohama (Japan). Bureau of Port Construction.
T. Ohtsuka.
In: Management of Bottom Sediments Containing Toxic Substances: Proceedings of the Second U.S.-Japan Experts' Meeting-October 1976, Tokyo, Japan, EPA-600/3-77-083, July 1977, p 20-61, 3 ref, 35 fig, 6 tab.

Descriptors: *Dredging, *Bottom sediments, *Eutrophication, *Phosphorous, *Anaerobic conditions, *Water pollution control, *Pollution abatement, Sludge, *Oxygen demand, Pollutants, *Metals, Environmental engineering, Sediments, Biodegradation, Benthos, Bays, Biochemical oxygen demand, Water quality, Oil, Mercury, Polychlorinated biphenyls, Cadmium, *Tokyo Bay(Japan), *Sludge removal.

Rapid industrialization and urbanization of Tokyo Bay has resulted in decreased quality of the resource. Eutrophication has resulted from the large quantity of organic matter produced endogenously in the Bay as well as from the surrounding land. Oxygen consumption by the bottom sludge produces anaerobic condition in the bottom layer which allows release of phosphorous in the Bay. It is expected that removal of the accumulated sludge will improve the environment with subsequent increases in kind and number of benthos and crustaceans. Additional research on all aspects of bottom mud and water quality on the ecosystem is indicated. (See also W78-03735) (Katz)
W78-03737

AN EXPERIMENT IN REMOVAL OF ORGANICALLY POLLUTED BOTTOM MUD FROM THE SETO INLAND SEA,
Nansei Regional Fisheries Research Lab., Hiroshima (Japan).
A. Murakami.
In: Management of Bottom Sediments Containing Toxic Substances: Proceedings of the Second U.S.-Japan Experts' Meeting-October 1976, Tokyo Japan. EPA-600/3-77-083, July 1977, p 62-88. 6 ref, 13 fig, 5 tab.

Descriptors: *Sludge disposal, *Bottom sediments, *Eutrophication, *Red tide, *Pollution abatement, Methodology, *Dredging, *Biochemical oxygen demand, Machinery, *Fishkill, *Environmental engineering, Nuisance algae, Water pollution, Water pollution control, Mud, Marine fisheries, Nitrogen, Phosphorous, Domestic wastes, Industrial wastes, Equipment, *Seto Inland Sea(Japan), Osaka Bay(Japan), Hiroshima Bay(Japan).

Organic pollution of bottom mud in the Seto Inland Sea was first identified in the 1950's and became a substantial problem in the 1970's with concentrated areas observed in Osaka Bay, Hiuchi Nada, Hiroshima Bay, and Beppu Bay. Bottom pollution is related to the harmful red tide which occurred in the Seto Inland Sea in the 1960's. Eutrophication in inshore waters contributes to the outbreak of the red tide, and the organically polluted bottom mud contributes to the eutrophication. Since 1973, the Fisheries Agency has been removing the polluted mud to reduce the eutrophication. The dredged mud is transferred to a treatment pontoon by a suction pipe. The mud is then treated through coagulation, sedimentation, and dehydration. Activated charcoal is used to filter the decant water which is then discharged to the sea. The settled sludge is hardened with cement and dumped in a land area. Work needs to be done on the method of removing newly deposited materials from the surface of polluted bottom muds. (See also W78-03735) (Katz)
W78-03738

THE MECHANISM OF METHYLMERCURY ACCUMULATION IN FISH,
Tsukuba Univ., Ibaraki (Japan). Dept. of Environmental Epidemiology.
For primary bibliographic entry see Field 5B.
W78-03739

DETERMINATION OF TRACE AMOUNTS OF METHYLMERCURY IN SEA WATER,
Kumamoto Univ., (Japan). Dept. of Industrial Chemistry.
For primary bibliographic entry see Field 5A.
W78-03740

BEHAVIOR OF HEAVY METALS AND PCBS IN DREDGING AND TREATING OF BOTTOM DEPOSITS,
Public Works Research Inst., Tokyo (Japan).
For primary bibliographic entry see Field 5B.
W78-03741

A STUDY ON THE BEHAVIOR OF MERCURY-CONTAMINATED SEDIMENTS IN MINAMATA BAY,
Japan Bottom Sediments Management Association, Tokyo.
For primary bibliographic entry see Field 5B.
W78-03742

USING SAND FILL TO COVER DREDGE SPOILS CONTAINING MERCURY,
Kitakyushu Municipal Bureau of Port and Harbor, Fukuoka (Japan).
S. Fujino.
In: Management of Bottom Sediments Containing Toxic Substances: Proceedings of the Second U.S.-Japan Experts' Meeting-October 1976, Tokyo, Japan, EPA-600/3-77-083, July 1977, p 144-154. 2 ref, 2 tab, 9 fig.

Descriptors: *Dredging, *Water pollution control, *Soil stabilization, *Pollution abatement, *Mercury, *Path of pollutants, Methodology, *Impoundments, *Landfills, Feasibility, Water pollution control, Safety, Environmental engineering, Dusts, Methodology, Heavy metals, Metals, Public health, *Dredge spoils, *Dokai Bay(Japan), Bamboo nets method.

Bottom sediments contaminated with mercury were removed from Dokai Bay, Japan to a spoil area. Wind-borne dust from the dried spoil became a potential secondary pollution source. This paper reports on a project to cover the impounded spoil with a layer of sand one meter thick. Since the impounded spoil was too soft to allow the direct placement of the sand layer, the use of a 'bamboo-net method' was adopted after studying several alternatives. Rafts made of thick, long bamboos were placed on the mud and sheets of plastic were spread over them. A layer of sand and a layer of surface soil followed. This technique was verified as satisfactory in terms of economic feasibility, safety and pollution control. There was no influence on the periphery of the area due to exudation of pore water from the spoils. (See also W78-03735) (Katz)
W78-03743

CHEMICAL STABILIZATION OF SOFT SOILS,
Port and Harbour Research Inst., Kanagawa (Japan). Soil Stabilization Lab.
T. Okumura.
In: Management of Bottom Sediments Containing Toxic Substances: Proceedings of the Second U.S.-Japan Experts' Meeting-October 1976, Tokyo, Japan. EPA-600/3-77-083, July 1977. p 155-168, 6 ref, 11 fig, 2 tab.

Descriptors: *Landfills, Environmental engineering, *Soil stabilization, *Dredging, *Soil treatment, *Lime, *Asphalt, *Portland cements, Particle size, Public health, Environmental control, Soil chemistry, Cements, Pollution control, Reclaimed land, *Chemical stabilization, *Dredge spoils.

Chemical stabilization methods have recently been employed on reclaimed surface soils and in-situ soft clayey soils. Chemical stabilization is affected by the characteristics of the soil and the stabilizing agents. In this paper various kinds of chemical stabilizing agents are reviewed, stabilizing effects are considered, and the test results of comparisons of different stabilizers are shown. In conclusion, there is no single agent useful for all kinds of soil and stabilizing conditions. The commercial cost of some special additives makes them impractical, even though they add some degree of increased strength in the stabilization. It is much more reasonable, in practice, to increase the content of the simple stabilizing agents such as quick lime, hydrated lime, portland cement, and slag cement. (See also W78-03735) (Katz)
W78-03744

A METHOD FOR DISPOSING OF WASTE WATER AT DREDGED MATERIAL RECLAMATION SITES,
Japan Dredging and Reclamation Engineering, Tokyo.
For primary bibliographic entry see Field 5E.
W78-03745

LEGAL AND ADMINISTRATIVE ASPECTS OF BOTTOM SEDIMENT MANAGEMENT,
Corvallis Environmental Research Lab., OR.
A. F. Bartsch.
In: Management of Bottom Sediments Containing Toxic Substances: Proceedings of the Second U.S.-Japan Experts' Meeting-October 1976, Tokyo, Japan, EPA-600/3-77-083, July 1977, p 191-201. 10 ref, 1 fig, 2 tab.

Descriptors: *Dredging, *Waste disposal, *Legislation, *Water quality control, *Pollution control, *Oceans, *Bottom sediments, *Federal Water Pollution Control Act, *Research and development, Public health, Water quality, Industrial wastes, Environmental control, Pacific Ocean, Atlantic Ocean, Sewage sludge, Heavy metals, Pesticides, *Marine protection, Research and Sanctuaries Act, *Dredge spoils.

Regulations currently control municipal and industrial wastes discharged through pipes and have done so for 50 years. Similar programs to control ocean dumping and dredge spoils in the United States are new. Sources potentially toxic sediments dumped in the oceans include industrial wastes, sewage sludge, construction and demolition debris, and dredge spoils. The Marine Protection, Research and Sanctuaries Act of 1972 attempts to regulate this dumping, research ways to end all ocean dumping and create marine sanctuaries. Additional legislation and current research on toxic substances in bottom sediments are presented. (See also W78-03735) (Katz)
W78-03746

HYDRAULIC DREDGING AS A LAKE RESTORATION TECHNIQUE: PAST AND FUTURE,
Corvallis Environmental Research Lab., OR.
S. A. Peterson.
In: Management of Bottom Sediments Containing Toxic Substances: Proceedings of the Second U.S.-Japan Experts' Meeting-October 1976, Tokyo, Japan. EPA-600/3-77-083, July 1977, p 202-228. 34 ref, 8 fig, 4 tab.

Descriptors: *Dredging, *Environmental effects, *Lakes, *Lake sediments, *Bottom sediments, *Temperature, *Water pollution control, *Benthos, *Water quality, Boating, Eutrophication, Habitats, Phosphorous, Standing crops, Biological communities, Oxygen, Michigan, Florida, Iowa, *Hydraulic mining, *Lake Lansing(Mich), *Clean lakes program, *Lake restoration, Storm Lake(Iowa), Trout Lake(Florida), Long Lake(Mich).

Hydraulic dredging in freshwater lakes has given rise to serious environmental concerns. Examples of past dredging projects are described and the paucity of factual data from the projects is pointed out. Lack of reliable data makes it difficult to predict the ecological effects of dredging freshwater lakes. Federal funding through the 'Clean Lakes Program' will be the impetus for new lake restoration dredging projects in the United States. Potential advantages and disadvantages of dredging lakes are addressed. Lake Lansing, Michigan provides an example of the type of dredging project which may be funded. Evaluation of these projects should provide answers to many of the environmental concerns associated with dredging. (See also W78-03735) (Katz)
W78-03747

INTERCHANGE OF NUTRIENTS AND METALS BETWEEN SEDIMENTS AND WATER DURING DREDGED MATERIAL DISPOSAL IN COASTAL WATERS,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5B.
W78-03748

DREDGING CONDITIONS INFLUENCING THE UPTAKE OF HEAVY METALS BY ORGANISMS,
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5B.
W78-03749

DREDGED MATERIAL DENSIFICATION AND TREATMENT OF CONTAMINATED DREDGED MATERIAL,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
C. C. Calhoun, Jr.
In: Management of Bottom Sediments Containing Toxic Substances: Proceedings of the Second U.S.-Japan Experts' Meeting - October 1976, Tokyo, Japan. EPA-600/3-77-083. July 1977, p 253-265. 3 tab, 2 fig.

Descriptors: *Dredging, *Waste treatment, *Drainage, Methodology, *Landfills, *Bottom sediments, Research and development, *Flocculation, *Sludge treatment, *On-site investigation, Dissolved oxygen, Waste water treatment, Impoundments, Particle size, Vegetation effects, Oil wastes, *Densification, *Dredged spoils, *Riverine Utility Craft.

This paper describes work to develop methods for dredged material densification and treatment of contaminated dredged material. Densification techniques include conventional gravity drainage, mechanical agitation, electro-osmosis, crust management, aeration, frost action, wicks, and vegetation. With the exception of aeration and frost action, all techniques are being evaluated by large scale field tests. The applicability of various conventional wastewater treatment methods to dredged material is discussed. The extent of oil and grease contamination associated with confined disposal areas is reviewed as is the use of flocculants to improve the quality of effluents for confined containment areas. Field tests to determine the effectiveness of injecting oxygen and air into the pipeline during open-wastr disposal to increase the dissolved oxygen in the water column are discussed as well as field tests to evaluate the ability of vegetation to remove contaminants for disposal area effluents. (See also W78-03735) (Katz)
W78-03750

ARTIFICIAL-RECHARG EXPERIMENTS NEAR LAKIN, WESTERN KANSAS,
Geological Survey, Lawrence, KS. Water Resources Div.; and Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 4B.
W78-03775

SOME ASPECTS OF THE PERSISTENCE AND FATE OF ACROLEIN HERBICIDE IN WATER,
Commonwealth Scientific and Industrial Research Organization, Griffith (Australia). Div. of Irrigation Research.
For primary bibliographic entry see Field 5B.
W78-03817

THE PHASED CLEAN-UP PROGRAM, KANAWHA RIVER,
E. N. Henry.
Division of Water Resources, Department of Natural Resources, West Virginia. September 1974. 7 append.

Descriptors: *Kanawha River(WV), *Water pollution control, *Chemical industry, *Sewage treatment, *West Virginia, Rivers, Effluents, Industrial wastes, Sewage disposal, Waste treatment, Pollution abatement, Biochemical oxygen demand.

A phased water pollution abatement program begun in 1959 for the Kanawha River in West Virginia has resulted in improved control of chemical

and sewage effluents, mainly without transferring costs to consumers. Chemical manufacturing increased greatly during World Wars I and II, and surveys in 1946-48 indicated serious pollution of the river from soluble chemical by-products and untreated sewage. Contamination was characterized by scums, oil streaks, and chemical odors, dissolved oxygen depletion during warm months due to bacterial breakdown of sewage and chemicals, and loss of all but coarse fishlife. Sewage and chemical wastes were essentially untreated. Sewage and chemical treatment standards were set in 1958; chemical plants were to reduce BOD5 by 40% (60% of a baseline discharge level set in 1959), reduce odors, and eliminate foams, scums, solids, and color from effluents. Primary sewage treatment requirements were extended to all cities. The Phase I deadline was set for June 1963; by that date nine primary sewage treatment plants, four industrial secondary treatment systems, and a joint municipal-industrial secondary treatment works were in operation. Phase II goals, including municipal secondary treatment and further industrial BOD5 reductions, were set for 1966, and the Phase III deadline was 1972. Municipal compliance was delayed in both phases, but industries made great progress. Appendices detail abatement efforts of Union Carbide, Monsanto, du Pont, and FMC Corporations. (Lynch-Wisconsin)
W78-03821

LAKES AND PONDS,
Pennsylvania Univ., Philadelphia. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 6B.
W78-03842

ALGAE HARVESTING FROM SEWAGE.
Caldwell Connell Engineers Pty. Ltd, Canberra (Australia).
Environmental Study Report 1, 1976. 99 p, 18 fig, 20 tab, 13 ref.

Descriptors: *Harvesting of algae, *Algae, *Sewage treatment, *Beneficial uses, *Nutrient removal, Feeds, *Livestock, Ponds, Equipment, Nutrients, Australia, Werribee(Australia), Scenedesmus.

Algae for use in livestock feeding were harvested by filtration from shallow ponds receiving primary sewage treatment effluent, in experiments conducted in Werribee, Victoria, Australia in early 1975. Algae was found to be more practical and economical in deriving protein from sewage than bacteria, yeast, or fungi. Feeding trials with various livestock demonstrated that sewage-derived algae concentrate is comparable to soybean meal as a high-protein feed supplement. High-rate ponds are preferable to the normal, deeper waste stabilization ponds as toxic blue-green algae can be excluded and desirable green forms promoted; high-rate ponds are also more productive, occupy less space, and are amenable to industrial operation and control techniques. The 0.28-ha test pond received sewage effluent with an average BOD5 level of 405 mg/l and COD level of 733 mg/l. Maintenance of a pH of 8.3-9.0 through addition of lime favored larger, more easily-harvested Scenedesmus over the smaller Chlorella. Paper made of 40% pine kraft and 60% eucalypt kraft was a better filter than asbestos paper. A full-scale harvesting system would produce an effluent containing 15 mg/l suspended solids (91% removal for primary effluent), 20 mg/l total BOD5 (95%), 210 mg/l total COD (72%), 7.5 mg/l total nitrogen as N (83%), 0.5 mg/l ammonia nitrogen as N (98%), and 2.8 mg/l total phosphorus as PO4 (88%). (Lynch-Wisconsin)
W78-03843

INVESTIGATION OF MINING RELATED POLLUTION REDUCTION ACTIVITIES AND ECONOMIC INCENTIVES IN THE MONONGAHELA RIVER BASIN,
Baker (Michael), Jr., Inc., Beaver, PA.
F. J. Doyle, C. Y. Chen, R. D. Malone, and J. R. Rapp.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 352, Price codes: A17 in paper copy, A01 in microfiche. Appalachian Regional Commission Agreement with Environmental Protection Agency, Office of Research and Development, April 1975. 384 p, 22 fig, 18 tab, 296 ref, 2 append. 14010 HQC-5, 72-89/RPC-707.

Descriptors: *Mining, *Coal mine wastes, *Pollution abatement, *Beneficial use, *Monongahela River Basin, Appalachian Mountain region, Rivers, River basins, West Virginia, Pennsylvania, Maryland, Acid mine drainage, Land reclamation, Revegetation, Landfill, Incentives, Industrial wastes, Acid mine water, Nonstructural alternatives.

Mining-related pollution-reduction activities which private industry might profitably undertake in the Monongahela River Basin of West Virginia, Pennsylvania, and Maryland are identified and evaluated in this study. Economic incentives are discussed for environmental improvements in existing mining operations and abandoned mines; emphasis is placed on coal waste utilization. Conclusions include: (1) controlling surface water infiltration into underground mines is beneficial to coal mine operators when mine drainage discharges are moderate to highly acid; (2) a coal credit may be the only practical method for concurrent mine reclamation and recovery of remaining coal reserves; (3) combining abandoned mine land reclamation with removal of coal refuse piles is practical, and would be assisted by passage of the proposed Surface Mining Control and Reclamation Act of 1975; (4) prospects of reclamation and revegetation of mined lands for profitable timbering or pulpwood operations does not appear promising; (5) utilization of waste coal offers high economic potential with relatively high Btu content for power production; (6) coal mine waste can be used for landfill and embankment material; (7) raw coal waste and fly ash are suitable for manufacturing bricks and lightweight aggregate; and (8) alumina can be extracted economically from coal refuse. (Lynch-Wisconsin)
W78-03844

THE SAFE DRINKING WATER ACT: A DOLLARS AND SENSE PERSPECTIVE,
Ecodyne Corp., St. Paul, MN. Lindsay Div.
D. D. Nowlin.
Water Conditioning, Vol. 19, No. 10, p 10-14, December, 1977.

Descriptors: Water quality control, *Potable water, *Rural areas, Economics, *Water treatment, Public health, *Water quality standards, *Safe Drinking Water Act, Point-of-use water treatment.

The Safe Drinking Water Act (PL 93-523) gives the U. S. EPA the authority to set standards for water supply systems having more than 15 connections or serving more than 25 individuals. Estimates are that $1.0-$1.8 billion will need to be spent to achieve compliance with primary water quality regulations. Small towns and rural areas will be especially hard hit; the EPA calculates that $200-$237 per capita would be required to upgrade the average system of 100 users or less. The major cost problem is that small centralized systems would be treating all water delivered to users, while only a small portion of the treated water would actually be used for drinking and cooking. Economic considerations strongly favor point-of-use treatment as opposed to centralized treatment in the majority of such cases. Federal agencies are urged to take note to the point-of-use option as a cost-effective alternative to water quality improvement methods presently being considered. (Eberle-NWWA)
W78-03846

DRINKING WATER STANDARDS: PRINCIPLES AND HISTORY 1914 TO 1976,
Environmental Protection Agency, Boston, MA. Water Supply Branch.
F. B. Taylor.
Journal of the New England Water Works Assn., Vol. 91, No. 3, p 237-259, September, 1977. 7 tab, 13 ref.

Descriptors: *Potable water, Standards, Water quality control, Legislation, History, Public health, *Water quality standards, *Public Health Service Drinking Water Standards.

To understand the evolution of U. S. drinking water standards, one must start first with the National Quarantine Act of 1878. This act was major codification of the fairly old concept of legislation to control the spread of disease. By 1890, sections of revised quarantine acts were dealing specifically with protection against water borne disease. The 1914 Treasury Standards for drinking water (known also as the first Public Health Service Drinking Water Standards) became the basis for all succeeding revisions of U. S. standards through 1974. Though the first standards prescribed limits on bacteria only, limits on various chemical constituents were added in later revisions as the need became apparent and as the technology for detecting these constituents became feasible. The National Interim Primary Drinking Water Standards effective last June extend these limits beyond interstate carrier systems to more than 240,000 community water supplies. Throughout the world, several basic principles have been applied in setting standards. These include (1) preventing the spread of disease, (2) aesthetic considerations, and (3) determining what degree of monitoring ability and compliance to a proposed standard is economically and technologically possible for community water supply systems. (Eberle-NWWA)
W78-03847

WATER CONSERVATION: DRAMATIC CHANGES TAKING PLACE,
Eutek, Inc., San Francisco, CA.
For primary bibliographic entry see Field 3E.
W78-03851

REMOVING H2S FROM GEOTHERMAL STEAM,
Coury and Associates, Inc., Lakewood, CO.
G. E. Coury, and M. Vorum.
Chemical Engineering Progress, Vol 73, No 9, p 93-98, September, 1977. 4 fig, 4 tab, 6 ref.

Descriptors: *Thermal power, *Hydrogen sulfide, *Steam, Air pollution design criteria, Economics, Cooling towers, Ammonia, Sulfur compounds, Scrubbers, Fluid-bed reactors.

Hydrogen sulfide gas is one of the primary sources of air pollution associated with the utilization of geothermal steam for the production of electricity. Although H2S removal from various gaseous streams has been studied and practiced for many years, the geothermal application poses some unusual problems due to the temperature of the steam and the nature of geothermal turbines. In the process described in this paper, the H2S is absorbed in an aqueous solution of copper salts by precipitating copper sulfides. The copper is recovered from the precipitate by roasting in a fluid-bed reactor and is recycled to an absorber. The net products are the soluble sulfate and sulfite salts of ammonia. The process has also been designed to use part of the cooling tower blowdown as makeup water to dissolve the ammonium salts for disposal. The economics of the H2S removal process appear to be comparable to the relative cost of flue gas desulfurization systems for fossil-fuel fired boilers. (Eberle-NWWA)
W78-03855

GROUND-WATER POLLUTION PROBLEMS IN THE SOUTHEASTERN UNITED STATES,
Geraghty and Miller, Inc., Port Washington, NY.
For primary bibliographic entry see Field 5B.
W78-03856

FORCES EXERTED BY WAVES ON A PIPELINE AT OR NEAR THE OCEAN BOTTOM,
California Univ., Berkeley. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 8B.
W78-03873

NATURAL HAZARD MANAGEMENT IN COASTAL AREAS,
Colorado Univ., Boulder. Inst. of Behavioral Science.
G. F. White, E. J. Baker, D. D. Baumann, and W. T. Chow.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 015, Price codes: A14 in paper copy, A01 in microfiche. Report to NOAA, Office of Coastal Zone Management, November 1976. 314 p, 22 fig, 4 append.

Descriptors: *Baseline studies, Hazards, Environmental effects, Hurricanes, Floods, Erosion, Landslides, Earthquakes, Coasts, Tsunamis, Management, Volcanoes, Avalanches, Subsidence, Outer Continental Shelf, Environmental impact, *Coastal Zone Management.

Coastal areas in the United States are afflicted with a distinctive array of natural hazards. Beach erosion is one, but along the coast problems of hurricane, tornado, flood, landslides, earthquake, tsunami, volcano, snow avalanche, and land subsidence are severe and may appear in different combinations. State management of coastal areas may be strengthened by giving implicit attention to these hazards. In turn, the information, planning, and management activity under coastal zone management may contribute to wiser adjustments to these growing hazards. Some state coastal zone programs reflect substantial awareness of and concern with natural hazards, either independent of or in concert with one or more Federal agencies. These efforts should be carefully examined by the coastal manager for their adequacy and for their relationship with the overall coastal zone management program. In other states, weak or inadequate efforts may demand significant upgrading or restructuring to reflect current technical knowledge, to enhance popular awareness, and to incorporate a hazard management component. (Sinha-OEIS)
W78-03879

MISSISSIPPI SOUND TEMPORAL AND SPACIAL DISTRIBUTION OF NUTRIENTS,
Gulf Coast Research Lab., Ocean Springs, MS.
For primary bibliographic entry see Field 5B.
W78-03880

WATER QUALITY EVALUATION OF DREDGED MATERIAL DISPOSAL FROM LOS ANGELES HARBOR,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5C.
W78-03889

MANPOWER AND TRAINING NEEDS OF STATE WATER POLLUTION CONTROL AGENCIES.
ABT Associates, Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 370, Price codes: A06 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, D.C., 1973, 129 p, 5 append.

Descriptors: *Water pollution control, *Manpower, *Personnel management, *Methodology, *Resource allocation, *Human resources, *Federal Water Pollution Control Act, Resources development, Administration, Education, Training, Planning, *1972 Federal Water Pollution Control Act Amendments, *Manpower requirements model, Workload indicators, *Manpower planning.

This study assesses the impacts of the 1972 Water Quality Act amendments in terms of the need for expanded personnel resources, or for training or retraining of personnel. The purpose of this report is: (1) to describe the methodology for development of staffing criteria for state water pollution control agencies; (2) to present the results of the study; (3) to identify and analyze problems encountered; and (4) to specify further actions which can be taken to provide management with full information on the human resource impacts of the Water Quality Act. This study represents a first step toward the development of occupation definitions and staffing guides for state water pollution control agencies. These will permit program managers to translate estimated program workloads into both quantitative and qualitative manpower requirements. Once these staffing criteria have been developed and validated, they will form the basis for a predictive model for determining state agency manpower requirements. This model will specify the functions which must be performed by state water pollution control agencies and will enable the user to determine the manpower requirements for each function on the basis of the size of a workload indicator for that function. This research is aimed at the creation of a federal-state-local manpower planning system. (Nessa-NC)
W78-03890

ROCKY MOUNTAIN ENVIRONMENTAL RESEARCH. QUEST FOR A FUTURE. PROBLEMS AND RESEARCH PRIORITIES IN THE ROCKY MOUNTAIN REGION.
Eisenhower Consortium for Western Environmental Forestry Research, Fort Collins, CO.
For primary bibliographic entry see Field 6B.
W78-03897

EVALUATION OF THE FLORIDA WATER SUPPLY PROGRAM.
For primary bibliographic entry see Field 5F.
W78-03898

ENERGY DEVELOPMENT AND LAND USE IN TEXAS,
Texas Transportation Inst., College Station.
For primary bibliographic entry see Field 3E.
W78-03900

SYSTEM FOR NUMERICALLY RATING WATER SUPPLY SYSTEMS,
Hittman Associates, Inc., Columbia, MD.
For primary bibliographic entry see Field 5F.
W78-03901

CLASSIFICATION OF AMERICAN CITIES FOR CASE STUDY ANALYSIS: VOLUME I. SUMMARY REPORT,
Urban Systems Research and Engineering, Inc., Cambridge, MA.
For primary bibliographic entry see Field 6A.
W78-03918

COAL WASTE STABILIZATION BY ENHANCED VEGETATION,
Bureau of Mines, Washington, DC.
J. P. Capp, D. K. Gillmore, and D. G. Simpson.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-7505105-1, Price codes: A02 in paper copy, A01 in microfiche. In: Reports of the Polish-U.S. Symposium, 'Environmental Protection of Openpit Coal Mines.' Denver, Colo., May 27-29, 1975, p 125-136.

Descriptors: *Coal mine wastes, *Coal mines, *Strip mine wastes, *Fly ash, *Reclamation, *Land reclamation, *Vegetation, Establishment, *Slope stabilization, *Stabilization, *Soil stabilization, Mine wastes, Wastes, Industrial wastes, Water pollution sources, Mine acids.

Coal wastes generated by previously uncontrolled surface mining and dumping of preparation plant refuse continue to cause environmental and aesthetic problems. One potential method of treatment developed by the United States Bureau of Mines employs powerplant fly ash as a soil-building amendment. Application of tonnage quantities of fly ash has resulted in successful revegetations of experimental sites totaling 83 acres of orphaned surface mines and 59 acres of refuse material. Costs include regrading, mixing of ash and spoil, seeding, fertilizing and mulching, but are highly dependent upon haulage of fly ash. (Katz)
W78-03952

CHEMICAL AND BIOLOGICAL STUDIES ASSOCIATED WITH THE RECOVERY OF THE RIVER EBBW FAWR (1970-74),
University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.
R. Williams.
Water Pollution Control, Vol. 75, No. 4, p. 428-444, 1976. 5 fig, 10 tab, 23 ref.

Descriptors: *Water quality, Water pollution, *Water pollution effects, *Water pollution control, *Water pollution sources, *Pollution abatement, *Water chemistry, *Industrial wastes, *Water pollution treatment, *Effluents, Aquatic environment, Monitoring, Biological communities, Environmental effects, Toxicity, Population, Fish populations, *Ebbw Fawr River(Wales), LC 50, Steel works.

The Ebbw River System has been subject to pollution by steelwork's effluent since the 1930's. A treatment plant constructed to treat the steelwork's discharge became operational in 1971 and achieved satisfactory effluent standards by mid-1973. The present paper presents studies on the changes in river chemistry and biology during the period 1970-74. In terms of water chemistry, improvements were noted in pH and suspended solids levels while suspended coal residues remained a problem. Plant populations were seen to make significant headway in recolonizing the polluted regions, while macroinvertebrates and fish were much less successful, owing at least partially, to their reliance on an established plant community. (Katz)
W78-03953

THE JAPANESE REGIONAL WASTEWATER TREATMENT SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering; and Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5D.
W78-03969

TEMPERATURE CRITERIA FOR FRESHWATER FISH: PROTOCOL AND PROCEDURES,
Environmental Research Lab.-Duluth, MN.
W. A. Brungs, and B. R. Jones.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 032, Price codes: A07 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA-600/3-77-061, May 1977, 129 p, 25 tab, 8 fig, 129 ref.

Descriptors: Freshwater fish, Water quality, Water pollution effects, *Temperature, Growth,

Reproduction, *Standards, Mortality, Water pollution, *Thermal pollution, Thermal power, Thermal power plants, *Thermal stress, *Thermal water, Methodology, Laboratory tests, *Water quality criteria, *Water quality standards, *Temperature requirements, Standards development, Numerical criteria.

The evolution of freshwater temperature criteria is discussed as it relates to standards development by regulatory agencies. The present, generally accepted philosophical approach to criteria development is explained in detail and its use to protect various life stages of fish is demonstrated by selected examples. Numerical criteria for survival, spawning, embryo development, growth, and gamete maturation of fish species were calculated and tabulated. (Katz)
W78-03976

DERIVATION OF RESIDUAL COEFFICIENTS FOR TYPICAL INDUSTRIES IN NEW ENGLAND,
Center for the Environment and Man, Inc., Hartford, CT.
H. D. Mlynarski, and G. M. Northrop.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 996, Price codes: A07 in paper copy, A01 in microfiche. Final Report from Phase 2 of the Study of the Impact of Economic Development and Land Utilization Policies on the Quality of the Environment, with Initial Application to New England. Report No NSF-RA-E-75-159, October 1975. 151 p.

Descriptors: *Pollution abatement, *Residual coefficients, *New England, *Environmental impacts, *Mathematical models, *Regional planning, *Economic development, Land use, *Industries, Polluting activities.

This report contains a summary of the residual coefficients used in the Residual General Model to convert population, employment, and other measures of economic activity to an annual amount of pollutants. The report serves two functions: (1) it tersely summarizes an extensive set of residual coefficients; and (2) it presents their derivation and source documentation in a consistent manner. These Residual Coefficients are the multipliers used to calculate annual amounts of polluting residuals. The objective of this effort is to provide a clear description of the methodology and source documents used in the compilation of these coefficients in order to furnish a framework through which similar data might be applied to other regions. Included are: revised residual coefficients matrix and explanatory items; explanation of the methodology used to determine the residual coefficients for each of the 85 designated polluting activities; problems involved in computing residual coefficients; and a listing of source documents cited. (Bell-Cornell)
W78-03988

EFFLUENT STANDARDS--EFFECT UPON DESIGN,
Los Angeles Bureau of Sanitation, CA.
W. F. Garber.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 103, No EE6, p 1115-1127, December 1977. 1 fig, 4 tab, 8 ref.

Descriptors: *Water quality, *Environmental impact statements, *Water standards, *Effluents, Design practices, Toxicity, Toxicology, Legislation, Water treatment, California, Wastewaters, Trace metals, Ocean waters, Chlorinated hydrocarbons.

Factors including a goal of ultimate exclusion of the use of the waters of the United States for the disposal of pollutants, limited knowledge of actual toxicity limits, problems with accurate analytical methods, little knowledge of uncontrollable background, and zealot pressures on legislatures have led to overly conservative standards. These requirements with unrealistic design and construction deadlines have left the designer little choice but to design for compliance with numbers shown in the standards rather than the least net negative environmental impact. After the mandates of the present laws are met, the energy use to achieve 'higher standards' will lead to a poorer overall land, air, and water environment. Assurance that environmental improvement will accrue is therefore directly dependent upon scientifically valid effluent and receiving water standards and it is of considerable importance that research be carried out in this area. (Bell-Cornell)
W78-03991

HIGH-RATE DISINFECTION: CHLORINE VERSUS CHLORINE DIOXIDE,
O'Brien and Gere Engineers, Inc., Syracuse, NY.
For primary bibliographic entry see Field 5D.
W78-03992

PRINCIPLES FOR WATER QUALITY MANAGEMENT,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
D. A. Okun.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 103, No EE6, p 1039-1055, December 1977. 1 tab, 26 ref.

Descriptors: *Water quality, *Regional development, *Water management(Applied), *Regions, Water costs, Potable water, Water resources, Water supply, Water projects, Economies of scale, Efficiencies, Financing, United States.

On April, 1974 there were created in England and Wales 10 water authorities which were given the responsibility for the ownership, planning, design, construction, operation and financing of facilities for water supply, water pollution control, water-based recreation, flood prevention, fisheries, and inland navigation. Study of the process of this revolutionary reorganization led to the development of five principles for sound water quality management that might guide practice in the United States: (1) every water project is unique and should be treated as so; (2) efficiencies and economies of scale should be exploited; (3) the costs should be met by those who benefit; (4) potable water should be drawn from protected rather than polluted sources; and (5) the management of water supply and water pollition control should be integrated. Regionalization is the key to following these principles, and interest in regionalization is already being expressed in the United States. Many approaches to regionalization can be followed, according to local circumstances. (Bell-Cornell)
W78-03993

LAGUNA DE BAY WATER RESOURCES DEVELOPMENT,
Bureau of Experts, Sogreah, Grenoble, France.
E. Pariset.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 103, No EE6, p 1021-1038, December 1977. 7 fig, 2 tab, append.

Descriptors: *Water resources development, *Water supply, *Water pollution, *Flood control, *Water management(Applied), Dams(Concrete), Algae, Water quality, Spillways, Sewage disposal, *Philippines, Bays, Water programs, Optimum development plans, Limnology, *Lake regulation, Mathematical models.

A comprehensive program for the water management of Laguna de Bay, a 900-km2 shallow brackish lake in the Philippines, has been studied. Hydrology was analyzed and the construction of two dams recommended to protect Manila against floods and to control the lake. The water quality and main limnological aspects were established with the help of a specially built laboratory. The main problem presently is the excessive proliferation of algae triggered by the excess of nutrients, mainly nitrates, in the lake. Main uses of water were evaluated: fish raising, irrigation, and water supply including operation of an 8-m3/hr pilot plan and the corresponding water quality criteria. A first approach of the pollution control program needed in order to obtain results was completed and the economic interest for the community ascertained. Recommendations were made for the institutional organization and the mode of financing without which the best program remains inapplicable. (Bell-Cornell)
W78-03994

THE BACTERICIDAL ACTION OF FREE AND COMBINED CHLORINE WITH RESPECT TO THE REQUIREMENT OF THE SOVIET STATE STANDARD 2874-73 'DRINKING WATER', (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Inst. (I).
For primary bibliographic entry see Field 5F.
W78-04054

ESTIMATE OF COSTS FOR WATER POLLUTION CONTROL MEASURES IN THE PULP AND PAPER INDUSTRY.
Department of the Environment, Ottawa (Ontario). Water Pollution Control Directorate.
Environmental Protection Service, Economic and Technical Review, Report EPS 3-WP-77-11, 30 p, September, 1977. 9 tab, append.

Descriptors: *Costs, *Water pollution control, *Pulp and paper industry, *Canada, Foreign countries, Water pollution treatment, Waste water treatment, Economics, Wastes, Industrial wastes, Water pollution sources, Legislation, Capital costs, Operating costs.

This report presents projected estimates of the capital and operating costs that will be incurred by the Canadian pulp and paper industry in complying with the federal pulp and paper effluent regulations. Of the total of 157 mills assessed, 62 were deemed to be in compliance with the regulations, including 28 mills discharging to municipal sewers. The capital cost of pollution control facilities for the mills not in compliance has been projected to be $1,034 million. Annual operating cost of these facilities for all mills have been projected to be $34.3 million. The cost data presented are considered accurate in relation to the various production categories of the pulp and paper industry, and relevant to the industry as a whole. The method used in compiling these data is outlined, as well as inherent limitations. (Witt-IPC)
W78-04067

THE SELF-PURIFICATION OF UNDERGROUND WATERS, (IN RUSSIAN),
Belorussian Sanitary-Hygienic Research Inst., Minsk (USSR).
For primary bibliographic entry see Field 5B.
W78-04076

PROTECTION OF WATERS FROM CONTAMINATION WITH PESTICIDES AND MINERAL FERTILIZERS: STUDIES OF 1971-1975, (IN RUSSIAN),
Kharkov Vodokanalniiproekt Inst. (USSR).
N. N. Dykhanov, and I. D. Pichakhchi.
Gidrobiol Zh 13(1), p 14-27, 1977.

Descriptors: *Water pollution control, *Pesticides, *Mineral fertilizers, Fertilizers, Pesticide residues, *USSR.

Results are presented of complex studies performed by the research institutes of the USSR during 1971e1975 concerning surface water protection from contamination with remnants of mineral fertilizers and pesticides drifted by runoff from the farming lands. Promising trends of the further research in this field are discussed.--Copyright 1978, Biological Abstracts, Inc.
W78-04078

MEASURING THE COST OF INDUSTRIAL WATER POLLUTION CONTROL,
B. A. Gelb, and J. G. Myers.
Conference Board Inc., New York, N.Y., Report No. 700, 92 p, 1976. 6 charts, 19 ref, 25 tab.

Descriptors: *Costs, *Water pollution control, *Industrial wastes, United States, Waste water treatment, Water pollution sources, Steel, Oil, Pulp and paper industry, Chemical industry, Legislation, Water quality act, Pollution abatement, Alkalis(Bases), Chlorine, Oil industry.

An overview of the procedure used for measuring the costs of industrial water pollution abatement is presented, and a summary is given of the findings and cost projections resulting from detailed case studies of 5 manufacturing industries, including pulp and paper, alkali-chlorine, industrial and organic chemicals, petroleum refining, and steel. The impact of the 1972 amendments to the U.S. water quality regulations is clearly indicated. A glossary of terms is appended. (Brown-IPC)
W78-04079

THE SIGNIFICANCE OF THE (GERMAN) WASTEWATER DISCHARGE TAX LAW AND ITS FEE-COMPUTING FORMULA FOR THE PULP INDUSTRY (DIE BEDEUTUNG DES ABWASSERABGABENGESETZES NACH MASSGABE DER BEMESSUNGSFORMEL FUER DIE ZELLSTOFFINDUSTRIE),
Papierwerke Waldhof-Aschaffenburg A. G., Raubling (West Germany).
K. Hoch.
Muenchner Beitraege Abwasser Fischerei Flussbiologie, Vol. 27, p 59-70, 1977. 7 fig, 1 tab.

Descriptors: *Legislation, Pulp and paper industry, *Effluents, Water pollution, Biochemical oxygen demand, Foreign countries, Water pollution sources, Wastes, Industrial wastes, *Pulp wastes, Taxes, *Pollution taxes(Charges), *Germany(Water pollution taxes).

Data are reviewed concerning the production, size, and regional distribution of West German pulp mills; the effluent discharge loads (BOD and COD) of the main processing stages involved in pulp manufacture; and factors affecting the effluent load levels of the German pulp industry (currently 250-550 kg of 5-day BOD/ton of pulp). Attainable reductions in these load levels are examined from their technical and economic angles. It is concluded that at least 3 years should be allowed for the development of the desired efficiencies in available pollution-abatement technologies, plus 5 years for practical realization of necessary mill modernizations (or shut-downs). In addition, international agreements are needed not only on standardization of toxicity parameters (in view of rivers traversing national boundaries) but also on financing aids to necessary capital investments. (Speckkhard-IPC)
W78-04082

PULP AND PAPER MANUFACTURE: ENERGY CONSERVATION AND POLLUTION PREVENTION,
Noyes Data Corp., Park Ridge, NJ.
For primary bibliographic entry see Field 5D.
W78-04084

AN ANALYSIS OF BOD AND COD IN THE STONE GROUNDWOOD PROCESS,
Technische Univ. Darmstadt (West Germany). Inst. fuer Paper-fabrikation.
For primary bibliographic entry see Field 5A.
W78-04089

REFINER PULP MILL EFFLUENT,
New Zealand Forest Service, Rotorua.
For primary bibliographic entry see Field 5B.
W78-04091

IN-PLANT TECHNOLOGY FOR THE PREVENTION OF AIR AND WATER POLLUTION (ZAKLADOWE TECHNOLOGIE ZAPOBIEGANIA ZANIECZYSZCZANIU POWIETRZA I WODY),
IVL-Consulting Ltd., Goeteborg (Sweden).
G. Wernquist.
Przeglad Papierniczy, Vol. 33, No. 5, p 182-185, May, 1977. 8 fig, 1 tab.

Descriptors: *Pulp and paper industry, *Water pollution control, *Air pollution, Pulp wastes, Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Water reuse, Recycling, Ion exchange, Pollution control, Bleaching wastes, Water pollution control, Water purification, Foreign countries, Europe, *Sweden, Condensates, Closed systems.

Recent technology aimed at preventing water and air pollution, developed by the Swedish pulp and paper industry, made it possible to reduce the pollution level to that of about 50 years ago, although production during this period increased nearly tenfold. Discussed are closed-circuit pulp screening and purification of condensate which, along with dry barking and an improved pulp washing method, resulted in a nearly completely closed system in a modern mill up to the bleaching stage. Presently, bleaching is responsible for nearly 70% of mill-caused pollution, and efforts are being made to develop suitable processes for the purification of bleach plant effluents. Methods aimed at the reduction of pollution include prolonged delignification (cooking) before bleaching, oxygen bleaching, recycling of bleach plant effluents to evaporators and kraft digesters, and waste water purification, e.g., by means of ion-exchangers. Reduction of air pollution is presently achieved by the use of electrofilters. The advantages and drawbacks of this process are indicated. (Stapinski-IPC)
W78-04093

RECLAMATION OF POLLUTED FARM PONDS,
Louisiana Tech Univ., Ruston. Dept. of Agricultural Engineering.
J. W. D. Robbins, and J. D. Nelson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 807, Price codes: A04 in paper copy, A01 in microfiche. Louisiana Water Resources Research Institute, Baton Rouge, Completion Report, July 1977. 47 p, 4 fig, 22 ref, 7 append. OWRT B-008-LA(2).

Descriptors: *Eutrophication, *Lake restoration, *Nutrient inactivation, *Sediment sealing, *Farm ponds, *Water quality, Nutrient cycling, Clay soils, Aquatic ecology, Lakes, Reservoirs, Impoundments, Nutrients, Pollutants, Water pollution control.

The objective was to determine if application of clay soils to nutrient-rich pond water sould be effective in reclaiming the usefulness of eutrophic farm ponds. Clay particles were to serve as a nutrient inactivant and bottom sediment sealant. Pond water was isolated (in situ) with polyethylene columns. Three clay soil types were used at three application rates on four sites of 12 columns each withint the pond--nine columns for the different treatments and three control columns. Three sites were treated in July and the fourth site was treated in February. Water samples were taken from the columns and the pond before and after treatment. Samples were analyzed for various water quality parameters to determine the effectiveness of each treatment. Laboratory results indicated that under the experimental conditions of this study, application of clay soil within columns in the summer did not effectively reduce productivity or limit nutrient availability. Visual observations of pond productivity indicated that treatment in winter was more effective. It is suggested that clay should not be eliminated from consideration as a nutrient inactivant, but further study should be initiated to determine the effects of season of treatment.
W78-04098

RUNOFF POLLUTION FROM MULTIPLE FAMILY HOUSING,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W78-04102

IODINE TO CONTROL MICROBIOLOGICAL GROWTH IN FUEL STORAGE BASIN WATER,
Allied Chemical Corp., Idaho Falls, ID. National Engineering Lab.
For primary bibliographic entry see Field 5F.
W78-04108

GREAT LAKES WATERS: RADIATION DOSE COMMITMENTS, POTENTIAL HEALTH EFFECTS, AND COST-BENEFIT CONSIDERATIONS,
Argonne National Lab., IL.
E. J. Ainsworth, T. B. Borak, D. N. Edgington, W. E. Kisieleski, and T. L. Winters.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/ES-58, Price codes: A04 in paper copy, A01 in microfiche. Report ANL/ES-58, July 1977, 50 p, 16 tab, 33 ref, append. W-31-109-Eng-38.

Descriptors: *Water quality, *Radioactivity, *Great Lakes, *Cost-benefit analysis, Radioisotopes, Standards, Water quality standards, Environmental effects, Dose commitment.

A Great Lakes Water Quality Agreement was signed by the United States and Canadian Governments in 1972 which concerned nondegradation of Great Lakes waters and maintenance of low levels of radioactivity and other pollutants. The agreement proposed an objective of one millirem radioactivity. Data presented show that current levels of radioactivity in the Great Lakes waters result in dose commitments in excess of 1 mrem for whole body and 6 mrem for bone. Doses to man resulting from ingestion of the water are not expected to decline by 2050. Cost-benefit considerations support a policy of removal of Ra226 and Sr90 through treatment of water before ingestion. Adoption of the water-quality radioactivity objective of one millirem is stated to be premature and adoption should be delayed unitl the radioactivity levels are established more accurately. (Chilton-ORNL)
W78-04109

A STUDY OF THE SEABOB, XIPHOPENEUS KROYERI (HELLER) IN LOUISIANA,
Louisiana Wildlife and Fisheries Commission, New Orleans. Seafood Div.
C. L. Juneau, Jr.
Technical Bulletin No. 24, September 1977, 24 p, 8 fig, 15 tab, 24 ref.

Descriptors: Management, *Fish management, *Shrimp, *Louisiana, Coasts, Breeding, *Commercial fishing, Commercial shellfish, *Seabobs.

Sampling conducted along coastal areas west of the Mississippi River from October 1974 through September 1976 indicated that catch per effort for seabobs was higher in late summer and early fall again in late winter. Biological, cliematoogical, and hydrological data were also gathered throughout the period of investigation. It was found that seabobs usually congregate near beaches and around the mouths of rivers and passes after the passage of a cold front. Recommended management practices for the utilization of seabobs without detriment to other species included: (1) allowing trawling only in areas known not to over-winter white shrimp; (2) allowing trawling only within a certain distance from the beach; (where white shrimp do not usually overwinter); (3) allowing trawling in all areas but enforce a count law on white shrimp; (4) allowing trawling in all areas without count law but permitting only a small percentage of shrimp species other than seabobs. (Chilton-ORNL)
W78-04116

1977 ENVIRONMENTAL CONDITIONS RELATIVE TO SHRIMP PRODUCTION IN COASTAL LOUISIANA ALONG WITH SHRIMP CATCH DATA FOR THE GULF OF MEXICO,
Louisiana Wildlife and Fisheries Commission, New Orleans. Seafood Div.
B. B. Barrett, and E. J. Ralph.
Technical Bulletin No 26, December 1977. 16 p, 7 fig, 12 tab, 14 ref.

Descriptors: *Environmental effects, *Shrimp, *Salinity, *Temperature, Population, *Louisiana, *Gulf of Mexico, Commercial fishing, Brown shrimp.

The average per annum Gulf shrimp catch for the period 1965-1975 was 127 million pounds (heads off), valued at an annual average of $121 million dockside. 58% of these were brown shrimp, 27% white, 13% pink and 2% royal reds, rock shrimp, and seabobs. There has been an apparent trend over the past ten years toward increased catches of brown shrimp. Examination of environmental parameters over the past twenty years indicated that changes in salinities and temperatures in nursery areas may be a factor in increased brown shrimp populations. (Chilton-ORNL)
W78-04117

PERMISSIBLE LEVELS OF MIGRATION OF CHEMICALS FROM PLASTICS INTO WATER, (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Gigieni i Toksikologii Pestitsvidov, Kiev (USSR).
V. O. Sheftel.
Gig Sanit 10, p 88-90, 1976.

Descriptors: *Water pollution standards, *Lethal limit, *Chemical wastes, *Plastics, *Potable water, Public health, Organic compounds, *Acetates, *Phthalates, *Titan, *Zinc.

The permissible level of migration (PLM) of harmful substances from plastics into water is not a standard for drinking water quality, but a criterion for the preliminary hygienic inspection of the use of polymeric materials in water supply systems. This study was conducted by laboratory methods under model conditions. For substances whose migration level is 2-3 orders lower than the threshold of their unfavorable effect on water quality, the release from plastics need not be standardized. When the maximum permissible concentrations of substances have been established according to organoleptic and sanitary-toxicological indices, analogous values may be used as the PLM. The PLM of some substances (e.g., butylacetate, dibutylphthalte, dioctylphthalate, titan, Zn) may differ somewhat from their maximum permissible concentrations as a result of the criteria used to substantiate these values.--Copyright 1978, Biological Abstracts, Inc.
W78-04126

IDAHO WATER SUPPLY PROGRAM.
Environmental Protection Agency, Seattle, WA. Air and Water Programs Div.
For primary bibliographic entry see Field 6D.
W78-04147

ENVIRONMENTAL IMPACTS OF THE GENERATION OF ELECTRICITY IN THE PACIFIC NORTHWEST. VOLUME II.
Equitable Environmental Health, Inc., Woodbury, NY.
For primary bibliographic entry see Field 6G.
W78-04149

ON THE RECOVERY OF PERTURBED ECOSYSTEMS,
California Univ., Santa Barbara. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-04160

POWER PLANT CHLORINATION: REGULATORY CONSIDERATIONS,
Michigan Water Resources Commission, East Lansing.
For primary bibliographic entry see Field 5C.
W78-04173

CONTROL OF NONPOINT WATER POLLUTION FROM AGRICULTURE: SOME CONCEPTS,
Agricultural Research Service, Chickasha, OK. Southern Great Plains Watershed Research Center.
M. H. Frere, D. A. Woolhiser, J. H. Caro, B. A. Stewart, and W. H. Wischmeier.
Journal of Soil and Water Conservation, Vol 32, No 6, November-December 1977, p 260-264. 6 fig, 1 tab, 13 ref.

Descriptors: *Water pollution control, *Erosion, *Fertilizers, *Pesticides, *Farm management, Federal water pollution control act, Agricultural chemicals, Watersheds, River basins, Runoff, Farm wastes, Nutrients, Pollution taxes, Education, Conservation, Alternative practices, *Nonpoint source pollution, Incentives.

Federal and State laws require that methods be developed for evaluating nonpoint pollution problems and for recommending control practices. Since the major responsibility for control lies with organizations covering large areas, such as river basins or states, the task is difficult at best. Control methods can be classified into two groups: (1) methods applicable to large areas, and (2) farming practices that are site-specific because of climate, topography, economics, etc. Some advantages and disadvantages of education, incentives, taxation, and legal penalties for broad areas are discussed. The use of flow charts for erosion, nutrient, and pesticide problems are briefly discussed. The charts should be useful in selecting farming practices that reduce nonpoint pollution and in evaluating their consequences.
W78-04200

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

PLAN FORMULATION AND EVALUATION STUDIES--RECREATION. VOLUME III. A PRELIMINARY ANALYSIS OF DAY USE RECREATION AND BENEFIT ESTIMATION MODELS FOR SELECTED RESERVOIRS,
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4C.
W78-03893

PLAN FORMULATION AND EVALUATION STUDIES-RECREATION. VOLUME V, A GENERALIZED RECREATION DAY USE PLANNING MODEL,
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 6B.
W78-03895

AN APPLICATION OF THE INTERREGIONAL I/O MODEL FOR THE STUDY OF THE IMPACT OF THE MCCLELLAN-KERR ARKANSAS RIVER MULTIPLE PURPOSE PROJECT,
Catholic Univ. of America, Washington, DC. Inst. of Social and Behavioral Research.
For primary bibliographic entry see Field 4A.
W78-03899

CLASSIFICATION OF AMERICAN CITIES FOR CASE STUDY ANALYSIS: VOLUME I. SUMMARY REPORT,
Urban Systems Research and Engineering, Inc., Cambridge, MA.
E. Lake, C. Blair, J. Hudson, and R. Tabors.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 021, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-600/5-77-008a, May 1977, Socioeconomic Environmental Studies Series, 38 p, 10 tab, 2 fig, append. 68-01-3299.

Descriptors: *Methodology, *Cities, *Regional analysis, *Urban areas, *Urban sociology, *Programs, Systems analysis, Regions, Environmental effects, *Factor analysis, *Clustering, *Model cities, *City classification, Case studies, Impact analysis, Program analysis, Policy analysis.

Attempts to analyze and evaluate the impacts of federal programs have led to the extensive use of case studies of program impacts at selected sites. This study develops a methodology for the systematic selection of representative case study sites and for generalizing the study results. The methodology involves two-stage factor analysis and clustering. It is applied to the specific program/policy problem of selecting appropriate metropolitan areas for case studies when analyzing the impact of federal policies on general environmental quality. The methodology utilizes a Standard Metropolitan Statistical Area (SMSA) data base (which includes 262 SMSA's), including variables related to urban form, environmental quality, and household, industrial, and government activity. These variables are analyzed through a two-stage factor analysis technique which allows a heuristic consideration of the significant characteristics. Finally, city clusters are developed which consist of areas with similar attributes. Modal, or representative, cities are selected for each cluster of cities and are suggested as case study sites. The city clusters may be used to generalize the study results and to analyze the transferability of results between city cluster. The methodology is sufficiently flexible to consider a wide range of research hypotheses. (Nessa-NC)
W78-03918

MODELS FOR ASSESSING THE ECONOMIC VALUE OF HYDROPOWER FOR PEAKING PURPOSES AND THE PRICING OF PEAKING ALTERNATIVES,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 6D.
W78-03964

URBAN FLOOD WATER MANAGEMENT SYSTEMS IN SEMIARID REGIONS: MODEL EXTENSION, DESIGN AND APPLICATION,
Arizona Water Resources Research Center, Tucson.
K. Arai, S. Ince, and S. Resnick.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 485, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, 1977. 63 p, 12 fig, 5 tab, 20 ref, 3 append. OWRT A-049-ARIZ(1). 14-31-0001-4003.

Descriptors: *Model studies, *Arizona, *Urban runoff, *Computer programs, *Rainfall-runoff relationships, *Thunderstorms, Reservoirs, *Storm hydrographs, Urban drainage, *Watershed management, Infiltration, Semi-arid lands, Rainfall-runoff models, Thunderstorm non-linear reservoir models, *Urban watersheds, Tucson(Ariz).

A non-linear reservoir model is used to represent the rainfall-runoff relationships for thunderstorms on the urban watersheds of Tucson, Arizona. Two types of computer programs are developed: a calibration program to obtain a best-fit calculated hydrograph; and a verification program to generate storm hydrographs given the watershed characteristics and a hyetograph. Calibration reveals the relationship of the model parameters, namely, (f) the inflow coefficient, (a) the constant coefficient, and (TL) the time lag, to the total rainfall, drainage area, channel length, and infiltration capacity of the watershed. The average discrepancy between the predicted hydrograph and the actual hydrograph for Tucson urban watersheds is 20-25 percent.
W78-03965

A COMPUTERIZED METHOD FOR ABSTRACTING AND EVALUATING ENVIRONMENTAL IMPACT STATEMENTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
For primary bibliographic entry see Field 6G.
W78-03970

WATER RESOURCES MANAGEMENT AND PLANNING: OPTIMIZATION MODELING OF MULTIPLE RESERVOIR SYSTEMS,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
M. H. Houck, and B. R. Cleland.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 821, Price codes: A04 in paper copy, A01 in microfiche. Charles W. Harris Hydraulic Laboratory, Technical Report No. 54, October 1977. 69 p, 21 tab, 35 ref, append. OWRT A-086-WASH(1), 14-34-0001-7102.

Descriptors: *Multiple-purpose reservoirs, *Washington, *Model studies, *River basin planning, *Water resources management, Systems engineering, *Mathematical programming, *Optimization, Stochastic hydrology, Multiple objective programming, Decision making, Yakima River(Wash), Planning.

The class of optimization models which can be used as tools by the water resource planner or manager is examined. Five models are described and discussed in terms of their mathematical structure, computational burden or cost of solution, method of incorporating the stochastic nature of streamflow, ability to identify general optimal operating policies, and ability to identify optimal reservoir system designs. The five models are called: Multi-Year Deterministic Dynamic Program, Explicitly Stochastic Linear Program, Explicitly Stochastic Dynamic Program, and Chance Constrained Stochastic Linear Program. The Explicitly Stochastic Dynamic Program and The Chance Constrained Stochastic Linear Program are superior to the other models in terms of general usefulness. The Chance Constrained Stochastic Linear Program is the best of the models in most planning situations.
W78-04106

ANALYSIS OF INFORMATION SYSTEMS FOR HYDROPOWER OPERATIONS, - EXECUTIVE SUMMARY,
Jet Propulsion Lab., Pasadena, CA.
For primary bibliographic entry see Field 8C.
W78-04107

THE ECONOMIC IMPACT OF COMMERCIAL SPORTS FISHING ACTIVITIES IN MOREHEAD CITY, NORTH CAROLINA.
For primary bibliographic entry see Field 6B.
W78-04145

6B. Evaluation Process

IMPACT OF GROUNDWATER DEVELOPMENT IN ARID LANDS: A LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 4B.
W78-03757

LAKES AND PONDS,
Pennsylvania Univ., Philadelphia. Dept. of Landscape Architecture.
J. Tourbier, and R. Westmacott.
Technical Bulletin 72, The Urban Land Institute, Washington, D.C., 1976. 73 p, 55 fig.

Descriptors: *Lakes, *Ponds, *Recreation facilities, *Water management(Applied), *Water resources development, *Artificial lakes, *Planning, Eutrophication, Recreation demand, Fishing, Wildlife habitats, Social aspects, Water quality control, Water pollution control, Algal control, Dam design, Land development, Landscaping.

Various aspects of planning, developing and managing natural and artificial lakes are discussed. Included are: (1) demand for, and development of, lakeshore property; (2) problems associated with lake management (site, water level maintenance, thermal stratification, siltation, water quality, eutrophication, safety, mosquitoes, wave action, and debris); (3) lake uses (aesthetic value, recreation, wildlife habitats, water storage, biological water quality improvement, storage of treated sewage effluents, detention and retention basins, and sediment control); (4) design criteria (engineering surveys, catchments, depth, dams, spillways, trickle tubes, sealing, wave action, excavated lakes and ponds, and vegetation); and (5) legal and management considerations. Water is the key element in recreational decision-making; 41% of people in the U.S. prefer water-related recreation to any other type. Purchasers of lakeshore property tend to be well-educated and have relatively high incomes, and are likely to be active in community and lake management. Profit is not generally an important reason in buying lakeshore real estate. Even in states with abundant natural lakes, developers must construct artificial lakes to meet demand. In consequence, the supply of suitable sites is becoming exhausted, and there is increasing resistence on the part of the public to damming high quality streams. This bulletin discusses the mechanics of building and maintaining artificial lakes in detail. (Lynch-Wisconsin)
W78-03842

1977 REVIEW, 1978 PREVIEW.
For primary bibliographic entry see Field 4B.
W78-03848

PLAN FORMULATION AND EVALUATION STUDIES--RECREATION. VOLUME I. EVALUATION OF RECREATION USE SURVEY PROCEDURES,
Army Engineer District, Sacramento, CA.
R. E. Brown, D. A. Crane, and A. M. Kinsky.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-000 648, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Institute for Water Resources (Army), Washington, D.C., October 1969, 51 p, 2 tab, 8 fig, 3 append.

Descriptors: *Recreation, *Recreation demand, *Reservoirs, *Surveys, *Methodology, *Statistical methods, Probability, Economics, Recreation facilities, Model studies, Estimating, Analytical techniques, Approximation method, Projections.

An experimental recreation-use survey was put into effect in seven Army Engineer Districts at 52 reservoir projects in 1966 to test a survey procedure designed to provide a low cost system for obtaining reliable, consistent recreation-use estimates for research and planning activities. One objective of the experimental survey was to provide the basis for designing a Corps-wide survey procedure. Testing in the seven selected districts was made so that weaknesses in the survey system could be identified and evaluated. This report presents the evaluation of the existing survey procedures and provides alternative suggestions for the improvement of the survey. The alternative survey designs presented build upon the accomplishments of the existing survey procedure. The principal improvement consists of providing relevant known probabilities so that precision of the survey information can be estimated with greater accuracy. A modified recreation use survey designed for administration by district offices is presented. The modified survey design provides for precision in estimating the accuracy of the survey information without reducing the existing survey's advantages. Alternatives to the district survey design, which could be administered from a single central Corps element, are given with explanation of the effect of the alternatives on the survey results. This report is one of five volumes in this series of studies. (See also W78-03892 thru W78-03895) (Nessa-NC)
W78-03891

PLAN FORMULATION AND EVALUATION STUDIES--RECREATION. VOLUME II. ESTIMATING INITIAL RESERVOIR RECREATION USE,
Army Engineer District, Sacramento, CA.
R. E. Brown, D. M. Crane, C. R. DesJardins, and R. Hydra.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-000 649, Price codes: A15 in paper copy, A01 in microfiche. Prepared for Institute for Water Resources (Army), Washington, D.C., June 1974, 359 p, 3 append.

Descriptors: *Recreation, *Recreation demand, *Reservoirs, *Estimating, *Methodology, Recreation facilities, Analytical techniques, Forecasting, Probability, Approximation method, Most similar project.

This report presents a methodology for estimating initial recreation use at prospective Corps of Engineers reservoirs. It is the outgrowth of recreation use studies instituted by the Office of the Chief of Engineers. The procedure utilizes the 'most similar project' concept. Data from an existing reservoir that is most comparable in size, operation, and anticipated recreation-use characteristics is applied to a reservoir under study to provide a basis for the use estimating technique. The report provides general descriptions, pertinent project information, and recreation use data for 52 existing Corps reservoirs. It includes detailed discussion and evaluation of a prospective reservoir project and general criteria for selecting a similar project from among the 52 existing reservoirs. An example detailing the application of the methodology is furnished. While the methodology eliminates much of the uncertainty previously associated with estimating recreation use and benefits for

Corps reservoir projects, it is by no means the final solution. There are inherent deficiencies in the method. However, as more recreation-use data are collected and analyzed, it is planned that the technique will be revised and improved. This report is one of five volumes in this series of studies. (See also W78-03891) (Nessa-NC)
W78-03892

PLAN FORMULATION AND EVALUATION STUDIES-RECREATION. VOLUME IV, ESTIMATING RECREATIONAL FACILITY REQUIREMENTS,
Army Engineer District, Sacramento, CA.
R. E. Brown, and G. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-000 651, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Institute for Water Resources (Army), Washington, D.C. June 1974, 24 p, 2 tab, 7 ref, append.

Descriptors: *Methodology, *Recreation, *Recreation demand, *Reservoirs, *Recreation facilities, Economics, Cost-benefit analysis, Model studies, Estimating, Analytical techniques, Approximation method, Estimating equations, Projections, Statistical methods, Most similar project(Recreation).

The study's purpose is to present a general methodology for estimating the number and type of recreational facilities identified with a particular activity needed to serve a number of recreation days at a proposed reservoir. The planning procedure synthesizes planner judgment, existing recreational use survey data, and the concepts of estimating annual recreational use employed by the Corps of Engineers. The data were collected at 52 reservoirs in the period from 1966 through 1969. The facility requirements planning methodology developed assumes that the size of the proposed reservoir site has been determined and that annual total recreational use estimates have been computed. The implication of this assumption is that the planning process under consideration is a process of accommodating recreational use. Alternative investment levels can be used to inhibit or induce recreational use levels, but the purpose of the facility planning process is to respond to expected use levels, not to affect them. The planning process can effectively employ annual use estimates derived in different ways, but familiarity with the concept of estimating from data on the 'most similar project' is required. This concept is detailed in Volume II of this study. There are 5 volumes in this series of studies. (See also W78-03891) (Nessa-NC)
W78-03894

PLAN FORMULATION AND EVALUATION STUDIES-RECREATION. VOLUME V, A GENERALIZED RECREATION DAY USE PLANNING MODEL,
Army Engineer District, Sacramento, CA.
R. E. Brown, and W. J. Hansen.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-000 652, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Institute for Water Resources (Army), Washington, D.C. June 1974, 37 p, 5 tab, 3 fig, 22 ref.

Descriptors: *Recreation, *Recreation demand, *Reservoirs, *Model studies, *Methodology, *Recreation facilities, Economics, Cost-benefit analysis, Estimating, Analytical techniques, Approximation method, Estimating equations, Projections, Statistical methods, *Travel-costs, *Travel-cost model, *Army Engineer District--Sacramento, Fort Worth, Little Rock, Tulsa.

This study offers refined procedural guidelines for an analytical evaluation of reservoir recreation use and benefits consistent with the requirements of the Federal Water Projects Recreation Act of 1965 and with the Water Resources Council's (WRC) 'Proposed Principles and Standards for Planning Water and Related Land Resources.' A general model is described for use in project planning. Two empirical demonstrations are given with sensitivity analyses of the evaluations. An outline is presented of the general steps involved in replicating the procedure. The most widely used existing methods for estimating recreation benefits are imprecise. A travel-cost method is suggested as a theoretical and empirical improvement. The general planning model that is described and tested consists of the development of regional estimators for predicting recreation use at proposed reservoir projects and the operation of these estimators to derive the individual project demand schedules for estimating recreation benefits. Although the same variables significantly affected recreation in different geographic regions, the magnitude of the effects varied between regions. Using data collected from 31 reservoirs, homogeneous regions were identified for which sufficiently accurate use estimators could be developed. This study is a refinement of work presented in the four preceding volumes of this series. (See also W78-03891) (Nessa-NC)
W78-03895

GUIDELINES FOR ATTRACTING PRIVATE CAPITAL TO CORPS OF ENGINEERS PROJECTS,
West Virginia Univ., Morgantown. Bureau of Business Research.
For primary bibliographic entry see Field 6C.
W78-03896

ROCKY MOUNTAIN ENVIRONMENTAL RESEARCH. QUEST FOR A FUTURE. PROBLEMS AND RESEARCH PRIORITIES IN THE ROCKY MOUNTAIN REGION.
Eisenhower Consortium for Western Environmental Forestry Research, Fort Collins, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 446, Price codes: A13 in paper copy, A01 in microfiche. Prepared for National Science Foundation, Washington, D.C., Research Applied to National Needs, 1975, 286 p, 2 append. NSF-GI-39421.

Descriptors: *Environmental effects, *Assessments, *Management, *Rocky Mountain Region, *Growth rates, *Planning, *Research priorities, Forecasting, Mining, Technology, Land development, Recreation, Rural areas, Economic impact, Mathematical models, Water resources, Sewage treatment, Watersheds, Irrigation, River basins, Flood control, Desalination, Cloud seeding, Institutions, Land use, *Human ecology, *Ecosystems, Energy resources, Mineral resources, Population growth.

This study identifies environmental problems and research questions in the Rocky Mountain Region. The research will be used to make management decisions to preserve and enhance the Region for future generations. The purpose of the research was to identify and evaluate current and potential problems associated with the growing interaction of people and natural environments in the Region, and to determine and establish priorities for the research required to provide the necessary basis for environmentally sound resource management on public and private land. Task forces were formed to address several subject areas, including biological resources; human needs and responses; institutional arrangements; mineral and energy resources; recreation and tourism; rural residential development; timber and forage uses; and water resources and uses. An interdisciplinary and broad based committee was selected by task force leaders to determine the state of knowledge in each field, the gaps in knowledge, and thus the major needs to be researched. The findings of each task force were documented and a draft of each task force report was sent for review. The review comments were incorporated in the final reports presented here. (Nessa-NC)
W78-03897

AN ECONOMIC OVERVIEW OF HAWAII'S WATER INSTITUTIONS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 6E.
W78-03930

WATER SHORTAGE IN ISRAEL: LONG-RUN POLICY FOR THE FARM SECTOR,
New Mexico Univ., Albuquerque. Dept. of Economics.
For primary bibliographic entry see Field 3F.
W78-03990

PRINCIPLES FOR WATER QUALITY MANAGEMENT,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5G.
W78-03993

OPTIMUM SIZE LIMIT FOR A FISHERY WITH A LIMITED FISHING SEASON,
Western Australia Univ., Nedlands. Dept. of Mathematics.
B. S. Goh.
Ecological Modelling, Vol 3, No 1, p 3-15, 1977. 1 fig, 9 ref, append.

Descriptors: *Fisheries, *Fishing, *Optimization, *Size limit, Management, Seasonal, Constraints, Time-invariant linear model, Total biomass yield, Maximization, Control theory, Harvesting, Methodology, Algorithms, Computation, Mathematical models, Equations, Systems analysis.

In the management of a fishery with many year-classes, a standard objective is to maximize the biomass yield. If the fishing effort is fixed, this objective can be attained by prescribing an optimum size limit. This implies that onlu fish which are larger than the optimum size limit should be caught. The theory for computing the optimum size limit when fishing is carried out continuously is well established. In contrast, the theory for computing the optimum size limit when the fishing season is limited to the same period in each year has not been developed, in spite of the fact that many fisheries are being exploited. A fishing season may be limited because the weather or the migration patterns of the fish population permit fishing only during a certain period in the year. A season may also be limited because it is necessary to reduce the fishing mortality in order to conserve the fish population. A theory for computing the optimum size limit when the fishing season is limited is developed herein and is applied to a hypothetical fishery. The data for this example comes from the North Sea plaice fishery. It is found that for a given fishing effort, the optimum size limit is 44.5 cm if fishing is carried out continuously, 41.3 cm if fishing is limited to 6 months per year, and 28.7 cm if fishing is limited to a period of a tenth of a year per year. (Bell-Cornell)
W78-03995

COMMERCIAL AND INSTITUTIONAL WATER USE IN PUERTO RICO,
Puerto Rico Univ., Mayaguez. School of Engineering.
A. G. Valentin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 804, Price codes: A04 in paper copy, A01 in microfiche. Puerto Rico Water Resources Research Institute Mayoguez, Completion Report, September 1976. 46 p, 15 fig, 8 tab, 16 ref. OWRT A-045-PR(1).

Descriptors: *Water utilization, *Industrial water, *Domestic water, *Distribution systems, Water demand, Peak ratios, *Puerto Rico, Cities, Commercial water use, Institutional water use.

Objectives were to investigate the commercial and institutional water-use situation in the Island of Puerto Rico and estimate the expected and design water-use indices for various types of establishments. The sample included hotels, department stores, car washes, automobile service stations, laundries, restaurants, barber shops, primary and secondary schools, colleges and universities, hospitals and churches. Analyses reveal that: (1) more than half of the sample of establishments lack the availability of lawn or garden areas; (2) the public aqueduct is almost the sole water intake source, with almost no additional treatment prior to use; (3) only about 16% of the sample reported using evaporative air conditioning; (4) there is a lack of knowledge on water-usage ratios among establishments; (5) almost no water recirculation is practiced; (6) personal use, general cleaning and service-spending water uses, ranked highest; (7) almost all water discharges reported as going into the public sewer system; (8) the most common water uses were food processing, steam producing, laundering, dishwashing, shampooing, air conditioning, icemaking and solvent cooling. The minimum, average and maximum service capacities were calculated and water-use 'expected' and 'design' indices were estimated.
W78-04097

WATER RESOURCES MANAGEMENT AND PLANNING: OPTIMIZATION MODELING OF MULTIPLE RESERVOIR SYSTEMS,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 6A.
W78-04106

THE ECONOMIC IMPACT OF COMMERCIAL SPORTS FISHING ACTIVITIES IN MOREHEAD CITY, NORTH CAROLINA.
Prepared by Coastal Resources Corporation for N.C. Department of Administration, (Raleigh), April 1, 1972, 3 fig, 30 tab, 6 append.

Descriptors: *Commercial fishing, *Sports fishing, *Methodology, *Input-output analysis, *Economic impact, *North Carolina, Economics, Mathematical studies, Recreation, Tourism, Income, Morehead City(NC), Carterette County(NC).

This study reports an estimate of the economic gains realized in a single county from a portion of the total sports fishing activity that takes place in that county; specifically, the commercial facilities that cater to sports fishermen in Morehead City, Carterette County, North Carolins, under conditions and policies prevailing in 1971. The study addresses the problems of economic impact, planning systems, and marketing strategy. The research methodology consisted of: designing the method for evaluation of recreation-tourism enterprises; testing, refining, and finalizing the design, including survey questionnaires; a survey of fishermen that varied by type of facility and season; a direct mail questionnaire to lessees of wet and dry boat storage space in Morehead City marinas; interviews of operators of primary and secondary sports fishing enterprises to acquire information on the history and character of the enterprise, gross income, and the distribution of annual expenditures to salaries, and operating expenses according to the location of the recipient. This information was used to construct matrices describing the sports fishing sector of the economy. The final analytical step consisted of checking data available from the Bureau of the Census and the Office of Business Economics; the tabulation and analysis of the data; and the calculation of the economic impact of the several types of commercial sports fishing opportunities available by season. (Nessa-NC)
W78-04145

REPORT OF THE SOUTHEASTERN NEW ENGLAND STUDY--A STRATEGY FOR BALANCED DEVELOPMENT AND PROTECTION OF WATER AND RELATED LAND RESOURCES IN EASTERN MASSACHUSETTS AND RHODE ISLAND.
New England River Basins Commission, Boston, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 166, Price codes: A04 in paper copy, A01 in microfiche. Regional Report December 1975, 3 maps, 3 append. Summary, December 1975, 48 p.

Descriptors: *Natural resources, *Land resources, *Water resources, *Conservation, *Regional development, Water resources development, Water supply, Water conservation, Economics, Administration, Management, Planning, Water quality, Outdoor recreation, Sites, Locations, Flood control, Flood damage, Erosion, *Massachusetts, Land development, *Rhode Island, Marine management.

The Southeastern New England (SENE) study's goals were twofold: to identify and recommend public and private actions to be taken to provide for balanced conservation and development of the region's water and land resources; and to develop a water and land resource data base. The study's conclusion that both growth accomodation and the provision of economic opportunities are compatible with the protection of the region's natural resources was based on three findings: enhancing the environment enhances the region's economy; anticipated growth can be accomodated and should be guided to protect fragile resources and make development more effcient; and existing knowledge, programs and institutions provide the tools for achieving results, but some changes are needed. Planning objectives and recommendations for several natural resource priorities--guiding growth, water supply, water quality, outdoor recreation, marine management, flooding and erosion and site location of key facilities--were presented. The study concludes with several options for integrating water and land resources policy making and program management into other economic and social programs of the region. (Zayac-NC)
W78-04146

TRIAL APPLICATION OF REVISED EVALUATION PROCEDURES AT KINGSPORT, TENNESSEE.
Tennessee Valley Authority, Kingsport.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 840, Price codes: A06 in paper copy, A01 in microfiche. A Report to the Water Resources Council's Special Task Force on Evaluation Procedures, March 1970, 43 p, 3 tab, 6 plates, 3 append.

Descriptors: *Evaluation, Analytical techniques, *Cost-benefit analysis, *Planning, Cost analysis, Theoretical analysis, Comparative costs, Land use, Water resources, Measurement, Environmental effects, Interest rates, Multiple purpose, Recreation, Employment, Project benefits, Tennessee, Flood plains, Flood damage, *Sensitivity analysis, *Multiple objective planning, Reedy Creek(TN), Kingsport(TN).

This study describes a trial application of the revised evaluation procedures for water and related land resources projects presented in the June, 1969 report of the Water Resources Council's Special Task Force on Evaluation Procedures. The trial application was confined to the evaluation of alternatives under consideration by TVA in its current planning at Kingsport, Tennessee. The evaluation was confined to a comparison of five alternative means of flood damage reduction. Each alternative included a single land use plan selected to satisfy various portions of Kingsport's projected land needs. Measurement of effects was concentrated on those that could be included in income accounts. New procedures were used to evaluate, in monetary terms, enhanced employment, land enhancement along reservoir shorelines, and estimates of the value of recreation at neighborhood parks and play areas. Acceptable but not final procedures were developed. Non-monetary benefits measured were in the environmental account and included acres of greenbelt and miles of natural stream. Conclusions were not found sensitive to a variation in interest rates between 3.25 and 6 percent, and project life between 50 and 100 years. The multi-objective planning approach was found good in principle but in need of refinement. (Nessa-NC)
W78-04148

MOTORS AND OARS IN THE GRAND CANYON. RIVER CONTACT STUDY, PART II,
Human Ecology Research Services, Inc. Boulder, CO.
B. Shelby, and J. M. Nielsen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 730, Price codes: A04 in paper copy, A01 in microfiche. Final Report, June 1976. 59 p, 11 tab, 26 ref, 2 append. CX821040104.

Descriptors: *Boating, *Recreation demand, *Colorado River, *Social aspects, *Grand Canyon(AZ), Arizona, Rivers, Resource allocation, Environmental effects, Recreation facilities, Surveys, Planning, Wilderness areas.

A policy conflict over use of motorized boats in the Grand Canyon, especially by commercial outfitters using large pontoon rafts in what was previously a nonmechanized wilderness area, is assessed by means of surveys of both motor and oar passengers. Passengers on combination trips exposed to both motor and oar travel preferred oar travel (79-91%) over motor travel (4-6%). Reasons given included the slower, more relaxed pace; quiet; trip environment more sensitive to the river and Canyon; and smaller, more comfortable social groupings. No difference was perceived in terms of safety. Motor trips tend to involve more total passengers and more people per boat, have more contact with other parties each day, spend less time in the canyon, make fewer and shorter side trips, and make more adjustments for crowding. The motor-oar combination trips were especially designed for this study for evaluation purposes, and provided data on perceptions and preferences. Standard trips, in which boaters tended to have experienced only one of the two types of travel, provided comparative information on length of trips, size of party, and social, economic, and demographic characteristics. Motor and oar boaters in this latter group were similar in background, but commercial trip passengers had higher than average incomes and educational levels and lived in or around big cities. Effects of an oars-only policy in the canyon is evaluated. (Lynch--Wisconsin)
W78-04151

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

GUIDELINES FOR ATTRACTING PRIVATE CAPITAL TO CORPS OF ENGINEERS PROJECTS,
West Virginia Univ., Morgantown. Bureau of Business Research.
G. R. Dreese, T. S. Witt, and J. M. Rovelstad.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-041 571, Price codes: A11 in paper copy, A01 in microfiche. Prepared for Army Engineer Institute for Water Resources, Fort Belvoir, VA. Vols I and II, March 1977, 208 p. DACW31-75-c-0077.

Descriptors: *Recreation facilities, *Investment, *Profit, *Forecasting, *Feasibility studies, Capital, Capital supply, Management, Pricing, Regulation, Regression analysis, Mathematical

studies, Statistical methods, Statistical data, *Small businesses, Concessionaires, *Ragstown Lake(PA), Standardized accounting audits, Discriminant analysis.

The study is presented in 2 volumes--Vol. I is devoted to the development and estimation of a statistical model of Corps concessionaries; Vol. II is a feasibility study for the newly-developed Ragstown Lake project in Pennsylvania, using the model developed in Vol. I. Vol. I analyzes Corps of Engineers commercial concessionaires located on Corps projects throughout the U.S. The objective was to isolate the policy and procedural means by which additional private capital could be attracted to meet the needs of nearly 400 million visitors who use recreation facilities at Corps projects. Corps concessionaires are small businesses and suffer the problems of all small businesses. No single factor was found to influence profitability. The report's conclusions dispute many of the commonly held assumptions about factors critical to profitability. The recommendations are directed at Corps managers. Standardization of accounting procedures and periodic audits to maintain quality control of financial information provided by concessionaires are clearly indicated. Developing training and other management improvement programs for concessionaire operators appears warranted. The Small Business Administration could provide this service. If additional capital inflows from private sources are to be encouraged, controls and other inhibitions on pricing of concessionary services and competitive services supplied by the Corps should be relaxed. Corps sponsored market studies for individual concessionaire sites offer limited assistance in finding and assuring profitable concessionaire operators. Vol. II is a feasibility study; it forecasts demand for basic marina services at Ragstown Lake, PA, and provides estimates of capital cost structure and operating profits/losses for various blends of business activity. (Nessa-NC)
W78-03896

WATER SHORTAGE IN ISRAEL: LONG-RUN POLICY FOR THE FARM SECTOR,
New Mexico Univ., Albuquerque. Dept. of Economics.
For primary bibliographic entry see Field 3F.
W78-03990

A PROFILE OF THE COMMERCIAL FINFISHERMEN IN COASTAL LOUISIANA,
Louisiana Wildlife and Fisheries Commission, New Orleans. Seafood Div.
P. Bowman, G. Adkins, and J. Tarver.
Technical Bulletin No 25, September 1977, 9 p. 2 fig, 6 tab, 4 ref.

Descriptors: Management, *Fish management, *Commercial fishing, *Louisiana, Coasts, Fish, Fishing, Trout, Drums, Finfishermen, *Spotted seatrout, *Red drum.

696 commercial fishermen were interviewed during May, 1976. Results of these interviews indicated that professional fishermen made up 9.4% of those interviewed, possessed 34.6% (93,205 feet) of the nets, and averaged 1,579.8 feet of net/fisherman. Casual fishermen made up 90.6% of the fishermen interviewed, owned 65.4% of the nets, and averaged 309.5 feet of net/fisherman. Professional fishermen fished an average of 166.8 days each in 1975 and landed 3,570,295 pounds of fish. During the same period, each casual fisherman fished an average of 15.7 days, catching 1,831,345 pounds of fish. No information was available on the number of recreational fishermen and the amount of fish they caught. The purpose for the gathering of this information was the development of a management plan for spotted seatrout and red drum. (Chilton-ORNL)
W78-04118

OYSTER DISTRIBUTION AND DENSITY ON THE PRODUCTIVE PORTION OF STATE SEED GROUNDS IN SOUTHEASTERN LOUISIANA,
Louisiana Wildlife and Fisheries Commission, New Orleans. Seafood Div.
R. J. Dugas.
Technical Bulletin No 23, September 1977, 27 p. 9 fig, 4 tab, 21 ref.

Descriptors: *Environmental effects, Management, *Fish management, Shellfish, Oysters, *Louisiana, Salinity, Hatcheries, Seed grounds.

An investigation was made to determine oyster reef distribution, oyster density on these reefs, environmental conditions influencing this density and distribution, and fishing pressure so that management decisions on this living renewable resource might be made. There is an optimum salinity regime within which oysters survive, grow and reproduce. An inward shift of this optimum salinity zone is occurring due to the reduction of freshwater flow entering the estuaries either from low rainfall or low river discharges. Several recommendations are suggested: (1) legally describe and define the Oyster Seed Ground area and adopt this description as policy in the event a quick alteration line is required; investigate the feasibility of obtaining some means of returning the discarded oyster shells from shucking and canning operations to the grounds; develop the technology for oyster hatchery program as a supply of seed oysters to be deposited on the grounds; and continue to monitor all the Oyster Seed Grounds. (Chilton-ORNL)
W78-04119

6D. Water Demand

SOURCES OF EMERGENCY WATER SUPPLIES IN SANTA CLARA COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. P. Akers.
Water-Resources Investigations 77-51 (open-file report), August 1977. 21 p, 2 fig, 2 tab, 22 ref.

Descriptors: *Water supply, *Alternate planning, *Disasters, *California, *Water wells, Water distribution(Applied), Civil defense, Public health, Water purification, Methodology, *Emergency water supplies, *Santa Clara County(Calif).

Water distribution systems in Santa Clara County, Calif., may be damaged and rendered inoperable by a large earthquake or other disaster. In such an event, individual agencies may have to implement emergency measures to supply water for drinking, firefighting, decontamination, or other purposes. In Santa Clara County, 128 wells have been identified as potential water-supply sources in emergencies. The criteria used to select the wells are: yield of at least 3 liters per second (50 gallons per minute), good water quality, ready accessibility, and available emergency power. Purification methods of small water supplies are described. (Woodard-USGS)
W78-03772

PLAN FORMULATION AND EVALUATION STUDIES--RECREATION. VOLUME I. EVALUATION OF RECREATION USE SURVEY PROCEDURES,
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 6B.
W78-03891

PLAN FORMULATION AND EVALUATION STUDIES--RECREATION. VOLUME II. ESTIMATING INITIAL RESERVOIR RECREATION USE,
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 6B.
W78-03892

PLAN FORMULATION AND EVALUATION STUDIES-RECREATION. VOLUME IV, ESTIMATING RECREATIONAL FACILITY REQUIREMENTS,
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 6B.
W78-03894

MODELS FOR ASSESSING THE ECONOMIC VALUE OF HYDROPOWER FOR PEAKING PURPOSES AND THE PRICING OF PEAKING ALTERNATIVES,
Washington State Water Research Center, Pullman.
R. J. Hanson, and C. B. Millham.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 633, Price codes: A09 in paper copy, A01 in microfiche. Completion Report (Parts I-III), August 15, 1976. 162 p. OWRT B-057-WASH(1). 14-31-0001-5124.

Descriptors: *Hydroelectric power, *Storage reservoirs, *Computer programs, Model studies, Costs, *Simulation analysis, *Peak power, Peaking capacity, Algorithms, *Snake-Columbia hydroelectric system.

A computer data structure and computer program are described for the fast evaluation and computation of power for 47 generation projects, and release evaluation for 4 storage reservoirs on the Snake and Columbia Rivers and tributaries. The system and its parameters are defined, complications in power computation are described, and the method of the cubic spline representation with its associated data structure is described. Graphs of the cubic-spline fits and tables of the spline coefficients are provided. An algorithm is presented for operating the Snake-Columbia hydroelectric system through the critical historical flow years. This operation allows the user to input constraints of monthly elevation or storage, minimum or maximum stream flows, and interregional transfers of water. By comparing a base operation with a new scenario (such as a large irrigation project) a public cost of lost base hydropower load can be obtained. The costs of replacement can then be computed and a reasonable estimate of the public's cost can be presented. A computer program has been written to carry out these computations. The program works within the required constraints to meet a monthly load or power requirements. The incremental storage changes are chosen to be released from the various control reservoirs on the basis of optimal power gain-to-loss ratios. The application of the simulation model developed is discussed. The case studies include diversion (interregional transfer), minimal instream flows, minimum reservoir elevation constraints, and mixtures of these stipulations. The development of the loads is described also. While these case studies were done using the simulation model, they could also have been done using the PASO operating model developed as part of this project.
W78-03964

COMMERCIAL AND INSTITUTIONAL WATER USE IN PUERTO RICO,
Puerto Rico Univ., Mayaguez. School of Engineering.
For primary bibliographic entry see Field 6B.
W78-04097

IDAHO WATER SUPPLY PROGRAM.
Environmental Protection Agency, Seattle, WA. Air and Water Programs Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 669 and PB-243 670, Price codes: A03 in paper copy, A01 in microfiche. Evaluation, October 1973. 207 p, 5 fig, 8 tab, 6 ref, 5 append; Summary, October 1973, 32 p, 2 fig, 1 tab, 5 ref.

Descriptors: *Water supply, *Administration, *Regulation, *Management, *Idaho, Water supply

development, Water allocation(Policy), Water distribution(Applied), Water management(Applied), Institutional constraints, Legal aspects, Water quality, Engineering, Idaho Drinking Water Standards(1964).

The purposes of the study were fourfold: to ascertain the condition of Idaho's water supplies; to determine the adequacy of legal, policy-making, educational and technical support systems, to evaluate the effectiveness of the Idaho water supply program; and to recommend improvements and addtions which may be needed to assure an adequate supply of safe drinking water for residents of Idaho. Investigations of the physical water supply system included bacteriological and chemical testing of water quality and an inventory of facilities and operation. Study of the state water supply program included a review of state authority, regulation and standards; a review of state organization, manpower and budget; and a survey of engineering activities and laboratory support. The study's recommendations included: an increase in the water supply program budget and manpower sources; an expansion of the bacteriological and chemical surveillance programs; a revision of the 1964 Idaho Drinking Water Standards; enabling legislation to require water supply operator certification, system planning and development, and flouridation; the establishment of a program to document related policy decisions; and that computer services be used to monitor the new water supply program. (Zayac-NC)
W78-04147

ENVIRONMENTAL IMPACTS OF THE GENERATION OF ELECTRICITY IN THE PACIFIC NORTHWEST. VOLUME II.
Equitable Environmental Health, Inc., Woodbury, NY.
For primary bibliographic entry see Field 6G.
W78-04149

6E. Water Law and Institutions

LEGAL AND ADMINISTRATIVE ASPECTS OF BOTTOM SEDIMENT MANAGEMENT,
Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5G.
W78-03746

PROGRAM OBJECTIVES FOR THE NATIONAL WATER DATA EXCHANGE (NAWDEX) FOR FISCAL YEAR 1978,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03767

BIBLIOGRAPHY OF REPORTS BY MEMBERS OF THE U.S. GEOLOGICAL SURVEY ON THE WATER RESOURCES OF ALASKA, 1870 THROUGH 1976,
Geological Survey, Anchorage, AK Water Resources Div.
For primary bibliographic entry see Field 10C.
W78-03778

DESIGN OF WATER RESOURCES PROJECTS WITH INADEQUATE DATA, VOLUME 2.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 4A.
W78-03783

THE SAFE DRINKING WATER ACT: A DOLLARS AND SENSE PERSPECTIVE,
Econdyne Corp., St Paul, MN. Lindsay Div.
For primary bibliographic entry see Field 5G.
W78-03846

DRINKING WATER STANDARDS: PRINCIPLES AND HISTORY 1914 TO 1976,
Environmental Protection Agency, Boston, MA. Water Supply Branch.
For primary bibliographic entry see Field 5G.
W78-03847

WATER CONSERVATION: DRAMATIC CHANGES TAKING PLACE,
Eutek, Inc., San Francisco, CA.
For primary bibliographic entry see Field 3E.
W78-03851

MANPOWER AND TRAINING NEEDS OF STATE WATER POLLUTION CONTROL AGENCIES.
ABT Associates, Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-03890

ENERGY DEVELOPMENT AND LAND USE IN TEXAS,
Texas Transportation Inst., College Station.
For primary bibliographic entry see Field 3E.
W78-03900

AN ECONOMIC OVERVIEW OF HAWAII'S WATER INSTITUTIONS,
Hawaii Univ., Honolulu. Water Resources Research Center.
H. Yamauchi.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 357, Price codes: A02 in paper copy, A01 in microfiche. Water Resources Bulletin, Vol 13, No 4, p 759-768, August 1977. 8 ref. OWRT A-019-HI(4), 14-31-0001-3211.

Descriptors: *Institutional economics, *Water policy, *Water rights, Environmental laws, *Common property, *Hawaii, Water allocation(Policy), Legal aspects.

The problem of allocating scarce water resources among competing uses and users over time in Hawaii is addressed with the contest of analytical institutional economics. The nature of this problem has been, in recent years, highly complicated by important institutional changes that control operating decisions for water supply and water pollution. Whereas the imbalance in governmental initiatives regarding changes in the system of water rigrhts (predominantly state) and environmental laws (predominantly federal) are based on U.S. constitutional provisions, the more fundamental roots of the crucial legal doctrines involved have been traced back to the common property concept. This suggests that the more promising opportunities for meeting the water policy challenges of the state are to be found in the historical common property system (ahupua'a) of Hawaii.
W78-03930

IDAHO WATER SUPPLY PROGRAM.
Environmental Protection Agency, Seattle, WA. Air and Water Programs Div.
For primary bibliographic entry see Field 6D.
W78-04147

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION: PAMUNKEY RIVER, HANOVER COUNTY, VIRGINIA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-03902

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, ARMSTRONG COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03903

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, NEW KENSINGTON, ARNOLD, LOWER BURRELL AND ALLEGHENY TOWNSHIP, WESTMORELAND COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03904

FLOOD PLAIN INFORMATION: OHIO, ALLEGHENY, MONONGAHELA AND YOUGHIOGHENY RIVER, ALLEGHENY COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03905

FLOOD PLAIN INFORMATION: CONEMAUGH AND LITTLE CONEMAUGH RIVERS, STONY AND BENS CREEKS, CITY OF JOHNSTOWN AND VICINITY, CAMBRIA AND SOMERSET COUNTIES, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03906

FLOOD PLAIN INFORMATION: PETERS CREEK, JEFFERSON BOROUGH, ALLEGHENY COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03907

FLOOD PLAIN INFORMATION: FRENCH CREEK, COCHRANTON, CRAWFORD COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03908

FLOOD PLAIN INFORMATION: CLARION RIVER AND SILVER CREEK, JOHNSONBURG, ELK COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03909

FLOOD PLAIN INFORMATION: HARE AND BEAR CREEKS, CORRY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03910

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, CALIFORNIA, COAL CENTER, AND WEST BROWNSVILLE, WASHINGTON COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03911

FLOOD PLAIN INFORMATION: BLACKSTONE RIVER, CUMBERLAND, LINCOLN, CENTRAL FALLS, AND PAWTUCKET, RHODE ISLAND.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W78-03912

FLOOD PLAIN INFORMATION: WEST BRANCH SUSQUEHANNA RIVER (EAST), LYCOMING COUNTY, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W78-03913

FLOOD PLAIN INFORMATION: FRANKSTOWN BRANCH JUNIATA RIVER, WILLIAMSBURG, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W78-03914

FLOOD HAZARD REPORT: SHICKSHINNY CREEK, LUZERNE COUNTY, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W78-03915

FLOOD PLAIN INFORMATION: BIG SANDY RIVER, WAYNE COUNTY, WEST VIRGINIA.
Army Engineer District, Huntington, WV.
For primary bibliographic entry see Field 4A.
W78-03916

FLOOD HAZARD INFORMATION: BUFFALO CREEK, LOGAN COUNTY, WEST VIRGINIA--POST DISASTER CONDITIONS.
Army Engineer District, Huntington, WV.
For primary bibliographic entry see Field 4A.
W78-03917

6G. Ecologic Impact Of Water Development

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: FORMALDEHYDE,
Atlantic Research Corp., Alexandria, VA.
For primary bibliographic entry see Field 5B.
W78-03714

CHLORDANE AND HEPTACHLOR IN RELATION TO MAN AND THE ENVIRONMENT. A FURTHER PESTICIDE REVIEW 1972-1975,
Environmental Protection Agency, Washington, DC. Office of Pesticide Programs.
For primary bibliographic entry see Field 5B.
W78-03715

INVESTIGATION OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS: ACRYLAMIDES,
Syracuse Research Corp., NY. Center for Chemical Hazard Assessment.
For primary bibliographic entry see Field 5B.
W78-03717

PESTICIDAL ASPECTS OF CHLORDANE IN RELATION TO MAN AND THE ENVIRONMENT,
Environmental Protection Agency, Washington, DC. Office of Pesticide Programs.
For primary bibliographic entry see Field 5B.
W78-03721

SETTLER'S CABIN PARK: ENVIRONMENTAL ASSESSMENT OF MINE DRAINAGE POLLUTION,
Ackenheil and Associates Geo Systems, Inc, Pittsburgh, PA.
For primary bibliographic entry see Field 5G.
W78-03723

ECOLOGICAL CONSIDERATIONS IN SITE ASSESSMENT FOR DREDGING AND SPOILING ACTIVITIES,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5C.
W78-03751

DREDGE DISPOSAL STUDY. SAN FRANCISCO BAY AND ESTUARY. MAIN REPORT.
Army Engineer District, San Francisco.
For primary bibliographic entry see Field 5E.
W78-03875

NATURAL HAZARD MANAGEMENT IN COASTAL AREAS,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 5G.
W78-03879

MARINE STUDIES OF SAN PEDRO, CALIFORNIA. PART II. POTENTIAL EFFECTS OF DREDGING ON THE BIOTA OF OUTER LOS ANGELES HARBOR. TOXICITY, BIOASSAY AND RECOLONIZATION STUDIES.
University of Southern California, Los Angeles. Allan Hancock Foundation; and University of Southern California, Los Angeles. Inst. of Marine and Coastal Studies.
For primary bibliographic entry see Field 5C.
W78-03882

ROCKY MOUNTAIN ENVIRONMENTAL RESEARCH. QUEST FOR A FUTURE. PROBLEMS AND RESEARCH PRIORITIES IN THE ROCKY MOUNTAIN REGION.
Eisenhower Consortium for Western Environmental Forestry Research, Fort Collins, CO.
For primary bibliographic entry see Field 6B.
W78-03897

ENERGY DEVELOPMENT AND LAND USE IN TEXAS,
Texas Transportation Inst., College Station.
For primary bibliographic entry see Field 3E.
W78-03900

A COMPUTERIZED METHOD FOR ABSTRACTING AND EVALUATING ENVIRONMENTAL IMPACT STATEMENTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
G. F. Martel, and R. T. Lackey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 459, Price codes: A05 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 105, December 1977. 93 p, 24 fig, 8 tab, 24 ref. OWRT A-070-VA(1).

Descriptors: *Reservoirs, Impoundments, *Computer programs, *Probability, Statistics, *Environmental effects, Simulation analysis, Methodology, Evaluation, *Environmental impact statements, Environmental analysis, *Environmental assessment, Dams.

This study describes the Dam Impact Evaluation System (DES), developed specifically for evaluating and comparing impacts from dam projects and project alternatives. DES operates on the creation of a distribution based on low, most likely, and high inputs by project evaluators on both impact and importance of factors and actions. Computer output includes comparisons between projects in both tabular and graphic form. Information is available on estimated impact, variance of the estimator's inputs, and probabilities of differences between projects. DES provides a method by which the value judgments and estimates of evaluators may be dealt with statistically. Both impact and weighting factors are considered, based on the probability distributions of evaluator input. Weighting factors are combined with impact to form weighted values that may be used in comparing dam projects and alternatives. In addition, DES utilizes the input for maximum information. The high, low, and most likely values for each evaluator are used to create variance and mean values which may be used in project comparisons and/or evaluation. The estimation of variances is valuable because it indicates areas of uncertainty. Factors with large variances may need additional data information to ensure more accurate prediction. Further, the distributions and numeric output indicate areas where the dam project may cause significant change or alteration. Finally, DES creates understandable, usable output graphically and numerically.
W78-03970

DERIVATION OF RESIDUAL COEFFICIENTS FOR TYPICAL INDUSTRIES IN NEW ENGLAND,
Center for the Environment and Man, Inc., Hartford, CT.
For primary bibliographic entry see Field 5G.
W78-03988

EFFLUENT STANDARDS--EFFECT UPON DESIGN,
Los Angeles Bureau of Sanitation, CA.
For primary bibliographic entry see Field 5G.
W78-03991

AQUATIC IMPACT ASSESSMENT AT CALVERT CLIFFS,
Martin Marietta Environmental Technology Center, Baltimore, MD.
For primary bibliographic entry see Field 5C.
W78-04062

ECOLOGICAL LAND UNITS OF BEAR CREEK WATERSHED AND THEIR RELATIONSHIP TO WATER QUALITY,
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 4D.
W78-04099

1977 ENVIRONMENTAL CONDITIONS RELATIVE TO SHRIMP PRODUCTION IN COASTAL LOUISIANA ALONG WITH SHRIMP CATCH DATA FOR THE GULF OF MEXICO.
Louisiana Wildlife and Fisheries Commission, New Orleans. Seafood Div.
For primary bibliographic entry see Field 5G.
W78-04117

A CRITICAL EVALUATION OF THE NON-RADIOLOGICAL ENVIRONMENTAL TECHNICAL SPECIFICATION - VOL. 1. PROGRAM DESCRIPTION, SUMMARY AND RECOMMENDATIONS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
S. M. Adams, P. A. Cunningham, D. D. Gray, K. D. Kumar, and A. J. Witten.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL/NUREG/TM-69, Price codes: A04 in paper copy, A01 in microfiche. Report ORNL/NUREG/TM-69, Vol 1, June 1977, 46 p, 7 tab, 11 ref. W7405-eng-26, ERDA 40-550-75 (Interagency agreement).

Descriptors: *Environment effects, Specifications, Monitoring, Ecology, Powerplants, *Nuclear powerplants, Evaluation, Assessments, *Hydrothermal monitoring, *Ecological monitoring.

This report includes a summary of the screening phase of a study conducted as part of the environmental Technical Specification program for eight nuclear power plants. An evaluation of the adequacy of hydrothermal and ecological monitoring data for each plant is given as are the summary and recommendations resulting from a detailed examination of three nuclear power plants. Due to sporadic operating histories, several plants were

eliminated from consideration for more in-depth analysis. Results of this study are expected to feed back into the present environmental assessment process and provide a basis for predicting potential impacts at future facilities. Fixed thermograph networks were considered to provide the best method for continuous environmental surveillance and for constructing probablistic isotherm maps. It was suggested that selection of monitoring stations during preoperational periods should involve identification of monitoring areas with comparable physical and chemical characteristics which directly affect the type of biological community within the area. (See also W78-04131) (Chilton-ORNL)
W78-04130

A CRITICAL EVALUATION OF THE NON-RADIOLOGICAL ENVIRONMENTAL TECHNICAL SPECIFICATIONS - VOL. 4, SAN ONOFRE NUCLEAR GENERATING STATION UNIT 1,
Oak Ridge National Lab., TN. Environmental Sciences Div.
S. M. Adams, P. A. Cunningham, D. D. Gray, and K. D. Kumar.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL/NUREG/TM-72, Price code: A05 in paper copy, A01 in microfiche. Report ORNL/NUREG/TM-72, Vol 4 of ORNL/NUREG/TM-69, June 1977, 83 p, 36 fig, 9 tab, 37 ref. W-7405-eng-26 Inter agency agreement No. ERDA-40-550-75.

Descriptors: *Environmental effects, *Monitoring, Ecology, Model studies, Sampling, Plankton, Benthos, Nekton, *San Onofre Nuclear Generating Station(Calif), Powerplants, *Nuclear powerplants, California.

Material in this report includes an analysis of hydrothermal and ecological monitoring data collected in 1975 for San Onofre Nuclea Generating Station, Unit 1. Included in the hydrothermal analysis is a discussion of models used plume predictions prior to plant operation and an evaluation of present hydrothermal monitoring. It was concluded that the present program meets requirements of the Technical Specifications. Evaluation of the ecological monitoring program reviewed the sampling program designed to monitor planktonic, benthic, and nektonic communities in the vicinity. It was concluded that the frequency of sampling of all trophic levels is inadequate and that sampling should be extended into offshore areas. (See also W78-04130) (Chilton-ORNL)
W78-04131

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES, THE KEWAUNEE NUCLEAR POWER PLANT SITE,
Argonne National Lab. IL.
For primary bibliographic entry see Field 5C.
W78-04132

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES - THE QUAD-CITIES NUCLEAR POWER STATION SITE,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5C.
W78-04133

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES, THE ZION NUCLEAR POWER STATION SITE,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5C.
W78-04134

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES - PRAIRIE ISLAND NUCLEAR GENERATING PLANT SITE,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5C.
W78-04135

AN EVALUATION OF ENVIRONMENTAL DATA RELATING TO SELECTED NUCLEAR POWER PLANT SITES - A SYNTHESIS AND SUMMARY WITH RECOMMENDATIONS,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5C.
W78-04136

ENVIRONMENTAL IMPACTS OF THE GENERATION OF ELECTRICITY IN THE PACIFIC NORTHWEST. VOLUME II.
Equitable Environmental Health, Inc., Woodbury, NY.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 097, Price codes: A10 in paper copy, A01 in microfiche. Prepared for Bonneville Power Administration, Portland, OR, September 1976. 189 p, 9 fig, 91 tab. 14-03-6103N.

Descriptors: *Power plants, *Environmental effects, *Pacific Northwest U.S., *Thermal power plants, *Environmental effects, *Pacific Northwest U.S., *Thermal power plants, *Electric power production, Methodology, Air pollution effects, Water pollution effects, Water supply, Land use, Population, Vegetation, Mapping, Regulation, Nuclear power plants, Bonneville power administration, Energy parks.

This study describes and quantifies where possible the environment impacts of all existing plants and various scenarios for planned thermal electrical generating facilities through 1995 in the Pacific Northwest. It includes extraction, processing and transportation as well as fuel conversion for the generating facilities. Evaluation of the regional impact potential of power generartion is based on air quality, water quantity/quality, population/land use, and flora variables. Subregions of homogeneous impact susceptibility and related characteristics are defined and mapped. These maps and regulatory considerations are the basis for maps outlining geographical areas of constraints on development of power generation. The impact of six scenarios for meeting power needs over the next 20 years in the Bonneville Power Administration (BPA) service area are tablulated. The evaluation of environmental impact of each scenario addresses incremental, synergistic, long term cumulative, and threshold effects of air, water, and solid residuals and effects of population and land disturbance. The subregional analysis is followed by an evaluation of the impacts of power generation scenarios on the entire region. It includes an analysis of the comparative impacts of energy parks and dispersed sites, and varying numbers of larger and smaller power generation units of the same capacity. (Nessa-NC)
W78-04149

REPORT OF A WORKSHOP ON THE IMPACT OF THERMAL POWER PLANT COOLING SYSTEMS ON AQUATIC ENVIRONMENTS.
Sigma Research Inc., Richland, WA.
For primary bibliographic entry see Field 5C.
W78-04155

THE CONNECTICUT RIVER ECOLOGICAL STUDY, THE IMPACT OF A NUCLEAR POWER PLANT.
American Fisheries Society, Bethesda, MD.
For primary bibliographic entry see Field 5C.
W78-04174

HYDROGRAPHY,
Essex Marine Lab., CT.
For primary bibliographic entry see Field 5C.
W78-04183

7. RESOURCES DATA

7A. Network Design

AN EXAMPLE OF REGIONAL CO-OPERATION FOR IMPROVING THE HYDROLOGICAL AND METEOROLOGICAL INFORMATION,
World Meteorological Organization, Managua (Nicaragua). Central American Hydrometeorological Project.
E. Basso, A. Arriagada, H. Neira, and M. P. Delgado.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol.), p 35-57, 1974. 12 fig, 20 ref.

Descriptors: *Training, *Hydrology, *Foreign countries, *Networks, Data collections, Hydrologic data, Instrumentation, Publications, Information exchange, Meteorological data, Meteorology, Discharge measurement, Precipitation(Atmospheric), Sediment discharge, Floods, Rainfall, Water balance, Sediment transport, *Central America, *Costa Rica, *El Salvador, *Guatemala, *Honduras, *Nicaragua, *Panama.

The Central American Hydrometeorological Project initiated in September 1967 represents a cooperative effort among the countries of the Central American Isthmus (Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama) and the United Nations Development Programme. The World Meteorological Organization acts as executive agency. Project objectives are: (1) installation of a basic network of meteorological and hydrological stations; (2) collection, processing, and publication of the data; (3) training of personnel by means of courses, fellowships, or through technical publications and manuals; and (4) the institutional strengthening of the meteorological and hydrological services in the area. Important Project activities have been the testing of new equipment used in developed countries in order to study their application to the characteristics and tropical climate of the area, and the development and application of methods for meteorology, hydrology and sediment studies with limited information. It was concluded that their use in other areas with similar conditions can be useful and that regional cooperation can be one effective means for coping with inadequate data through the pooling of individual countries' efforts. (See slso W78-03783) (Humphreys-ISWS)
W78-03785

7B. Data Acquisition

LANDSAT LINEAR TREND ANALYSIS: A TOOL FOR GROUNDWATER EXPLORATION IN NORTHERN ARKANSAS,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 4B.
W78-03752

DEFINING REACTIONS AND MASS TRANSFER IN PART OF THE FLORIDAN AQUIFER,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-03770

A PROCEDURE FOR DETECTION AND MEASUREMENT OF INTERFACES IN REMOTELY

ACQUIRED DATA USING A DIGITAL COMPUTER,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
K. H. Faller.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA TR R-472, Price codes: A03 in paper copy, A01 in microfiche. NASA Technical Report No. NASA TR R-472, July 1977. 31 p, 12 fig, 4 tab, 3 ref.

Descriptors: *Remote sensing, *Tides, *Interfaces, Measurement, Shoreline, Detection, Data acquisition, Multispectral scanner.

A technique developed and evaluated for the detection and measurement of surface feature interfaces in remotely acquired data is described. A computer implementation of this technique has been effected to automatically process categorized data derived from various sources such as the Landsat multispectral scanner and other scanner-type sensors. The basic elements of the operational theory of the technique are described together with details of the procedure. An example application of the technique to the analysis of tidal shoreline length is given with a breakdown of manpower requirements. The technique as applied to Landsat multispectral scanner data is evaluated with respect to accuracy and precision. (Sinha-OEIS)
W78-03865

REMOTE SENSING OF OIL POLLUTION AT THE SEA SURFACE I. REVIEW OF REMOTE SENSING METHODS EMPHASIZING RADAR,
Netherlands Interdepartmental Working Group on the Application of Remote Sensing, Delft.
For primary bibliographic entry see Field 5A.
W78-03867

REMOTE SENSING OF OIL POLLUTION AT THE SEA SURFACE II. DAMPING OF WATER WAVES BY AN OIL LAYER AS A POSSIBLE INDICATOR FOR SOLAR OBSERVATIONS,
Netherlands Interdepartmental Working Group for the Application of Remote Sensing Techniques, Delft.
For primary bibliographic entry see Field 5A.
W78-03868

METAMORPHISM OF SNOW AND ICE SINTERING OBSERVED BY TIME LAPSE CINE-PHOTOMICROGRAPHY,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
For primary bibliographic entry see Field 2C.
W78-04007

NUMERICAL PARAMETERS TO IDENTIFY SNOW STRUCTURE,
Swiss Federal Inst. for Snow and Avalanche Research, Weissfluhjoch-Davos.
For primary bibliographic entry see Field 2C.
W78-04008

ON THE DIELECTRIC CONSTANT OF WET SNOW,
Innsbruck Univ. (Austria). Physikalisches Inst.
For primary bibliographic entry see Field 2C.
W78-04012

CREEP-INDUCED CHANGES IN STRUCTURE AND DENSITY OF SNOW,
Moscow State Univ. (USSR). Snow Avalanche Problem Lab.
For primary bibliographic entry see Field 2C.
W78-04015

CONTINUOUS MEASUREMENTS OF DEFORMATIONS ON AN AVALANCHE SLOPE,
Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
For primary bibliographic entry see Field 2C.
W78-04022

STUDIES OF SUBTERRANEAN WATERS: 25. METHODS OF COLLECTING INTERSITITIAL SUBTERRANEAN WATERS, (IN FRENCH),
Centre National de la Recherche Scientifique, Moulis (France). Lab. Souterrain.
Claude Bou.
Ann Speleol. 29(4), p 611-620, 1974.

Descriptors: Methodology, Groundwater, Water wells, *Fauna sampling, Interstitial waters, *Mediterranean Sea, Rivers, *Subterranean waters.

Two method of fauna collection in underground waters are described. The first known as 'methode des sondages tubes Bou-Rouch' is intended for the study of the under-flow of rivers. Since its preliminary description in 1967, it has been intensely used in the areas around the Mediterranean Sea. The second, described by Cvetkov in 1968, is intended for the study of the fauna of wells. The respective advantages of the 2 methods and the extension of their use are discussed.--Copyright 1975, Biological Abstracts, Inc.
W78-04024

MULTIVARIATE DATA ANALYSIS AS A TOOL FOR DAY-BY-DAY AVALANCHE FORECAST,
Grenoble Univ. (France). Lab. de Mecanique des Fluides.
For primary bibliographic entry see Field 2C.
W78-04031

HOW TO DESIGN AND SELECT A (WASTE WATER) SAMPLER,
Sirco Products Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5A.
W78-04068

ASSESSMENT OF WATER QUALITY STATUS AND TRENDS IN MINNESOTA BY REMOTE SENSING TECHNIQUES,
Minnesota Univ., Minneapolis.
For primary bibliographic entry see Field 5A.
W78-04105

WATER RESEARCH INSTRUMENTATION: 2.
For primary bibliographic entry see Field 5A.
W78-04153

7C. Evaluation, Processing and Publication

LANDSAT LINEAR TREND ANALYSIS: A TOOL FOR GROUNDWATER EXPLORATION IN NORTHERN ARKANSAS,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 4B.
W78-03752

FIELD GUIDE TO THE GEOLOGY OF THE DURHAM TRIASSIC BASIN, NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.; and Campbell Coll., Buie's Creek, NC.
For primary bibliographic entry see Field 2J.
W78-03760

DIGITAL MODEL OF THE ARIKAREE AQUIFER NEAR WHEATLAND, SOUTHEASTERN WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-03761

WATER-RESOURCES INVESTIGATIONS IN NORTH DAKOTA, 1976.
Geological Survey, Bismarck, ND. Water Resources Div.
Water-Resources Investigations in North Dakota Folder, 1977. 1 sheet.

Descriptors: *Water resources, Investigations, *Inter-agency cooperation, *North Dakota, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Groundwater, Water quality, On-site investigations, Dissolved solids, Water level fluctuations, Bibliographies, Networks, *Maps, Cooperative water-studies program.

Water-resources studies and investigations in North Dakota made by the U.S. Geological Survey in cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include collections of basic information through a hydrologic data network, areal hydrologic or interpretative studies, and research projects. The hydrologic data network consists of primary, secondary, and water-management streamflow stations; groundwater observation wells; and water-quality observation sites. Small State maps show principal sources of ground water, average annual precipitation, average annual runoff, discharge of the principal rivers, and the dissolved solids in surface waters. A map, scale 50 mi to the in, shows by symbols, numbers, and colored outli[illegible]: the hydrologic data network and investigations in North Dakota as of September 1976. (Woodard-USGS)
W78-03764

WATER-RESOURCES INVESTIGATIONS IN ARIZONA, 1977.
Geological Survey, Tucson, AZ. Water Resources Div.
Water-Resources Investigations in Arizona Folder, 1977. 1 sheet.

Descriptors: *Water resources, Investigations, *Inter-agency cooperation, *Arizona, Surveys, Planning, Hydrologic data, Basic data collections, Precipitation(Atmospheric), Flood plains, Streamflow, Runoff, Reservoirs, Groundwater, Water quality, On-site investigations, Dissolved solids, Water level fluctuations, Bibliographies, Networks, *Maps, Cooperative water-studies program.

Water-resources studies and investigations in Arizona made by the U.S. Geological Survey in Cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include collections of basic information through a hydrologic data network, areal hydrologic or interpretative studies, and research projects. The hydrologic data network consists of primary, secondary, and water-management streamflow stations; ground-water observation wells; and water-quality observation sites. Small State maps show average annual precipitation, flood prone areas, storage in principal reservoirs, water quality, principal sources of ground water, discharge of the principal rivers, and change in water levels in aquifers of developed areas. A map, scale 50 mi to the in, shows by symbols, numbers, and colored outline the hydrologic data network and investigations in Arizona as of January 1977. (Woodard-USGS)
W78-03765

PROGRAM OBJECTIVES FOR THE NATIONAL WATER DATA EXCHANGE (NAWDEX) FOR FISCAL YEAR 1978,
Geological Survey, Reston, VA. Water Resources Div.
M. D. Edwards.
Open-file report 77-791, 1977. 8 p.

Descriptors: *Data storage and retrieval, *Information exchange, *Programs, *Project planning, *Data processing, Data transmission, Systems analysis, Bibliographies, Water resources, Training, *Data collections, *National Water Data Exchange(Nawdex), Storet, Watstore, Wrsic, Eds, Endex, Oasis, Data services, Water data sources directory, Master water data index.

This report presents the program objectives for the National Water Data Exchange (Nawdex) for Fiscal Year 1978, October 1, 1977 to September 30, 1978. Objectives covered include Nawdex membership, membership participation, Nawdex services, identification of sources of water data, the indexing of water data, systems development and implementation, training, recommended standards for the handling and exchange of water data, and program management. The report provides advance information on Nawdex activities, thereby, allowing the activities to be better integrated into the planning and operation of programs of member organizations. (Woodard-USGS)
W78-03767

GROUND-WATER LEVELS IN WYOMING, 1976,
Geological Survey, Cheyenne, WY. Water Resources Div.
W. C. Ballance, and P. B. Freudenthal.
Open-file report 77-686, August 1977. 187 p, 21 fig, 5 ref.

Descriptors: *Groundwater, *Water levels, *Observation wells, *Water level fluctuations, *Wyoming, Data collections, Hydrographs, Water wells, Sites, Water utilization, Irrigation, Municipal water, Aquifers.

Ground-water levels are measured periodically in a network of about 280 observation wells in Wyoming to record changes in ground-water storage. The areas of water-level observation are mostly where ground water is used in large quantities for irrigation or municipal purposes. This report contains maps showing location of observation wells and water-level changes from 1976 to 1977. Well history, highest and lowest water levels, and hydrographs for most wells also are included. The program of groundwater observation is conducted by the U.S. Geological Survey in cooperation with the Wyoming State Engineer and the city of Cheyenne. (Woodard-USGS)
W78-03768

BIBLIOGRAPHY OF REPORTS BY MEMBERS OF THE U.S. GEOLOGICAL SURVEY ON THE WATER RESOURCES OF ALASKA, 1870 THROUGH 1976,
Geological Survey, Anchorage, AK. Water Resources Div.
For primary bibliographic entry see Field 10C.
W78-03778

WATER RESOURCES DATA FOR IDAHO, WATER YEAR 1976.
Geological Survey, Boise, ID. Water Resources Div.
Water-Data Report ID-76-1, November 1977. 634 p, 21 fig, 1 tab.

Descriptors: *Idaho, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Idaho consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report contains discharge records for 192 stations; stage only records for 2 gaging stations; stage for 6 lakes; contents for 25 lakes and reservoirs; water-quality for 91 gaging stations, 42 partial-record stations, 2 lakes, and 222 wells; and water levels for 6 observation wells. Also included are data for 58 crest-stage partial-record stations and 180 low-flow partial record stations. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S Geological Survey and Cooperating State and Federal agencies in Idaho. (Woodard-USGS)
W78-03780

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1976--VOLUME 2. EASTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 887, Price codes: A16 in paper copy, A01 in microfiche.
Water-Data Report WA-76-2, October 1977. 344 p, 18 fig.

Descriptors: *Washington, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Eastern Washington.

Water resources data for the 1976 water year for Washington, consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells and springs. This report, in two volumes, contains discharge records for 248 gaging stations, stage only records for 3 gaging stations, stage and contents for 44 lakes and reservoirs, water quality for 124 stations and 8 lakes, and water levels for 108 observation wells. Also included are 172 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collections program and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Washington. (Woodard-USGS)
W78-03781

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1976--VOLUME 1. WESTERN WASHINGTON.
Geological Survey, Tacoma, WA. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 886, Price codes: A18 in paper copy, A01 in microfiche.
Water-Data Report WA-76-1, October 1977. 403 p, 21 fig.

Descriptors: *Washington, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Western Washington.

Water resources data for the 1976 water year for Washington, consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells and springs. This report, in two volumes, contains discharge records for 248 gaging stations, stage only records for 3 gaging stations, stage and contents for 44 lakes and reservoirs, water quality for 124 stations and 8 lakes, and water levels for 108 observation wells. Also included are 172 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Washington. (Woodard-USGS)
W78-03782

DESIGN OF WATER RESOURCES PROJECTS WITH INADEQUATE DATA, VOLUME 2.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 4A.
W78-03783

WATER RESOURCES PROJECTS IN NIGERIA AND THE HYDROLOGICAL DATA EMPLOYED IN THEIR PLANNING AND DEVELOPMENT,
Ife Univ. (Nigeria). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W78-03784

GEOHYDROLOGICAL STUDIES IN SMALL AREAS WITHOUT SYSTEMATIC DATA,
For primary bibliographic entry see Field 4B.
W78-03787

METHODS OF ANALYSING DEFICIENT DISCHARGE DATA IN ARID AND SEMI-ARID ZONES FOR THE DESIGN OF SURFACE WATER UTILIZATION,
Tahal Water Planning for Asrael Ltd., Tel Aviv.
For primary bibliographic entry see Field 4A.
W78-03788

RELATION OF HYDROLOGICAL PROGRAMS OF THE CENTER OF HYDROGRAPHIC STUDIES FOR COMPLETE STUDIES OF HYDRAULIC RESOURCES WITH INSUFFICIENT DATA,
For primary bibliographic entry see Field 2A.
W78-03791

OBJECTIVE CRITERIA TO DECLARE A SERIES OF DATA SUFFICIENT FOR TECHNICAL PURPOSES,
For primary bibliographic entry see Field 2A.
W78-03795

SOME CRITERIA USED IN HYDROLOGIC STUDIES WITH INADEQUATE DATA,
For primary bibliographic entry see Field 2A.
W78-03796

DETERMINATION OF HYDROLOGICAL CHARACTERISTICS IN POINTS WITHOUT DIRECT HYDROMETRIC DATA,
World Meteorological Organization, Bogota (Columbia); and United Nations Development Program, Bogota (Columbia).
For primary bibliographic entry see Field 4A.
W78-03797

FLOOD ESTIMATION BY DETERMINATION OF REGIONAL PARAMETERS FROM LIMITED DATA,
For primary bibliographic entry see Field 4A.
W78-03805

COMPUTERIZED ANALYSIS OF STREAM ALGAE,
Uppsala Univ. (Sweden).
For primary bibliographic entry see Field 5C.
W78-03815

IFYGL TEMPERATURE TRANSECTS: TEMPERATURE DISTRIBUTIONS ACROSS THREE SECTIONS OF LAKE ONTARIO CONTINUOUSLY TRANSVERSED OVER FOUR-DAY INTERVALS IN JULY, AUGUST, AND OCTOBER 1972,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W78-03841

FLOOD PLAIN INFORMATION: PAMUNKEY RIVER, HANOVER COUNTY, VIRGINIA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-03902

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, ARMSTRONG COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03903

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, NEW KENSINGTON, ARNOLD, LOWER BURRELL AND ALLEGHENY TOWNSHIP, WESTMORELAND COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03904

FLOOD PLAIN INFORMATION: OHIO, ALLEGHENY, MONONGAHELA AND YOUGHIOGHENY RIVER, ALLEGHENY COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03905

FLOOD PLAIN INFORMATION: CONEMAUGH AND LITTLE CONEMAUGH RIVERS, STONY AND BENS CREEKS, CITY OF JOHNSTOWN AND VICINITY, CAMBRIA AND SOMERSET COUNTIES, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03906

FLOOD PLAIN INFORMATION: PETERS CREEK, JEFFERSON BOROUGH, ALLEGHENY COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03907

FLOOD PLAIN INFORMATION: FRENCH CREEK, COCHRANTON, CRAWFORD COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03908

FLOOD PLAIN INFORMATION: CLARION RIVER AND SILVER CREEK, JOHNSONBURG, ELK COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03909

FLOOD PLAIN INFORMATION: HARE AND BEAR CREEKS, CORRY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03910

FLOOD PLAIN INFORMATION: MONONGAHELA RIVER, CALIFORNIA, COAL CENTER, AND WEST BROWNSVILLE, WASHINGTON COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-03911

FLOOD PLAIN INFORMATION: BLACKSTONE RIVER, CUMBERLAND, LINCOLN, CENTRAL FALLS, AND PAWTUCKET, RHODE ISLAND.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W78-03912

FLOOD PLAIN INFORMATION: WEST BRANCH SUSQUEHANNA RIVER (EAST), LYCOMING COUNTY, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W78-03913

FLOOD PLAIN INFORMATION: FRANKSTOWN BRANCH JUNIATA RIVER, WILLIAMSBURG, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W78-03914

FLOOD HAZARD REPORT: SHICKSHINNY CREEK, LUZERNE COUNTY, PENNSYLVANIA.
Army Engineer District, Baltimore, MD.
For primary bibliographic entry see Field 4A.
W78-03915

FLOOD PLAIN INFORMATION: BIG SANDY RIVER, WAYNE COUNTY, WEST VIRGINIA.
Army Engineer District, Huntington, WV.
For primary bibliographic entry see Field 4A.
W78-03916

FLOOD HAZARD INFORMATION: BUFFALO CREEK, LOGAN COUNTY, WEST VIRGINIA--POST DISASTER CONDITIONS.
Army Engineer District, Huntington, WV.
For primary bibliographic entry see Field 4A.
W78-03917

A COMPUTERIZED METHOD FOR ABSTRACTING AND EVALUATING ENVIRONMENTAL IMPACT STATEMENTS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.
For primary bibliographic entry see Field 6G.
W78-03970

8. ENGINEERING WORKS

8B. Hydraulics

SYNTHETIC UNIT HYDROGRAPH TECHNIQUE FOR THE DESIGN OF FLOOD ALLEVIATION WORKS IN URBAN AREAS,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-03802

PROSPECTS FOR GEOTHERMAL ENERGY APPLICATIONS AND UTILIZATION IN CANADA,
Toronto Univ. (Ontario). Inst. for Aerospace Studies.
For primary bibliographic entry see Field 4B.
W78-03845

PRELIMINARY ASSESSMENT OF A GEOTHERMAL ENERGY RESERVOIR FORMED BY HYDRAULIC FRACTURING,
Los Alamos Scientific Lab., NM.
H. D. Murphy.
Society of Petroleum Engineers Journal, Vol. 17, No. 4, p 317-326, August, 1977. 11 fig, 18 ref.

Descriptors: *Hydraulic conductivity, *Geothermal studies, *Thermal conductivity, Temperature, Pore pressure, Boreholes, Logging(Recording), Subsurface investigations, Physical properties, Granites, Permeability, Compressibility, Density, Drilling, Wells, *Hydraulic fracturing, In-situ measurements, Flowing temperature logs, Fracture extension pressure, Fracture growth, Fracture propping, Heat exchange system, Granitic rocks, Geothermal wells.

Two boreholes, each 3 kilometers in depth were drilled in northern New Mexico to extract geothermal energy from hot, dry rock. Both boreholes were in granitic rock and hydraulically fractured to establish a flow connection between them. Fracture to borehole intersection locations were determined for flowing temperature logs. In-situ measurements of rock permeability and compressibility displayed a strong dependence on pore pressure. An estimate of the minimum horizontal earth stress was derived from fracture extension pressures and found to be one-half the overburden stress load. Fracture growth was simple to achieve in the low-permeability granitic rock and the fractures appeared to be 'self-propped.' The present connection has a large file that probably cannot be reduced to a useful level. Redrilling to intersect directly one of the fractures will be prerequisite to the implementation of a heat exchange system. (Heiss-NWWA)
W78-03853

STUDY AND TESTING OF DIRECT CONTACT HEAT EXCHANGERS FOR GEOTHERMAL BRINES: FINAL REPORT,
DSS Engineers, Inc., Ft. Lauderdale, FL.
For primary bibliographic entry see Field 8G.
W78-03858

DEVELOPMENT OF AN ASSESSMENT METHODOLOGY FOR GEOPRESSURED ZONES OF THE UPPER GULF COAST BASED ON A STUDY OF ABNORMALLY PRESSURED FIELDS IN SOUTH TEXAS,
Southwest Research Inst., San Antonio, TX.
R. K. Swanson, P. Oetking, J. S. Osoba, and R. C. Hagens.
Available from the National Technical Information Service, Springfield, VA 22161 as COO-2687-5, August, 1976. 103 p, 52 fig, 26 ref, 3 append.

Descriptors: *Geothermal studies, *Thermal power, Thermal water, Temperature, Pressure, Aquifers, Natural gas, Exploration, Methodology, Assessments, Sands, Shales, Faults(Geology), Permeability, Depth, Compaction, Gulf Coastal Plain, *Texas, *Geopressured zones.

Detailed study of the producing gas fields in south Texas has identified a total of 47 abnormally pressured zones in a six-county area including Hidalgo, Brooks, Cameron, Willacy, Kenedy, and Live Oak Counties. The abnormal pressures are believed to be the result of arrested compaction of shale with increasing depth of burial, as a result of impaired subsurface drainage; increased temperature gradients are believed to be caused by the insulating properties of the undercompacted shale.

A methodology for assessing these zones was developed, and the depths and temperatures of the south Texas fields were determined. The question of fluid deliverability for thermal power was found to be the critical factor in determining the potential of a given area. Permeability values range from less than 0.03 md to more than 8 md, with an average of all fields near 1 md. Permeability decreases rapidly with depth, thus, the desirable combination of good permeability and high temperature seldom occurs in the study area. Nevertheless, five locations within the area were selected as potential candidates for further evaluation and possible eventual testing for power capability. (Eberle-NWWA)
W78-03863

FORCES EXERTED BY WAVES ON A PIPELINE AT OR NEAR THE OCEAN BOTTOM,
California Univ., Berkeley. Hydraulic Engineering Lab.
G. L. Bowie.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A046 551, Price codes: A09 in paper copy, A01 in microfiche. Published by Army Coastal Engineering Research Center, Fort Belvoir, Va., Technical Paper No. 77-11, October 1977. 177 p, 65 fig, 1 tab, 7 append. DACW72-74-C-0004.

Descriptors: *Pipelines, *Oil industry, *Water resources development, *Waves(Water), Pollution abatement, *Outer Continental Shelf, Ocean bottom, Wave forces, Lift forces.

The wave-induced forces on a submarine pipeline near the ocean floor consist of several components--inertial forces, drag forces, lift forces, and under some conditions, eddy-induced forces. For a pipeline touching the bottom, or at a small clearance above the bottom, the lift force is the predominant force in the vertical direction. The experimental results of this investigation, however, show that this steady-flow lift model is inadequate for wave-induced oscillatory flows. For pipelines at small clearances above the bottom, viscous effects near the bottom clearance constriction may result in lift forces acting in both the upward and downward directions during different parts of the wave cycle. In addition, the maximum positive and negative lift forces may not correspond to the positions of maximum horizonal velocities in the wave cycle. Quantitative relationships between these unknown lift force parameters and various dimensionless parameters defining the wave and pipe conditions were found. These relationships exhibited good correlation for all wave conditions, bottom clearances, pipe diameters, and orientation angles. (Sinha - OEIS)
W78-03873

DESIGN OF OPTIMAL WATER DISTRIBUTION SYSTEMS,
Technion-Israel Inst. of Tech., Haifa. Faculty of Civil Engineering.
E. Alperovits, and U. Shamir.
Water Resources Research, Vol 13, No 6, p 885-900, December 1977. 6 fig, 9 tab, 13 ref, 2 append.

Descriptors: *Water distribution(Applied), *Branching networks, *Pipelines, *Design, *Economic efficiency, *Linear programming, *Optimization, Cost minimization, Gradient method, Methodology, Demand, Operations research, Decision making, Constraints, Flow, Capital costs, Operating costs, Hierarchial decomposition, Postoptimality analysis, Pumping, Equations, Mathematical models.

A method called linear programming gradient (LPG) is presented, by which the optimal design of a water distribution system can be obtained. The system is a pipeline network which delivers known demands from sources to consumers and which may contain pumps, valves, and reservoirs. System operation under each of a set of demand loadings is considered explicitly in the optimization. The decision variables thus include design parameters (pipe diameters, pump capacities, and reservoir elevations) and operational parameters (the pumps to be operated and the valve settings for each of the loading conditions). The objective function, to be minimized, reflects the overall cost capital plus present value of operating costs. The constraints are in the form of demands to be met and pressures at selected nodes in the network to be within specified limits. The solution is obtained via a hierarchial decomposition of the optimization problem. The primary variables are the flows in the network. For each flow distribution, the other decision variables are optimized by linear programming. Postoptimality analysis of the linear program provides the information necessary to compute the gradient of the total cost with respect to changes in the flow distribution. The gradient is used to change the flows so that a (local) optimum is approached. The method has been implemented in a computer program, and solved examples are presented. (Bell-Cornell)
W78-03997

SNOW MECHANICS SYMPOSIUM.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 2C.
W78-03998

8C. Hydraulic Machinery

CORROSION SUSCEPTIBILITIES OF VARIOUS METALS AND ALLOYS IN SYNTHETIC GEOTHERMAL BRINES,
California Univ., Davis. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8G.
W78-03852

FIBERGLASS CASING AND SCREEN FULFILLS WELLS' NEEDS,
For primary bibliographic entry see Field 8G.
W78-03854

REMOVING H2S FROM GEOTHERMAL STEAM,
Coury and Associates, Inc., Lakewood, CO.
For primary bibliographic entry see Field 5G.
W78-03855

GEOTHERMAL HOT WATER PUMP.
Lear Motors Corp., Reno, NV.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 741, Price codes: A06 in paper copy, A01 in microfiche. Report No NSF/RA-760379, May, 1976. 144 p, 33 fig, 5 tab. Issued as Report No LMC 760504-A.

Descriptors: *Geothermal studies, *Pumps, *Thermal water, Brines, Pump testing, Electric motors, Rotors, Stators, Generators, Electric cables, Electric insulation, Materials, Bearings, Cooling, Performance, *Geothermal fluid pumps.

The development of a high-speed submersible pump which can operate in harsh geothermal environments is described in this report. Capable of functioning at depths in excess of 1,000 feet and at temperatures up to 450 degrees F (232 degrees C), the system is specially designed to circulate hot brine in a sealed circulation loop to prevent flashing of the brine into steam. Motor and pump design are discussed, and results of all testing performed on the prototype system are presented. The key element in this system is the electric motor. It was originally designed to produce a rated output of 400 hp at 11,600 rpm. Electromagnetic efficiency was predicted at 85.7% and overall efficiency at 72.3%. A generator failure prevented completion of high-speed tests, but full load tests at 7,400 rpm indicate that the motor is capable of rated performance at full speed, with slightly higher efficiencies than predicted. (Eberle-NWWA)
W78-03859

DRILLING FOR ENERGY RESOURCES.
National Research Council, Washington, DC. Ad Hoc Committee on Technology of Drilling for Energy Resources.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 206, Price codes: A05 in paper copy, A01 in microfiche. Report No. NSF/RA-760/95, 1976. 67 p, 17 fig, 5 tab, 25 ref.

Descriptors: *Drilling, *Energy, *Resource development, Oil, Natural gas, Thermal power, Mining, Coal mines, Shafts(Excavations), Nuclear energy, Exploration, Equipment, Offshore platforms, Technology, Costs, Government supports, Drilling rate, Downhole motors.

Because drilling is integral to the exploration, development, and production of most energy sources, the limitations of drilling technology which currently exist restrict the rate at which new supplies of energy can be found, extracted, and delivered. This report provides an overview of the U.S. drilling industry, describing the equipment and techniques for recovering oil, natural gas, coal, shale oil, nuclear fuels, and geothermal energy. In addition, it suggests particular areas in which government assistance would be valuable in augmenting present research and development efforts of private industry, as well as a rationale for such government involvement. Particular issues addressed include: (1) developing downhole motors; (2) training of drilling workers and engineers; (3) geothermal energy recovery; (4) economic risks of technology development and; (5) commercialization of new mining methods. (Eberle-NWWA)
W78-03861

ANALYSIS OF INFORMATION SYSTEMS FOR HYDROPOWER OPERATIONS, - EXECUTIVE SUMMARY,
Jet Propulsion Lab., Pasadena, CA.
R. L. Sohn, L. Becker, J. Estes, D. Simonett, and W. Yeh.
Report JPL 5040-43, RTOP 777-30-01, September 1976, 44 p, 5 fig, 7 tab. NASA NAS7-100.

Descriptors: *Water resources, *Management, Watershed management, Flow, *Systems analysis, Forecasting, Hydroelectric power, Meteorology, Energy, *Information systems, Hydrometeorology.

The operations of hydropower systems were analyzed, with emphasis on water resource management, to determine how aerospace derived information system technologies could be used to increase energy output. Results indicated that the major energy loss mechanism is the spillage of water - a forced release of water when the power pool is full and inflows are greater than turbine capacity. It was concluded that hydropower output could be incresed through use of information systems that provide increased anticipation times and accuracies for high inflow events. A hydrologic model would be required for the short term inflow forecasting process. Sensor and data handling system capabilities are reviewed and compared to the requirements, and an improved information system concept is recommended. (Chilton-ORNL)
W78-04107

LEARN MORE ABOUT VARIABLE SPEED PUMPING/2,
M. Gottliebson.
Water and Wastes Engineering, Vol 14, No 10, p 58-59, 62-64, 68, 90, October, 1977. 27 fig.

Descriptors: *Pumping, *Pumps, *Hydraulic machinery, *Analytical techniques, *Flow control, High flow, Head loss, Flow characteristics, Equipment, Waste water treatment.

Various considerations in the selection of pumping systems are discussed with respect to insuring sufficient pumping capacity to discharge the peak influent rate when any single pump in a series is out of service. Various configurations of one-, two-, and three-pump variable-speed pumping systems are discussed. The use of efficiency curves for optimum arrangement of the 'lag' and lead' pumps in a variable speed system is described. Basic operating modes include the load sharing mode, in which lead and lag pumps operate at the same speed and discharge rates, and the staggered mode, in which the lead pump operates at maximum speed while the lag pump discharges the portion of influent which exceeds the capacity of the lead pump. The use of a variable-speed controller in staggered pump operation is described. Power requirements and efficiency ratings for load sharing are compared with values for staggering. A series of guidelines for the operation of a variable-speed sewage pumping system are described. Configurations involving the combination of variable-speed pumps with constant-speed at which pump cavitation is produced. Methods of pump failure detection and pumping system control are described. (Schulz-FIRL)
W78-04154

8E. Rock Mechanics and Geology

PRELIMINARY ASSESSMENT OF A GEOTHERMAL ENERGY RESERVOIR FORMED BY HYDRAULIC FRACTURING,
Los Alamos Scientific Lab., NM.
For primary bibliographic entry see Field 8B.
W78-03853

8G. Materials

SOFT FORMATION INSERT BIT RUNS LONGER AND CUTS COSTS.
World Oil, Vol. 185, No. 7, p 93-96, December, 1977. 6 fig, 1 tab.

Descriptors: *Rotary drilling, *Drilling equipment, Costs, Laboratory tests, *Drill bits.

A new premium insert bit selling at competitive insert bit prices has been developed for and tested in softer formations by Reed Tool Company, Houston. Conventional soft formation milled-tooth bits normally drill 10 to 60 feet of hole per hour in recent sedimentary formations; bit life averages about 14 hours in such conditions. Various bit design parameters were evaluated in order to improve upon standard milled-tooth configurations. Both bearing performance and cutting structure were modified extensively. The optimum new design features a 'floating bushing' friction type bearing with conical tungsten carbide inserts. Contrary to expectations, chisel-shaped inserts showed no significant differences in rate of penetration compared with conical inserts, and in fact, suffered a much higher degree of breakage. The cost advantages of this new type bit can only be realized at relatively high speeds (approx. 130 rpm). Tests at 50-70 rpm resulted in lower rates of penetration, which translates into higher drilling costs. (Eberle-NWWA)
W78-03849

CONTINUOUS CHAIN BITS EXCEL IN LAB TESTS.
Drilling Dow, Vol. 39, No. 2, p 58, December, 1977. 1 fig.

Descriptors: *Rotary drilling, *Drilling equipment, Laboratory tests, *Drill bits.

Fixed head versions of Sandia Laboratories' continuous chain drill have been successfully tested and a complete working prototype will be ready for similar laboratory tests later this year. Basically, the bit system consists of 16 cutting surfaces on a chain which is advanced to bring a new surface into position without having to remove the apparatus from the hole. Designed primarily for slim-hole (4 3/4 in. diameter) exploratory drilling applications, the continuous chain drill is expected to increase downhole bit life and penetration rate. The hole is cut by a six-inch-long segment of chain wrapped around sprockets at the bottom of the bit. Plans call for the chain to be advanced by a piston/ratchet driver energized by the pressure of drilling mud in the hole. Assuming that each of the 16 cuting surfaces has one-third the life of a conventional diamond bit, the new system could result in a four-to fivefold improvement in bit life. Development of the Sandia chain drill is being sponsored by the U.S. Department of Energy's Division of Geothermal Energy. (Eberle-NWWA)
W78-03850

CORROSION SUSCEPTIBILITIES OF VARIOUS METALS AND ALLOYS IN SYNTHETIC GEOTHERMAL BRINES,
California Univ., Davis. Dept. of Mechanical Engineering.
R. B. Davis, and Z. A. Munir.
Journal of Materials Science, Vol. 12, No. 9, p 1909-1913, September, 1977. 6 fig, 1 tab, 12 ref.

Descriptors: *Corrosion, Metallurgy, *Saline water, Corrosion control, Stainless steel, Brines, Titanium, Molybdenum, Steel alloys, Pitting, Nickel, *Geothermal studies, Niobium, Type 304 stainless steel, Type 316 stainless steel, Monel 400, AISI 1010, Passivation, Salton Sea Brines.

The corrosion susceptibilities of various pure metals and alloys were investigated in synthetic geothermal fluids. Rates of corrosion of AISI 1010 steel, types 304 and 316 stainless steels, Monel 400, and nickel were determined at three temperatures (296, 333, and 368 degrees K). Rates of corrosion of molybdenum, niobium, and titanium were determined at 368 degrees K only. Table I details maximum corrosion rates and macroscopic appearances of the first five materials after testing. Weight loss measurements on the 1010 steel showed no tendency for passivation. Type 304 stainless steel appears to undergo an active-passive transition between 333 and 368 degrees K. In the passive state, type 304 has the same corrosion rates as type 316. At 368 degrees K the corrosion rate of pure nickel was 2.5 times that of Monel, which, in turn, was twice that of type 316 stainless steel. The corrosion rates of Mo, Nb, and Ti were less than one mdd at 368 degrees K. No pit formation conclusions can be drawn from tests of such short duration. (Palmer-NWWA)
W78-03852

FIBERGLASS CASING AND SCREEN FULFILLS WELLS' NEEDS,
G. B. Palmer, and D. P. Waltz.
Water Well Journal, Vol. 32, No. 1, p 92-93, January, 1978. 2 fig.

Descriptors: *Well casings, *Well screens, Water wells, On-site investigations, *Fiberglass.

The Fiberglass Resources Corporation of Farmingdale, N.Y., has developed a new type of fiberglass well casing and screen. The well screen (trade name Kwik-Flo) consists of diagonally-crossing fiberglass strands which form an open mesh with diamond-shaped perforations. One-tenth-inch rounded quartz sand grains are coated with epoxy and squeezed into place to fill these perforations with a durable yet porous medium. To test the new casing and screen, Fiberglass Resources Corporation financed on experimental well in the flood plain of the Hocking River near Athens, Ohio. The quantity of water produced by the test well is comparable to that produced by traditionally screened wells of twice its diameter. Other advantages of the new screen and casing include: (1) elimination of many pollution and corrosion problems; (2) ease of making joints; (3) less time spent in well development, and; (4) sand-free production of water. (Eberle-NWWA)
W78-03854

STUDY AND TESTING OF DIRECT CONTACT HEAT EXCHANGERS FOR GEOTHERMAL BRINES: FINAL REPORT,
DSS Engineers, Inc., Ft. Lauderdale, FL.
W. B. Suratt, and G. K. Hart.
Available from the National Technical Information Service, Springfield, VA 22161 as ORO-4893-1, Price codes: A08 in paper copy, A01 in microfiche. Final Report No ORO-4893-1, January, 1977. 137 p, 29 fig, 17 tab, 67 ref, 6 append.

Descriptors: *Heat exchangers, *Thermal power, *Brines(Geothermal), Heat transfer, Design, Thermal waters, Thermal powerplants, Boilers, Costs, Geothermal studies, *Isobutane, Working fluids, Direct contact heat exchangers, Preheaters, Working fluid loss, Brine pumps.

The object of the work was to assess the technical and economic feasibility of preheating and evaporating a secondary fluid via direct contact with hot geothermal brine for the ultimate purpose of electric power production. Preliminary studies resulted in the selection of isobutane as the working fluid for tests primarily because of the favorable amount of net work produced per pound of geothermal brine and the low amount and cost of working fluid lost in the direct contact heat exchange process. The test apparatus included a separate boiler and preheater, each 6 inches in diameter by 6 feet high. Brine entered the top of each vessel and left the bottom; isobutane entered the bottom of the preheater through a distributor plate to produce .15 inch droplets. No major problems with the system or with isobutane as working fluid were observed, and on the whole, the system demonstrated satisfactory thermal capabilities. Recommendations for future experimentation with such systems focus on cost reduction, determining design criteria for varying size and parameters, and demonstrating the reliability of direct contact heat exchangers in actual field conditions. (Eberle-NWWA)
W78-03858

GEOTHERMAL HOT WATER PUMP.
Lear Motors Corp., Reno, NV.
For primary bibliographic entry see Field 8C.
W78-03859

DRILLING FOR ENERGY RESOURCES.
National Research Council, Washington, DC. Ad Hoc Committee on Technology of Drilling for Energy Resources.
For primary bibliographic entry see Field 8C.
W78-03861

8I. Fisheries Engineering

INSTRUMENTATION TO MONITOR LOCATION OF FISH CONTINUOUSLY IN EXPERIMENTAL CHANNELS,
Bayshore Systems Corp., Springfield, VA.
J. R. Jahoda.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 944, Price codes: A07 in paper copy, A01 in microfiche. Ecological Research Series, Report EPA 600/3-77-035, April 1977. 117 p, 5 tab, 54 fig, 47 ref.

Descriptors: *Methodology, Laboratory tests, Laboratory equipment, *Laboratory animals, *Instrumentation, Aquaria, *Monitoring, Water temperature, Equipment, Freshwater fish, En-

vironmental effects, Ecology, Water pollution effects, Path of pollutants, *Location monitors, *Experimental channels, *Fish tracking equipment, *Continuous monitor, *Sonic transmitters, Biotelemetry, Acoustic receiver, Fish location.

This study resulted in the development and construction of equipment to continuously monitor the position and temperature of up to 20 fish in a water channel 486 meters long, 3 meters wide, and 1 meter deep. The system utilized miniature sonic transmitters (tags) operating in the 51 kHz to 366 kHz frequency range which were implanted in 500 gram or heavier fish. The battery operated tags were pulse modulated and designed for over 1 year operational life. Up to 20 individual fish could be monitored. (Katz)
W78-03925

MULTIFARIOUS POWER PLANT WATER INTAKE STRUCTURE (MWIS) A DESIGN CONCEPT TO REDUCE THE ENVIRONMENTAL EFFECTS OF COOLING WATER INTAKE STRUCTURES,
New York State Energy Research and Development Authority, New York.
B. Chezar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 201, Price codes: A09 in paper copy, A01 in microfiche. Report No NYSERDA 75/06, July 1976. 164 p, 38 fig, 36 tab, 94 ref.

Descriptors: *Environmental effects, *Engineering structures, Intake structures, Entrainment, Fish, Zooplankton, Powerplants, Design, Impingement.

The MWIS was designed principally for operation in estuarine water bodies (tidal) but can be used in river systems with minor modification. The principal design features include horizontal traveling screens which move in the direction and speed of the ambient water flow, three alternate levels of water withdrawal and adjustable louvers in front of the intake structure. Analysis of the life history, behavior, and distribution of a group of fish and macrozooplankton indicate that use of the MWIS will result in significant reduction of impingement and entrainment of these organisms. (Chilton-ORNL)
W78-04048

INVESTIGATIONS ON THE PROTECTION OF FISH LARVAE AT WATER INTAKES USING FINE-MESH SCREENING,
Tennessee Valley Authority, Norris. Div. of Forestry, Fisheries, and Wildlife Development.
D. A. Tomljanovich, J. H. Heuer, and C. W. Voightlander.
TVA Technical Note No B22, February 1977. 53 p, 16 fig, 8 tab, 15 ref.

Descriptors: *Environmental effects, *Intakes, Engineering structures, *Fish larvae, *Screens, Mortality, Design, Impingement.

Two studies (a laboratory investigation using a test flume with variables such as water velocity, intake screen opening, impingement duration, and larval fish species and size and a field study conducted at John Sevier Steam Plant) were conducted to investigate the use of an impinge-release intake screening system. Both studies showed that nearly all sizes of larval fish species in the Tennessee River Valley would be retained by 0.5 mm screen openings but not by 1.0 mm openings. Post-impingement survival was inversely related to duration of impingement and depended upon species, size, and water velocity. It was concluded that protecting larval fish and water intakes with the use of fine mesh screening appears to be a viable concept. (Chilton-ORNL)
W78-04049

THE PHYSICAL EFFECTS OF ENTRAINMENT - CURRENT RESEARCH AT ORNL,
Oak Ridge National Lab., TN. Environmental Sciences Div.
J. S. Suffern.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL/TM.5948, Price codes: A03 in paper copy, A01 in microfiche. Report No ORNL/TM-5948, August 1977. ESD Pub No 1073, 28 p. 10 fig, 1 tab, 18 ref. W-7405-eng-26.

Descriptors: *Environmental effects, *Powerplants, Cooling water, *Entrainment, Models, Mortality.

In order to evaluate the effects of entrainment on aquatic organisms and to measure the mortality associated with each component of the cooling system, a power plant cooling system simulator has been designed and is presently under construction at the Oak Ridge National Laboratory. The apparatus has been designed so that the internal hydraulics of operating power plant cooling circuits will be effectively reproduced. Experiments are planned which will make use of fresh water and marine fish and zooplankton species. Rearing and holding facilities which will assure an adequate supply of specimens and also allow for assessment of delayed mortality have been constructed. The purpose of these investigations is the identification of factors contributing to mortality during entrainment to provide a basis for redesign of cooling system components with a resulting minimization of the environmental impacts of power plants. (Chilton-ORNL)
W78-04050

EFFICIENCY OF NETS AND A NEW DEVICE FOR SAMPLING LIVING FISH LARVAE,
Lawler, Matusky, and Skelly, Tappan, NY.
P. M. McGroddy, and R. L. Wyman.
Journal of the Fisheries Research Board of Canada, Vol 34, 1977. p 571-754, 1 fig, 2 tab, 8 ref.

Descriptors: *Environmental effects, *Sampling, Larvae, *Mortality, *Nets, Efficiencies, Design, Fish larvae.

Mortality of fish larvae collected in plankton nets and in a new device which allows for control of water velocity during collection are compared. Test of the efficiency of the nets indicated a decline in the number of larvae captured with increase in water velocity. Recovery efficiency of the new device was 100% of the larvae entering it. Larval mortality was significantly reduced (27%, control mortality = 13%) with the new sampling device. (Chilton-ORNL)
W78-04056

THERMAL EFFECTS OF POWER PLANT ENTRAINMENT ON SURVIVAL OF LARVAL FISHES: A LABORATORY ASSESSMENT,
New York State Univ. at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5C.
W78-04057

MORTALITY OF STRIPED BASS EGGS AND LARVAE IN NETS.
New York Univ. Medical Center, NY. Lab. for Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-04059

EFFECT OF SHEAR ON EGGS AND LARVAE OF STRIPED BASS, MORONE SAXATILIS, AND WHITE PERCH, M. AMERICANA,
Maryland Univ., Solomons. Chesapeake Biological Lab. and Estuarine Studies.
R. P. Morgan, II, R. E. Ulanowicz, V. J. Rasin, Jr, L. A. Noe, and C. B. Gray.
Transactions of the American Fisheries Society, Vol. 105, No. 1, January 1976, p 149-154, 1 fig, 3 tab, 13 ref.

Descriptors: *Environmental effects, Velocity, *Shear stress, Bass, *Striped bass, Eggs, *Larvae, Perch, *White perch, Mortality.

Variations in water velocity can produce shear fields which have a detrimental effect on fish eggs and larvae. Experimental results showed that 36% of striped bass eggs exposed to shear levels of 350 dynes/square cm were killed in 1 min; 69% in 2 min; and 88% in 4 min. 9.3% of larvae exposed to the same force were killed in 1 min; 30.0% in 2 min; and 68.1% in 4 min. At ths shear level, 38% of white perch eggs were killed in 1 min; 41% in 2 min; 89% in 5 min; 96% in 10 min; and 98% in 20 min. 38% of white perch larvae were killed in 1 min; 52% in 2 min; and 75% in 4 min. These results are related to some characteristic shear values in the Chesapeake and Delaware Canal. (Chilton-ORNL)
W78-04060

SHELL SIZE - FREQUENCY DISTRIBUTIONS OF CORBICULA MANILENSIS PHILIPPI FROM A CLAM-FOULED STEAM CONDENSER,
Texas Univ. at Arlington. Dept. of Biology.
R. F. McMahon.
The Nautilus, Vol. 91, No. 2, April 1977, p 54-59, 3 fig, 14 ref.

Descriptors: *Environmental effects, Powerplants, Condensers, *Clams, Fouling, Size, Design, Shellfish, Corbicula manilensis.

Whole specimens and whole and half shells of Corbicula manilensis were collected from the clam-fouled steam condenser of an electric generating plant. A comparison of the size distribution of the samples indicated that the clams fouling the condenser are not a resident population but must have been carried into it from an external population. The condenser tubes appeared to act as a seive becoming fouled with shells of an appropriate size to become lodged in it. It was concluded that increasing the inside diameter of the tubes to 29.0 mm would allow all specimens to pass through and prevent fouling problems with these clams. (Chilton-ORNL)
W78-04061

AQUATIC IMPACT ASSESSMENT AT CALVERT CLIFFS,
Martin Marietta Environmental Technology Center, Baltimore, MD.
For primary bibliographic entry see Field 5C.
W78-04062

THE REACTION OF SMALL FISH TO PERFORATED PLATES,
California Univ., Berkeley. Dept. of Hydraulic Engineering.
J. A. Harder.
CONF-750980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California, September 28-October 2, 1975. Vol. 2. Technical and Topical Papers. p 118-127, 3 fig.

Descriptors: *Environmental effects, *Powerplants, Intakes, Screens, Fish, Fish behavior, Turbulence, *California Delta Peripheral Canal.

One of the proposals for excluding small fish from the intake structure to the California Delta Peripheral Canal has been to install a perforated plate screen along the banks of the Sacramento River through which the water would pass before being diverted to the canal. The present paper discusses problems involved with this proposal

and the behavior of small fish. A device which is being constructed in the laboratory for study of the problem is described. It was considered that the investigation of hazards to small fish along a screened bank may lead to consideration of the effects of altered state of turbulence on fish behavior in general. (See also W78-04155) (Chilton-ORNL)
W78-04163

EFFECTS OF ENTRAINMENT, ENTRAPMENT AND IMPINGEMENT,
Ecological Analysts, Inc., Baltimore, MD.
L. D. Jensen.
CONF-750 980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held Asilomar, Pacific Grove, California, September 28-October 2, 1975, Vol 2. Technical and Topical Papers. p 136-141.

Descriptors: *Environmental effects, *Powerplants, *Entrainment, Monitoring, Sites, Reviews, Research programs, *Entrapment, *Impingement, Site specific studies.

The paper suggests areas of data collection effort that are relevant to both research and monitoring programs for entrainment and entrapment at steam electric generating stations. General comments are presented regarding that nature of sampling efforts and research problems in these areas. Site-specific features warrant detailed reviews of data requirements and sampling protocol before initiating extensive and costly studies suggested by various regulatory guideline documents. The complexity of these studies indicates that utility personnel should consult and develop specific sampling programs in concert with various regulatory scientists in order to prevent misunderstandings and conflicts that may be anticipated as a result of the development of these research and monitoring programs. A summary of research needs which includes pump and plume entrainment effects and entrapment, impingement effects is given. (See also W78-04155) (Chilton-ORNL)
W78-04165

INVESTIGATIONS INTO MINIMIZING FISH LOSS AT STEAM ELECTRIC GENERATING STATIONS,
Southern California Edison Co., Rosemead.
J. A. Stipanov.
CONF-750 980, EPRI SR-38. In: Report of a Workshop on the Impact of Thermal Power Plant Cooling Systems on Aquatic Environments held in Asilomar, Pacific Grove, California, September 28-October 2, 1975. p 198-210, 6 fig.

Descriptors: *Environmental effects, *Engineering structures, Powerplants, Design, Fish, Mortality.

The paper reviews certain aspects of development work at Southern California Edison Company to mitigate fish loss at existing and future steam electric generating stations. Fish pump systems and inlet pipe configurations in use at some of the company's generating stations are described. It was concluded that a concrete velocity cap structure developed by the company in 1956 is the best system. A prototype installation of an improved velocity cap design was made in 1975 at a utility generating station. Evaluation of its performance will determine what course of action will be followed for new installations and what benefits modifications to existing caps might product. (See also W78-04155) (Chilton-ORNL)
W78-04171

PLANKTONIC FISH EGGS AND LARVAE OF THE LOWER CONNECTICUT RIVER AND THE EFFECTS OF THE CONNECTICUT YANKEE PLANT INCLUDING ENTRAINMENT,
NUS Corp., Pittsburgh, PA. Ecological Sciences Div.
For primary bibliographic entry see Field 5C.
W78-04181

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

PROGRAM OBJECTIVES FOR THE NATIONAL WATER DATA EXCHANGE (NAWDEX) FOR FISCAL YEAR 1978,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-03767

10C. Secondary Publication And Distribution

IMPACT OF GROUNDWATER DEVELOPMENT IN ARID LANDS: A LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 4B.
W78-03757

BIBLIOGRAPHY OF REPORTS BY MEMBERS OF THE U.S. GEOLOGICAL SURVEY ON THE WATER RESOURCES OF ALASKA, 1870 THROUGH 1976,
Geological Survey, Anchorage, AK. Water Resources Div.
A. J. Feulner, and K. M. Reed.
Open-file report 77-687, 1977. 112 p.

Descriptors: *Bibliographies, Publications, *Water resources, Hydrology, *Alaska, Surface waters, Groundwater, Sediments, Water quality, Ice, Snow, Permafrost, Hydrogeology, Documentation.

This bibliography lists publications prepared by members of the U.S. Geological Survey and published either by the Survey or by the other agencies and organizations between 1870 and the end of December 1976. The titles included are those whose primary topic is hydrology, water resources, or other aspects of water in Alaska. Related subjects, such as geology, included in many of these reports. (Woodard-USGS)
W78-03778

TEMPERATURE REQUIREMENTS OF SOME PERCIDS AND ADAPTATIONS TO THE SEASONAL TEMPERATURE CYCLE,
Environmental Research Lab.-Duluth, Monticello, MN. Monticello Ecological Research Station.
For primary bibliographic entry see Field 02H.
W78-04124

CHEMISTRY AND EFFECTS OF CHLORINE IN AQUATIC SYSTEMS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 05C.
W78-04127

10F. Preparation Of Reviews

SNOW MECHANICS SYMPOSIUM.
International Association of Scientific Hydrology, Gentbrugge (Belgium).
For primary bibliographic entry see Field 02C.
W78-03998

STRESS AND FRACTURE OF SNOW SLABS,
Department of the Environment, Calgary (Alberta). Glaciology Div.
For primary bibliographic entry see Field 02C.
W78-04018

A REVIEW OF BASIC SNOW MECHANICS,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 02C.
W78-04021

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 10
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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 10
MAY 15, 1978

W78-04201 – W78-04700

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

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To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

A THREE-DIMENSIONAL TURBULENT ENERGY MODEL FOR NONHOMOGENEOUS ESTUARIES AND COASTAL SEA SYSTEMS,
Rand Corp., Santa Monica, CA.
For primary bibliographic entry see Field 2L.
W78-04343

2B. Precipitation

ACCIDENTAL AND PLANNED WEATHER MODIFICATION IN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 3B.
W78-04205

PRECIPITABLE WATER OVER THE UNITED STATES, VOLUME 1: MONTHLY MEANS,
National Weather Service, Silver Spring, MD. Office of Hydrology.
G. A. Lott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 219, Price codes: A09 in paper copy, A01 in microfiche. NOAA Technical Report NWS 20, November 1976. 177 p, 11 fig, 4 tab, 13 ref.

Descriptors: *Precipitable water, *United States, *Precipitation(Atmospheric), Cloud physics, Moisture content, Atmosphere, Water vapor, Meteoric water, Rainfall, Monthly, Data collections, Climatology, Meteorology, Monthly means.

Mean monthly values of precipitable water were presented in tabular and graphical form for all radiosonde stations in the contiguous United States for the period 1946-72 and for Alaska 1950-69. The precipitable water was given by layers from the surface to 400 mb from twice-daily observations. (Sims-ISWS)
W78-04218

AGROMETEOROLOGICAL STUDIES IN THE TURKMEN SSR, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
A. P. Fedoseev, and K. Artykov.
Probl Osvoeniya Pustyn'. 4, p 31-35, 1974.

Descriptors: *Agrometeorological studies, Shrubs, *Turkmen-SSR, USSR, *Model studies, *Climates, Mathematical models, Biophysical models.

An estimation of the climatic resources of the Turkmen SSR (USSR) aimed at raising the efficiency of agriculture was made. The principles of long-range agrometeorological forecasts of range yield capacity (6-mo. forecast for herbaceous plants and 8-9 mo. forecasts for shrubs and semi-shrubs) were developed. The theoretical basis of the investigations should be applied to mathematical and biophysical modeling of agrometeorological processes.--Copyright 1975, Biological Abstracts, Inc.
W78-04241

THE DEVELOPMENT OF METEOROLOGICAL STUDIES IN THE TURKMEN SSR, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
N. S. Orlovskii, and E. K. Balakirev.
Probl Osvoeniya Pustyn'. 4, p26-30, 1974.

Descriptors: Fig, Land, Meteorological data, Olive, Pomegranate, Rubber, *Turkmen-SSR, USSR, Vegetation, *Climatic data, *Crops, Networks.

The 1st meteorological station in Turkmenistan (USSR) was organized in 1869. Today there are 56 stations and 44 meteorological posts which provide comprehensive climatic information. (Subtropical crops (fig, olive, pomegranate, rubber); range land vegetation are discussed.)--Copyright 1975, Biological Abstracts, Inc.
W78-04242

THE DETERMINATION OF REGIONAL EVAPOTRANSPIRATION BY MEANS OF STANDARD METEOROLOGICAL DATA,
Cornell University Ithaca, New York, School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2D.
W78-04372

SIMULATION OF DESIGN-STORMS WITH PROBABLE DISTRIBUTIONS IN TIME AND SPACE FOR STORM DRAINAGE SYSTEMS,
Technische Univ., Hanover (West Germany), Inst. fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
F. Sieker.
Progress in Water Technology, Vol 9, No 3, p 509-519, 1977. 3 fig, 1 ref.

Descriptors: *Design storm, *Distribution, *Statistical methods, *Storm drains, *Probability, Meteorological data, Rain gages, Analytical techniques, Methodolgy, Simulated rainfall, Probability, Equations, Model studies, *Variance analysis, Simulation equations, Normal distribution.

In case of hydraulic computation of storm drainage systems the postulate: 'frequency of rain is equal to frequency of discharge' is established. In order to ensure this postulate, design storms with probable distributions in time and space ought to be used. A method used to obtain such a design storm was described. The computation was based on the statistical method of variance analysis. The probable distribution in time was simulated by a model of twofold variance analysis, and the probable distribution in space by a model of a threefold one. All terms of the simulation equations represent statistical regularities which can be interpreted in regard to their physical sense. The probable distributions were given by arithmetic addition of those terms. The application of the method was shown by examples. (Singh-ISWS)
W78-04511

PATH- AND AREA-INTEGRATED RAINFALL MEASUREMENT BY MICROWAVE ATTENUATION IN THE 1-3 CM BAND,
National Center for Atmospheric Research, Boulder, CO.
D. Atlas, and C. W. Ulbrich.
Journal of Applied Meteorology, Vol. 16, No. 12, p 1322-1331, December 1977. 6 fig, 4 tab, 29 ref.

Descriptors: *Remote sensing, *Rainfall, *Radar, Microwaves, Attenuation, Rainfall intensity, Measurement, Correlation analysis, Regression analysis, Raindrops, Meteorology, Electrical engineering, *Microwave attenuation.

The reasons for linear relationship between microwave attenuation A and rainfall rate R near 1 cm wavelength were explained. This linearity also implies independence of the A-R relationship from the drop size distribution, thus making attenuation measurements near this wavelength attractive for path-averaged rainfall. Regression equations of the form $A = KR$ to the alpha power were calculated for 4 radar wavelengths from 0.86 to 3.2 cm from drop size spectra. As predicted, alpha increases from about 1.04 to 1.16, and average errors of estimate of R from the regression equations increase from about 9 to 21% from 0.86 to 3.2 cm, respectively. The larger errors at 3.2 cm reflect the increased dependence on the form of the drop size distribution. Even at 3.2 cm, the errors are typically less than half those incurred from the use of reflectivity factor Z and a priori Z-R relations. Various methods of measuring path- and area-averaged R were studied. Radar methods using standard targets fail over 30 km paths at wavelengths of 0.86 and 1.25 cm at mean R greater than about 9 and 20 mm/h respectively, because of excessive attenuation but are operative to larger mean rates at 1.78 and 3.2 cm. One-way methods between transmitter and receiver are the most suitable in terms of maximum measurable mean R. A wavelength between 1.5 and 2 cm provides a reasonable compromise between maximum measurable mean R and minimum errors. (Sims-ISWS)
W78-04530

2C. Snow, Ice, and Frost

SNOTEL: MONITORING CLIMATIC FACTORS TO PREDICT WATER SUPPLIES,
Soil Conservation Service, Portland, OR. West Technical Service Center.
For primary bibliographic entry see Field 7B.
W78-04213

CENTRAL AVALANCHE HAZARD FORECASTING- INTERIM REPORT, PHASE II,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
E. R. LaChapelle, R. T. Marriott, M. B. Moore, F. W. Reanier, and E. M. Sackett.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 825, Price codes: A05 in paper copy, A01 in microfiche. Washington State Highway Department Research Report 23.2, June 1976. 86 p, 15 fig, 7 tab, 8 ref, 3 append.

Descriptors: *Avalanches, *Snowpacks, *Washington, *Forecasting, Snow, Highways, Hazards, Snow management, Mountains, Weather, Safety, Warning systems, *Avalanche forecasting.

This report summarized the first year of activity under Washington State Department of Highways project Central Avalanche Hazard Forecasting (Agreement Y-1700) to test the feasibility and effectiveness of central avalanche forecasting for the Cascade Mountain Passes and adjacent territory. This project explores the possibilities of improving both mountain weather and related avalanche forecasts for use by the WSDH during winter operations in the mountain passes and, secondarily, explores the usefulness of an area-wide forecasting service to other cooperating agencies. The eventual aim of this work is to establish the technical and administrative framework for an operational, on-going mountain weather and avalanche forecasting service for Western Washington under the joint support of interested public agencies. (Sims-ISWS)
W78-04219

WATER FLOW THROUGH VEINS IN ICE,
Army Terrestrial Sciences Center, Hanover, NH. Snow and Ice Branch.
S. C. Colbeck.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 631, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-6, April 1976. 8 p, 8 ref.

Descriptors: *Glaciers, Water, *Flow, Model studies, Mathematical models, Snow cover, Snowpacks, Ice, Melting, Flow rates, Permeability, Pores, Porosity, Runoff, Glaciology, *Ice veins.

Water flow through the vein structure of temperate ice was described as Darcian flow, in which the pressure gradient is determined from vein size

and overburden pressure. A solution method for the resulting equation was given, and two special cases were considered. For steady flow, the equilibrium vein size is a function of depth; and, by neglecting the effects of diffusion, it was shown that flow perturbations introduced at the surface propagate downward at a constant speed. These perturbations propagate so slowly that even annual surface fluctuations of flow may be eliminated by diffusion before reaching the bottom of the glacier. (Sims-ISWS)
W78-04221

CHEMICAL COMPOSITION OF SNOW ON THE WATER SURFACE OF THE KAMA AND VOTKINSK RESERVOIRS,
Perm State Univ. (USSR). Lab. of Water Management Research.
N. A. Pecherkin, and E. A. Burmatova.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 422, Price codes: A02 in paper copy, A01 in microfiche. Cold Regions Research and Engineering Laboratory Draft Translation 611, March 1977. 8 p, 3 tab, 13 ref. Translated from Gidrokhimicheskie Materialy, Vol 39, 7 p, 1965.

Descriptors: *Snow, *Chemical analysis, *Reservoirs, Water quality, Chemistry of precipitation, Precipitation(Atmospheric), Salts, Air pollution, Pollutants, Water pollution sources, Path of pollutants, Pollutant identification, *USSR, Snow mineralization.

This article reported findings from an investigation of snow on the water surface of the Kama and Votkinsk reservoir. The investigation was conducted in the winter of 1961-63. The chemical composition of the sample was determined by the technique of Ye. S. Burkser, N.Ye. Fedorova and B.B. Zaydis. Observations made on these reservoirs made possible a rough calculation of the amount of salt and other chemicals arriving on the water surface. (Sims-ISWS)
W78-04222

EFFECTS OF RADIATION PENETRATION ON SNOWMELT RUNOFF HYDROGRAPHS,
Army Terrestial Sciences Center, Hanover, NH. Snow and Ice Branch.
S. C. Colbeck.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 763, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-11, April 1976. 14 p, 4 fig, 2 tab, 10 ref.

Descriptors: *Snow, *Snowmelt, *Melting, *Radiation, *Solar radiation, Effects, Model studies, Mathematical models, Runoff, Flow, Melt water, Hydrology, *Radiation absorption(Snow).

Water flow through the unsaturated portion of a snowpack was calculated using various assumptions about radiation penetration into the snow. The results showed that for the purposes of hydrologic forecasting, it is sufficiently accurate to assume that all of the radiation Absorption occurs at the surface. The error in the calculation of flow is largest for very shallow snowpacks, but the error is reduced by radiation absorption at the base of the snow and by the routing of meltwater through the saturated basal layer. (Sims-ISWS)
W78-04223

GROUNDED ICE IN THE FAST ICE ZONE ALONG THE BEAUFORT SEA COAST OF ALASKA,
Army Terrestrial Sciences Center, Hanover, NH.
A. Kovacs.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 352, Price codes: A03 in paper copy, A01 in microfiche. CRREL Report 76-32, September 1976. 26 p, 22 fig, 1 tab, 13 ref. NOAA-01-5-022-1651.

Descriptors: *Ice, *Coasts, *Sea ice, *Alaska, *Arctic, Remote sensing, Aerial photography, Satellites(Artificial), On-Site investigations, Movement, Measurement, Surveys, Cold regions, *Beaufort Sea, *Prudhoe Bay(Alaska), *Harrison Bay(Alaska), Grounded ice, Roughness, Thickness, Ice islands.

Four large grounded multi-year shear ridge formations were found in the grounded ice subzone of the fast ice zone near the Harrison Bay/Prudhoe Bay area of Alaska. A 166-m-long cross section of one of these formations was obtained by leveling and sonar measurements. These measurements revealed that the maximum ridge height was 12.6 m and that the formation was grounded in 17-18 m of water. The salinity, temperature, brine volume, and density of the ice were determined on samples obtained by coring. The physical characteristics of the formations as observed in satellite, SLAR, and aerial imagery indicated that these formations have not moved between the time of their formation in the fall of 1974 and August of 1976. Evidence of significant aeolian debris discoloring the ice was discussed. (Sims-ISWS)
W78-04224

GROWTH HISTORY OF LAKE ICE IN RELATION TO ITS STRATIGRAPHIC, CRYSTALLINE AND MECHANICAL STRUCTURE,
Army Terrestrial Sciences Center, Hanover, NH. Snow and Ice Branch.
A. J. Gow, and D. Langston.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 228, Price codes: A03 in paper copy, A01 in microfiche. CRREL Report 77-1, January 1977. 29 p, 22 fig, 9 ref.

Descriptors: *Lake ice, *Ice cover, *Lakes, *New Hampshire, Growth rates, Temperature, Winds, Stratigraphy, Structure, Crystals, Crystallography, Electrical conductance, On-site investigations, Laboratory tests, Ice, Physical properties, Mechanical properties.

Studies of the growth history and structural characteristics of winter ice covers on two New Hampshire lakes were described. The investigations included measurements of ice cover thickness, characterization of the stratigraphic and crystalline structure of the ice, identification and classification of major ice types, and measurements of electrolytic conductivity. The formation of cracks and flaws in the ice and their effects on the mechanical properties of the ice also were investigated measurement was described, and the interrelationships of the various physical and mechanical properties of temperate lake ice covers were discussed. (Sims-ISWS)
W78-04225

ARCHING OF MODEL ICE FLOES: EFFECT OF MIXTURE VARIATION ON TWO BLOCK SIZES,
Army Terrestrial Sciences Center, Hanover, NH. Applied Research Branch.
D. J. Calkins, and G. D. Ashton.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 841, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-42, November 1976. 15 p, 8 fig, 5 ref, 1 append.

Descriptors: *Ice jams, *Rivers, *Laboratory tests, *Model studies, Ice, Navigation, Mathematical models, Ice loads, Hydraulic structures, Hydraulics, Ice booms, Hydraulic models, Floating ice, Ice bridging, Ice blocks, Ice floes.

A study of arching of mixed, square fragmented ice floes at an opening in an ice boom was documented, using results from a model study in which two sizes of plastic blocks represented real ice. A power function, relating the upstream ice concentration to the ratio of a characteristic block dimension to the gap opening, was found adequate to distinguish between arching and nonarching events for block mixtures of two component sizes. It was demonstrated that when the respective total areas of the two block components are nearly equal, a minimum ice concentration initiates an arch across the opening. As the mixture of two sizes of blocks approaches a uniform (one-sized) mixture, a higher concentration of ice is needed to initiate the arch. When the ratio of the block dimension to the gap opening is equal to or less than 0.10, arching of the fragmented ice is not possible, even when the upstream ice discharge exceeds the maximum discharge of ice through a gap opening. The distribution of fragmented ice areas is an important parameter in establishing the minimum size of opening at which an ice boom will retain its arching capability. (Sims-ISWS)
W78-04226

WINTER THERMAL STRUCTURE AND ICE CONDITIONS ON LAKE CHAMPLAIN, VERMONT,
Army Terrestrial Sciences Center, Hanover, NH. Snow and Ice Branch.
R. E. Bates.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 146, Price codes: A03 in paper copy, A01 in microfiche. CRREL Report 76-13, June 1976. 29 p, 17 fig, 4 tab, 9 ref.

Descriptors: *Ice, *Thermal properties, *Lake ice, *Vermont, Lakes, Freshwater, Ice cover, On-site investigations, On-site data collections, Instrumentation, Temperature, Air temperature, Water temperature, Weather, Winds, Climatological data, Meteorology, *Lake Champlain(VT), Shelburne Point(Vt), *St. Albans Bay(Vt), Ice thickness, Ice formation, Thermistors, Bubble systems.

The thermal structure and ice conditions of Lake Champlain, a mid-latitude large lake, near Shelburne Point, Vermont, were studied during the winter of 1974-75. The lake was instrumented to a depth of 8.5 m with a string of highly calibrated thermistors and connected to a data logger on shore which recorded water temperatures every four hours. An ice mooring system was developed to anchor the thermistor string so that ice and water temperatures could be obtained at known levels. This temperature recording system measured vertical and horizontal variations in ice and water temperature regimes during ice formation, Growth, and decay. Meteorological data were measured during the winter period November 1974 through March 1975 at the site. Ice stratigraphy was determined for the ice at the site at its maximum seasonal growth for comparison with ice from St. Albans Bay (at the northern end of Lake Champlain) which had formed earlier. Correlations were determined between ice growth and accumulated degree days of freezing. The operation of a bubbler system installed near the measurement site around a service dock was observed. (Sims-ISWS)
W78-04227

THERMODYNAMIC DEFORMATION OF WET SNOW,
Army Terrestrial Sciences Center, Hanover, NH. Snow and Ice Branch.
S. C. Colbeck.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 830, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-44, November 1976. 13 p, 7 fig, 3 tab, 10 ref.

Descriptors: *Deformation, *Snow, *Rheology, *Thermodynamics, Model studies, Mathematical models, Heat flow, Heat transfer, Mass transfer, Particle shape, Ice, Freezing, Pressure, *Wet snow.

The deformation of wet snow was explained in terms of the thermodynamics of the three phases of water. When deformation by particle rearrangement is fully developed, deformation can occur most rapidly by melting at the particle contacts. The rate of deformation is highly sensitive to the stress level. A model of the hydrostatic deformation of wet snow was constructed, and examples of the deformation of wet snow were given for a variety of conditions. The results were in agreement with existing experimental evidence. The model accurately simulted the transient nature of the deformation and the effect of water content on the quasi-stable density of wet snow subjected to a constant stress. (Sims-ISWS)
W78-04228

ST. MARYS RIVER ICE BOOMS, DESIGN FORCE ESTIMATE AND FIELD MEASUREMENTS,
Army Terrestrial Sciences Center, Hanover, NH.
R. E. Perham.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 902, Price codes: A03 in paper copy, A01 in microfiche. CRREL Report 77-4, February 1977. 32 p, 19 fig, 8 tab, 13 ref, append.

Descriptors: *Ice loads, *Rivers, *Harbors, *Canada, On-site investigations, Design, Model studies, Mathematical models, Loads(Forces), Navigation, Ships, Ice, Freshwater, Engineering, Civil engineering, *Ice booms, Ontario, *St. Mary's River(Mich-Ontario), Winter river navigation, Inland waterways.

A set of two ice booms with a 250-ft (76-m)-wide navigation opening between them was designed to stabilize the ice cover in the harbor at Sault Ste. Marie, Michigan and Ontario, and to reduce the ice losses associated with winter navigation of ships on the St. Marys River. The forces-from natural effects on the ice cover were predicted using existing theory and physical data for the area. The forces in the boom structure resulting-from ice cover and boom interaction were estimated. When the ice booms were installed, force measurement systems were put into selected anchor cables. These systems were operated all winter in conjunction with a modest program of supplemental data gathering. The force data exhibited periods when the force distribution was in good agreement with predictions and periods when the effect of ice on the booms differed substantially from predictions. Sometimes passing ships had a substantial effect on the ice cover and the boom loads, and at other times, the effect was negligible. The direction of travel made little difference on average peak loads. The maximum loads on the booms resulted from natural occurrences. (Sims-ISWS)
W78-04233

REMOTE SENSING OF ACCUMULATED FRAZIL AND BRASH ICE IN THE ST. LAWRENCE RIVER,
Army Terrestrial Sciences Center, Hanover, NH. Applied Research Branch.
A. M. Dean, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A039 905, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 77-8, April 1977. 25 p, 15 fig, 2 tab, 7 ref.

Descriptors: *Remote sensing, *Ice, *St. Lawrence River, Instrumentation, Equipment, Aircraft, Radar, Cold regions, Rivers, Ice cover, Profiles, Maps, Mapping, Data collections, Data processing, Navigation, *Ice thickness, *Frazil ice, *Brash ice.

A broadbanded impulse radar system was used for aerial detection of accumulated frazil and brash ice in a 9.5-km reach of the St. Lawrence River near Ogden Island. The remote sensing and data reduction system developed for the project provided data sufficient for production of a contour map having 1-ft intervals. With this contour map, the accumulation pattern of frazil and brash ice could be analyzed. Recommendations were given for improving the performance of the aerial profiling system. (Sims-ISWS)
W78-04234

GROUNDWATER AND SURFACE WATER IN THE PERMAFROST REGION,
N. I. Tolstikhin, and O. N. Tolstikhin.
Water Resources Branch, Inland Waters Directorate, Fisheries and Environment Canada, Ottawa, Canada, Technical Bulletin No 97, 1977. 25 p., 11 fig, 3 tab, 22 ref.

Descriptors: *Groundwater, *Surface waters, *Permafrost, Springs, Ice, Freezing, Rivers, Lakes, Ponds, Free surfaces, *Suprapermafrost water, *Intrapermafrost water, *Subpermafrost water, Hydrolaccoliths, Icings.

The types of groundwater found in the permafrost region are discussed in detail: suprapermafrost water, intrapermafrost water and subpermafrost water. Also discussed is the emergence of groundwater on the surface in the form of springs, icings, pools of open water in ice, and hydrolaccoliths. Rivers and lakes in the permafrost region are described. (WATDOC)
W78-04352

ON MELTING ICEBERGS,
Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.
H. E. Huppert, and J. S. Turner.
Nature, Vol. 271, No. 5640, p 46-48, January 1978. 5 fig, 5 ref.

Descriptors: *Melting, *Icebergs, *Laboratory tests, Water resources, Water supply, Salinity, Sea water, Freshwater, Melt water, Saline water-freshwater interfaces, Mixing, Circulation, Water circulation, Ice, Ice-water interfaces, Towed icebergs.

In several countries the feasibility of acquiring freshwater from icebergs is being studied. The icebergs would be towed to the coast and then melted. One suggestion for melting the iceberg is to run each iceberg aground in water approximately 250 m deep, the mean depth of Antarctic icebergs. A relatively shallow pen then would be built around the iceberg. It is conjectured that the melt water would rise, without much mixing, into the pen, from where it would be siphoned off for subsequent use. Neshyba claims, however, that melt water produced by icebergs may be responsible for a large amount of upwelling and mixing in the Antarctic's Weddell Sea. He asserts that as the melt water rises up the side of an iceberg, it entrains a sizeable quantity of warmer, saltier water from the environment. Neshyba calculates that an average-sized iceberg is responsible for a vertical volume transport into the upper layer of the Weddell Sea of 3.3 x 10 to the 8th power cu cm/s. This is a considerable transport, and the raising of water and nutrients from depth by this mechanism would be of importance in determining the physical and biological properties of the Weddell Sea. The first suggestion, that fresh melt water rises to the surface, and Neshyba's claims, that the melt water will have mixed significantly with its salty environment before reaching the surface, cannot both be correct. Laboratory tests showed both conjectures to be in error. (Sims-ISWS)
W78-04515

ICEBERG SOUNDING BY IMPULSE RADAR,
Memorial Univ. of Newfoundland, St. John's. Centre for Cold Ocean Resources Engineering.
J. R. Rossiter, and K. A. Gustajtis.
Nature, Vol. 271, No. 5640, p 48-50, January 1978. 3 fig, 8 ref.

Descriptors: *Remote sensing, *Icebergs, *Radar, Sounding, Measurements, Sampling, Ice, Foreign research, Aircraft, Instrumentation, On-site investigations, Cold regions, *Newfoundland.

Knowledge of an iceberg's draft is essential for assessing its risk to underwater installations, for predicting its drift, and for estimating its total bulk. Because of the highly irregular shape of icebergs, it is impossible to estimate an iceberg's draft directly from its above-water dimenstions. It was reported in this paper that estimates of the draft of irregularly-shaped icebergs also can be obtained from the air quickly and accurately using short-pulse radar. A small iceberg in Twillingate Harbout, Newfoundland (49 deg 40 min N, 54 deg, 46 min W), was sounded from a helicopter using impulse radar on 11 June 1977. The result was verified by simultaneous measurement of the iceberg's draft using side-scan sonar. (Sims-ISWS)
W78-04516

THE COMPOSITION OF BASAL ICE FROM A GLACIER SLIDING OVER LIMESTONES,
Stanford Univ., CA. Dept. of Applied Earth Sciences.
B. Hallet, R. Lorrain, and R. Souchez.
Geological Society of America Bulletin, Vol 89, No 1, p 314-320, January 1978. 4 fig, 1 tab, 30 ref. NSF GA-40497X.

Descriptors: *Glaciers, *Chemicals, *Limestones, Sampling, On-site investigations, On-site data collections, Chemical analysis, Calcium, Foreign countries, Magnesium, Foreign research, Sodium, Potassium, Calcium carbonate, Calcite, Chemical precipitation, Ice, Cores, Cations, Chemistry, Glaciology, *Tsanfleuron Glacier(Switzerland).

Samples of ice from the Tsanfleuron Glacier (Switzerland) were analyzed for Ca, Mg, Na, and K by atomic absorption. The basal ice is distinctly richer in Ca and Mg, but it is slightly poorer in Na and K than the overlying glacier ice. The relative enrichment of Ca and Mg in basal ice appears to result from the limited incorporation of solutes as the ice forms by refreezing of pressure meltwaters that have flowed in intimate contact with the carbonate bedrock underlying the glacier. Because the bulk of the solutes are selectively rejected by the growing ice, they tend to accumulate in freezing subglacial waters until they eventually precipitate in areas where basal freezing is localized. This subglacial precipitation of CaCO3 results in thin superficial coatings of calcite that are abundant and particularly well developed in small concavities of the bedrock surfaces recently exposed by the retreat of the Tsanfleuron Glacier. Calculated minimum solute concentrations required to maintain such CaCO3 precipitation used in conjunction with an experimentally determined effective distribution coefficient, which characterizes the solute partitioning during the growth, can yield estimates of the Ca content of the regelation ice. The close agreement obtained between predicted and measured Ca contents in basal ice strongly supports the hypothesis that ice layers at the base of the Tsanfleuron Glacier are formed, at least in part, by regelation and that the calcite deposits result from the selective solute rejection that accompanies basal ice growth. (Sims-ISWS)
W78-04518

DEVELOPMENT OF LARGE ICE SAWS,
Army Terrestrial Sciences Center, Hanover, NH.
D. E. Garfield, B. Hanamoto, and M. Mellor.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 899, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-47, December 1976. 17 p, 11 fig, 6 ref.

Descriptors: *Ice saws, *Ice, *Michigan, *Locks, Equipment, On-site investigations, Evaluation, Navigation, Ships, Canals, Engineering, Mechani-

cal engineering, *Sault Ste. Marie(Mich), Chain saws, Cutting tools, Ice removal, Lock walls.

This report described two mechanical ice-cutting systems for the removal of ice collars at the high pool level on the Poe Lock of the St. Marys Falls Canal at Sault Ste. Marie, Michigan. One system was a narrow-kerf (3-1/4-in-wide) coal-cutting chain saw mounted on a bar, driven by a 65-hp wheeled trencher. The other system was a lumber-cutting chain saw mounted on a bar, driven by a 30-hp wheeled soil trencher which cut a 0.56-in-wide kerf. The lumber-cutting saw's bar was too flexible, and the desired cutting traverse speed was not met. The coal-cutting saw cut 6-ft-deep ice collars at traverse speeds of up to 10 ft/min and is acceptable. With a few modifications, the coal-cutting saw would be operational. (Sims-ISWS)
W78-04531

2D. Evaporation and Transpiration

EFFECTS OF RADIATION PENETRATION ON SNOWMELT RUNOFF HYDROGRAPHS,
Army Terrestial Sciences Center, Hanover, NH. Snow and Ice Branch.
For primary bibliographic entry see Field 2C.
W78-04223

THE DETERMINATION OF REGIONAL EVAPOTRANSPIRATION BY MEANS OF STANDARD METEOROLOGICAL DATA,
Cornell University Ithaca, New York, School of Civil and Environmental Engineering.
W. H. Brutsaert.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 133, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, November 1977. 32 p, 7 fig, 34 ref, append. OWRT A-068-NY(1), 14-34-0001-7067,68.

Descriptors: *Evapotranspiration, Hydrological cycle, *Atmospheric boundary layer, Water balance, Meteorology, *Meteorological data, *Boundary layers, Heat transfer, Water vapor.

The investigation was concerned with the applicability of recently developed similarity methods for the parameterization of the atmospheric boundary layer to the determination of regional evapotranspiration by means of standard meteorological data. Previous results had shown that the modeling of surface water vapor transfer on the basis of boundary layer parameterization is feasible, only if a calibrated similarity function was used for water vapor. This meant that contrary to the common assumption, the transfer mechanisms of heat and water vapor in the atmospheric boundary layer are likely to be dissimilar. To test this and to obtain an unbiased determination of the water vapor function, an analysis was performed of data taken over the ocean during the AMTEX experiments of 1974 and 1975. Thus bulk transfer relationships were obtained for water vapor and sensible heat in the atmosphere for different interpretations of the thickness scale of the boundary layer. The results obtained for sensible heat are in good agreement with the results of previous studies in the literature. The results for water vapor confirmed that, under unstable atmospheric conditions, the bulk mass transfer coefficient is quite different from that for sensible heat. A convenient equation was derived from the data for practical application. A method is thus available for the direct use of the similarity formulation in hydrological and related engineering problems, while obviating the need for excessive local calibration.
W78-04372

DESICCATION AND CONSOLIDATION OF DREDGED MATERIALS,
Northwestern Univ., Evanston, IL. Technological Inst.
For primary bibliographic entry see Field 5G.
W78-04525

HYDROLOGY OF TWO SMALL WETLAND BASINS IN EASTERN MASSACHUSETTS,
Lowell Univ., MA. Dept. of Earth Sciences
For primary bibliographic entry see Field 2H
W78-04539

2E. Streamflow and Runoff

HYDROLOGIC CONSIDERATIONS OF THE UPPER ST. JOHNS RIVER BASIN, FLORIDA,
Florida State Dept. of Environmental Regulation, Tallahassee.
W. J. McElroy.
Water Resources Bulletin, Vol. 13, No. 6, p 1153-1164, December 1977. 7 fig, 2 tab, 22 ref.

Descriptors: *Basins, *Rivers, *Flood plains, *Florida, Encroachment, Levees, Drainage, Watersheds(Basins), Storage capacity, Agriculture, Drainage districts, Flow, Water levels, Drainage effects, Drainage practices, Hydrology, *Upper St. Johns River basin(Fla).

Since the early 1900's, the Upper St. Johns River Basin, Florida, has been experiencing rapid agricultural development through reclamation of the low-lying marshland by organized drainage districts, private land owners, and corporations. These low-lying marsh areas, which constitute the floodplain, have been altered by the creation of levees, thereby reducing the natural storage capacity and permanently altering the regime of the system. This floodplain encroachment has resulted in both higher and lower water levels occurring in the upper basin area and in an increase in hydroperiod. This paper discussed the history and background of the basin accompanied by a hydrologic discussion and suggested recommendations for a water management plan that could improve the overall operation and management of the Upper St. Johns River basin. (Sims-ISWS)
W78-04204

RANGE, VELOCITY, AND MATERIAL FLUX OF COMPACTION FLOW IN GROWING SEDIMENTARY SEQUENCES,
Tuebingen Univ. (West Germany). Geologisch-Palaontologisches Inst.
For primary bibliographic entry see Field 2J.
W78-04209

FLOOD-FREQUENCY ANALYSIS FOR SMALL NATURAL STREAMS IN GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
H. G. Golden, and M. Price.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 113, Price codes: A05 in paper copy, A01 in microfiche. Open-file report 76-511, July 1976. 75 p, 14 fig, 13 tab, 35 ref.

Descriptors: *Flood forecasting, *Flood frequency, *Peak discharge, *Small watersheds, *Georgia, Analytical techniques, Flood data, Drainage area, Channel morphology, Rainfall-runoff relationships, Natural streams, Regression analysis, Model studies.

Flood information from 104 project basins (0.1 to 20 square miles) and data available from 170 larger basins (20 to 1,500 square miles) are analyzed to provide planners and designers with relations for estimating the magnitude and frequency of flood-peak discharges on small natural streams in Georgia. More than 90 percent of the project activity was directed toward the acquisition and processing of data for more than two thousand rainfall-runoff periods occurring during 1964-74 at the 104 project stations. Storm rainfall data were computed at 5-minute intervals from records of six long-term (about 75 years) National Weather Service Stations. The U. S. Geological Survey mathematical rainfall-runoff model is used to synthesize long-term flood records for about 80 percent of the project stations. Station flood-frequency data are developed, using the log-Pearson Type III distribution with regionalized skew coefficients. Multiple regression analysis is used to define relations between flood-frequency station data for small and large streams and 10 physical and climatological basin characteristics. The analysis indicates the drainage-basin size is the most significant variable. Five regions having distinct flood-peak characteristics are delineated. The developed relations, expressed as equations and nomographs, are considered usable for virtually any site in Georgia where the drainage area is between 0.1 and 20 square miles, and the flow is natural. (Woodard-USGS)
W78-04257

STREAMFLOW REGIONALIZATION IN BRITISH COLUMBIA, NO. 3, STATISTICS OF MEAN ANNUAL FLOW,
Department of the Environment, Ottawa, (Ontario). Water Resources Branch.
R. M. Leith.
Report Series No. 50, 1977, 40 p, 4 fig, 4 ref, 9 tab, 3 append.

Descriptors: *Streamflow, *Regional analysis, *Average, *Annual, Flow, Statistics, Precipitation(Atmospheric), *Canada, *British Columbia, Kootenay River, Kaslo, Columbia River, Quesnel River, Bakerville, Chilliwack River, Agassiz, Deviations.

Trends and serial correlations have been examined for series of annual flows and annual precipitations for 17 streamflow and 9 precipitation stations in British Columbia. This was undertaken to determine if there were statistically distinct trends in mean annual values which could bias regional analysis. No province-wide statistically distinct trends were found, although mean flows and precipitations were lower in the 1920's, 1930's, and 1940's than in the 1950's and 1960's. The maximum deviations of 5, 10, 15 year mean flows from 40 and 50 year mean flows were studied also to provide an indication of the extent to which short term means can differ from long term means. (WATDOC)
W78-04356

PREDICTING POLLUTANT DISPERSION IN RIVERS,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-04495

GRAVELLY FLOOD DEPOSITS OF IRVINE CREEK, ONTARIO, CANADA,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 2J.
W78-04503

THE SMALL SAMPLE ESTIMATION OF H,
Technical Univ. of Istanbul. (Turkey). Dept. of Hydraulics and Water Power.
Z. Sen.
Water Resources Research, Vol. 13, No. 6, p 971-974, December 1977. 1 fig, 3 tab, 11 ref.

Descriptors: *Hydrology, *Model studies, *Mathematical models, Markov processes, Monte Carlo method, Mathematics, Equations, Statistics, Regression analysis, Analytical techniques, Computer models, Streamflow, *Small sample estimation, Normal independent processes.

A general analytical procedure was presented for evaluating the expected value of the Hurst coeffi-

cient, h, in small samples. In particular, the expectation of h was derived analytically in an explicit form for the lag 1 Markov process, and then the validity of this analytical expression was checked against the results obtained by Monte Carlo simulation techniques. To this end, a large number of synthetic sequences were generated for various values of sample sizes, n, and the lag 1 serial correlation coefficient, rho, with the assumption that the underlying random variables are distributed normally. Furthermore, it was shown that the bias in rho for small samples is accentuated in the expected value of h which is a function of both n and rho only. (Sims-ISWS)
W78-04526

2F. Groundwater

SURFACE WATER-ESKER RECHARGE STUDY EAST LANSING-MERIDIAN TOWNSHIP, MICHIGAN,
Williams and Works, Grand Rapids, MI.
For primary bibliographic entry see Field 4B.
W78-04208

GROUND-WATER APPRAISAL OF THE PINELAND SANDS AREA, CENTRAL MINNESOTA,
Geological Survey, St. Paul, MN. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04246

THE EFFECT OF THE FAKA UNION CANAL SYSTEM ON WATER LEVELS IN THE FAKAHATCHEE STRAND, COLLIER COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04249

A DIGITAL MODEL OF THE FLORIDAN AQUIFER, NORTH OF TAMPA, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
A. F. Robertson, and M. J. Mallory.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 315, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 77-64, October 1977. 29 p, 14 fig, 1 tab, 14 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *Potentiometric level, *Transmissivity, *Model studies, Analytical techniques, Data collections, *Florida, Forecasting, Evaluation, Groundwater resources, West-central Florida area, Floridan aquifer.

A regional ground-water model of the Floridan aquifer was constructed for an 875-square-mile portion of the rapidly developing area north of Tampa Bay. The digital model was calibrated by comparing observed (March 1974 and May 1975) and computed potentiometric heads. A good comparison was obtained by adjusting leakance and transmissivity. Differences between the computed and measured potentiometric surface were generally less than 3 feet, with a maximum error of 15 feet. The calibrated model may be used as a predictive tool. For example, the model could be used to evaluate the regional effects of increased ground-water withdrawal on the Florida aquifer. (Woodard-USGS)
W78-04251

GROUND-WATER BASIC DATA FOR MORTON COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04252

GROUND-WATER RESOURCES OF GRIGGS AND STEELE COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04253

GROUND-WATER RESOURCES OF CAVALIER AND PEMBINA COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04254

GROUND-WATER LEVELS IN THE UNITED STATES, 1973-74. NORTHEASTERN STATES.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04255

GEOHYDROLOGY OF NORTH EASTERN PROVINCE, KENYA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04256

SUMMARY OF BASIC HYDROLOGIC DATA COLLECTED AT COSO HOT SPRINGS, INYO COUNTY, CALIFORNIA,
Geological Survey, Luguna Niguel, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04258

GEOLOGY AND WATER RESOURCES OF THE NORTHERN PART OF THE JUDITH BASIN, MONTANA,
Geological Survey, Billings, MT. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04263

APPROXIMATE AREAS OF RECHARGE TO THE CHICOT AND EVANGELINE AQUIFER SYSTEM IN THE HOUSTON-GALVESTON AREA, TEXAS,
Geological Survey, Houston, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04264

WATER-LEVEL CHANGES IN THE NORTHERN HIGH PLAINS OF COLORADO, 1964 TO 1976 AND 1972 TO 1976,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04265

NWWA RESEARCH FACILITY: AN OVERVIEW.
For primary bibliographic entry see Field 4B.
W78-04289

A LOOK AT GROUND WATER RESEARCH.
Water Well Journal, Vol 32, No 2, p 39-42, February, 1978.

Descriptors: *Groundwater, *Research facilities, *Tracers, Bromide ion, Resistivity, Plastic pipes, Well casings, Saline water intrusion, Water pollution sources, Water wells, Pollutants, Indicators.

1977 proved to be a productive year for ground water research in the U.S., and the increased amount of dollars available for such research in 1978 is a positive indication that progress will continue. Several of the more active ground water research centers in the nationa are described in this article, including the Auburn University Water Resources Research Institute, Pennsylvania State University, the Virginia Water Resources Research Center (Blacksburg), the Robert S. /Kerr Environmental Research Center, and Johnson Division, UOP. Recently completed studies and research in progress are reported for each of these centers. Of special interest is a discussion of Penn State's work with the bromide ion as a ground water tracer. (Eberle-NWWA)
W78-04290

REGIONAL GEOLOGY SERIES: PART 1, GLACIATED APPALACHIAN REGION,
National Water Well Association, Worthington, OH.
J. A. Hunt.
Water Well Journal, Vol. 32, No. 2, p 36-37, February, 1978, 1 fig.

Descriptors: *Groundwater, *Aquifers, *New England, *Northeast U.S., Drilling, Water supply, Water wells, Bedrock, Till, Glacial drift, Cracks, Joints(Geology), *Appalachian mountains region.

The concept of ten U. S. ground water provinces (as introduced by H. E. Thomas in 1952) has been a popular system for looking at large scale ground water conditions. The smallest of these regions, the Glaciated Appalachian, receives abundant rainfall and has rugged, hard rock terrain. Valleys are filled with sand and gravel outwash, and the entire area is irregularly blanketed with glacial till. This overburden is largely unsorted, and occasional large boulders can pose problems to drillers. Mud-rotary and cable-tool methods are usually chosen for drilling unconsolidated formations in this area; cable-tool and air hammer methods are commonly used in bedrock. The water that occurs in the bedrock is usually found in cracks and joints. The average domestic well provides about 5 gpm of generally good quality water. There are, however, many highly productive aquifers in surficial deposits of the region, and several major cities in this area obtain their water from permeable glacial deposits. Large diameter municipal and industrial wells are frequently expensive, requiring extensive test hole programs before a good site is located. (Eberle-NWWA)
W78-04291

NEWER TECHNIQUES AID SEARCH FOR GROUND WATER,
Universal Oil Products, St. Paul, MN. Johnson Div.
For primary bibliographic entry see Field 7B.
W78-04296

LIMITATIONS OF BANK-STORAGE MODEL ASSUMPTIONS,
Missouri Univ.- Columbia. Dept. of Geology.
J. M. Sharp, Jr.
Journal of Hydrology, Vol 35, No 1/2, p 31-47, October 1977. 14 fig, 1 tab, 26 ref. OWRT A-085-MO(3).

Descriptors: *Bank storage, *Mathematical models, *Surface-groundwater relationships, *Central U.S., *Alluvial aquifers, Hydraulic conductivity, Alluvium, Particle size, Depth, Dupuit-Forchheimer theory, Heterogeneity, Penetration, Flood plains, Meanders, Perched water, Digital computers, Computer models, Potentiometric level, Scour, Aquifers, Partial penetration, River stages.

Major alluvial aquifers in the central United States have certain common characteristics. Sediment mean grain size and hydraulic conductivity both increase with depth. Furthermore, most modern major rivers do not fully penetrate the alluvium. Examination of the common bank-storage model assumptions and comparison with major alluvial

aquifer hydrogeology indicated that many of the mentioned assumptions are questionable, and the resultant models may yield erroneous values. Common assumptions which do not correspond to observed data include the Dupuit-Forchheimer conditions and the assumptions of homogeneity, fully penetrating streams, and solely confined or unconfined systems. The limitations of bank-storage model assumptions must be understood clearly when attempting to understand hydrogeologic processes or in making decisions based on model output. (Visocky-ISWS)
W78-04335

HYDROGEOLOGY AND DELINEATION OF BURIED GLACIAL RIVER VALLEY AQUIFERS IN NORTHWESTERN MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology.
J. M. Sharp, Jr., R. F. Burmester, and O. Malvik.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 035, Price codes: A04 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, December 1, 1977. 65 p, 30 fig, 3 tab, 27 ref, 3 append. OWRT A-097-MO(1). 14-34-0001-7053 and 7054.

Descriptors: *Hydrogeology, *Aquifer characteristics, Bedrock, Saline water intrusion, Dissolved solids, *Missouri, Buried valleys, *Geophysical exploration, *Gravity geophysics, *Groundwater exploration.

Northwestern Missouri possesses a network of buried glacial or preglacial river valley aquifers. These aquifers represent the major ground-water resource in an otherwise relatively water poor area. Bedrock formations contain saline water of over 1000 ppm total dissolved solids. A multiple geophysical exploration program (involving gravity, seismic and electrical methods) was designed to delineate these aquifers. A gravity grid reconnaissance was made in the selected field area, and gravity residuals determined by polynomial trend surface analysis. A series of discontinuous residual lows generally correlate well with known bedrock lows. Seismic refraction gave accurate depths to bedrock in all areas, and confirmed that gravity residual lows in other areas represent bedrock lows. Electrical resistivity results were disappointing because adequate resistivity contrasts between the aquifers and bedrock were lacking. This is due to salt water encroachment from the bedrock. Some success was achieved in finding shallow aquifers. The multiple geophysical method appears feasible in northwestern Missouri, whereas any approach by itself is insufficient. A proposed ground-water exploration program is outlined.
W78-04496

APPLICATION OF THE DRILL-STEM TEST TO HYDROGEOLOGY,
Research Council of Alberta, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 8B.
W78-04508

CYCLIC STORAGE, WHERE ARE YOU NOW,
For primary bibliographic entry see Field 4B.
W78-04509

GROUND WATER AND VEGETATIONAL STRUCTURES, GROUND WATER COURSE COINCIDENCE METHOD AND VARIABILITY DIAGRAM IN CONTEXT OF ECOLOGICAL INVESTIGATIONS ON VEGETATIONAL UNITS AFFECTED BY GROUND WATER, NOVA ACTA LEOPOLDINA, VOL. 38, NO. 6, (IN GERMAN),
J. H. Scharf.
Johann Ambrosius Barth: Leipzig, East Germany 1973. 172 p.

Descriptors: *Ecological distribution, Forests, *Groundwater movement, Meadow, Methods, Variability, *Vegetation, *Water balance.

A brief explanation of objectives is given, followed by sections concerning the methods used, the 'catena principle,' parameters of water balance, the concept of ecological coindicence and ground water dynamics. An examination of the vegetational and hydrological data collected, its separation into forest, meadow and other vegetational categories and individual plants follows. The last 2 chapters include discussions of the methods and ecogeobotanical results, possible applications in plant cultivation and a general summary.--Copyright 1975, Biological Abstracts, Inc.
W78-04599

2G. Water In Soils

INFILTRATION FORMULA BASED ON SCS CURVE NUMBER,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
G. Aron, A. C. Miller, Jr, and D. F. Lakatos.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 103, No. IR4, Proceedings Paper 13427, p 419-427, December 1977. 3 fig, 4 tab, 9 ref.

Descriptors: *Infiltration, *Rainfall-runoff relationships, *Runoff, *Model studies, Soils, Storms, Urbanization, Equations, Curves, Permeability, Storage capacity, Soil water, Urban runoff, Cumulative curves, Differentiation.

A formula was developed for computing infiltration in rainfall-runoff simulations from published Soil Conservation Service (SCS) soils data. Cumulative infiltration was treated as the difference between cumulative rainfall and runoff. The SCS runoff formula then was differentiated with respect to precipitation to arrive at an infiltration rate with respect to rainfall increments rather than time as is used in most previous formulas. A numerical example was included, and 2 possible refinements were suggested which would involve additional computational labor but should improve the infiltration simulation. (Visocky-ISWS)
W78-04211

SOME REGULARITIES OF STATISTICAL DISTRIBUTION OF SOIL MOISTURE VALUES, (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Biology and Soil Science.
E. A. Dmitriev, L. O. Karpachevskii, N. S. Oreshkina, L. D. Zakharina, and E. V. Shein.
Pochvovedenie 3, p 135-141, 1977.

Descriptors: *Soil moisture, *Distribution patterns, Soil texture, Cereal, Grass, Legume, Moscow, Tree, *USSR(Volgograd), Wilting.

Statistical distribution of moisture values in heavy-textured soils (covered by trees, legumes, grasses and cereals) (soddy-podzolic of the Moscow region Russian SFSR, USSR and light-chestnut of the Volgograd region) and coarse-textured soils (of the Volgograd region) was studied. The distribution observed the law of normal distribution when soil moisture ranged from maximum water capacity to wilting point. The distribution of moisture values reliably (with probability more than 0.95) differed from normal distribution when the soil was dried to wilting point. When the dry soil was irrigated or on the boundary of layers with different mechanical composition, the values were less reliable.--Copyright 1978, Biological Abstracts, Inc.
W78-04315

TRACING VERTICAL TRANSLOCATION OF SOIL MOISTURE,
Clemson Univ., SC. Dept. of Agricultural Engineering.
J. T. Ligon, T. V. Wilson, J. F. Allen, and U. P. Singh.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY10, Proceedings Paper 13290, p 1147-1158, October 1977. 8 fig, 8 ref, 1 append. OWRT A-023-SC(8).

Descriptors: *Soil water movement, *Tracer studies, *Tritium, *South Carolina, Iodine, Iodine radioisotopes, Tracers, Radioisotopes, Diffusion, Soil water, Groundwater, Seepage, Soil moisture, Soils, Clays, Unsaturated flow, Dispersion, Drainage, Scintillation counters.

Tracer experiments using tritium tagged water were initiated during December 1972-January 1973 to determine the rate of downward displacement of water in unsaturated Piedmont profile. Tritium location was monitored by daily soil sampling immediately after injection of activity and at frequencies decreasing to once every 6 months after 1 yr. At the end of 23 months, the maximum level of activity was 24.8 ft (7.56 m). The observed rate of movement will bring the maximum tritium activity to the water table level of 65 ft (20 m) in about 6 yr. Under conditions at the research site, lateral displacement of the materials was negligible. Some detention of activity in the high-clay B-horizon of the soil was observed. (Sims-ISWS)
W78-04332

THE EFFECT OF SOIL MOISTURE ON RESISTANCE TO WIND EROSION, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Inst. of Mechanical Seismic Resistant Construction.
A. Azizov.
Pochvovedenie 1, p 102-105, 1977.

Descriptors: *Wind erosion(Soil), *Soil moisture, Air currents(Velocity).

A relationship was found between critical velocity and the air current producing the removal of soil paraticles and the moisture content in the upper soil layer. When soil moisture was less (or equal) than a certain ultimate value W. the effect of moisture was insufficient. If W > W the effect of moisture in removing soil particles was very strong. A semi-empirical formula was derived for determination of moisture contents which prevent the removal of soil particles.--Copyright 1978, Biological Abstracts, Inc.
W78-04337

HYDROLOGIC FACTORS AND ENVIRONMENTAL IMPACTS OF MASS SOIL MOVEMENTS IN THE OREGON COAST RANGE,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 4D.
W78-04365

LAND DISPOSAL OF CHEMICAL SLUDGE,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5E.
W78-04371

ENVIRONMENTAL TRANSPORT MODELING OF POLLUTANTS IN WATER AND SOIL,
Oak Ridge National Lab., TN; and Union Carbide Corp., Oak Ridge, TN. Nuclear Div.
For primary bibliographic entry see Field 5B.
W78-04481

MOBILITY OF HEAVY METAL HUMATES IN SOILS AND SURFACE WATERS,
Missouri Univ., Rolla. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.

W78-04494

MATHEMATICAL MODELING OF LAND RUNOFF CONTAMINATED BY PHOSPHORUS,
Marquette Univ., Milwaukee, WI.
For primary bibliographic entry see Field 5B.
W78-04507

SOIL WATER FLOW AND DISTRIBUTION IN HORIZONTAL AND VERTICAL DIRECTIONS AS INFLUENCED BY INTERMITTENT WATER APPLICATION,
Fruit and Fruit Technology Research Inst. Stellenbosch (South Africa).
I. Levin, and F. C. Van Rooyen.
Soil Science, Vol. 124, No. 6, p 355-365, December 1977. 7 fig, 4 tab, 11 ref.

Descriptors: *Soil water movement, *Infiltration, *Soil water, *Laboratory tests, Soil water, Soils, Sands, *Irrigation, Nutrients, Moisture content, Field capacity, Root zone, Aeration, Flow, Application methods, Agriculture, *Distribution patterns, Intermittent water application.

The flow and distribution of water in horizontal and vertical columns, using 2 soils of different texture, were investigated. The effect of continuous versus intermittent application of water to the soils was evaluated in terms of wetting front advance, cumulative infiltration, infiltration rate, and soil moisture content. In the vertical columns, using intermittent water application, the advance of the wetting front, the cumulative infiltration, and the infiltration rate were decreased and behaved as if the time-averaged water application rate were being applied continuously. This decrease also was found with the horizontal columns, but to a considerably smaller extent. In effect, this decrease would change the shape of the wetted soil volume in favor of the lateral direction when using point-source irrigation. The decrease in vertical water movement also can have favorable implications with respect to losses of water and nutrients beneath the root zone. By making use of intermittent water application, it also is possible to use high-discharge emitters while still obtaining low rates of water infiltration. In the medium-textured soil, the intermittent water application caused a significant decrease in soil moisture content in the transmission zone with both the vertical and horizontal columns. This implies improved aeration (reduced 'field capacity') when using intermittent water application in heavier textured soils. (Sims-ISWS)
W78-04528

THE FUNCTION OF DIFFERENT TYPES OF MACROPORES DURING SATURATED FLOW THROUGH FOUR SWELLING SOIL HORIZONS,
Soil Survey Inst., Wageningen (Netherlands). Dept. of Soil Physics.
J. Bouma, A. Jongerius, O. Boersma, A. Jager, and D. Schoonderbeek.
Soil Science Society of America Journal, Vol. 41, No. 5, p 945-950, September-October 1977. 6 fig, 2 tab, 23 references.

Descriptors: *Pores, *Pore water, *Saturated flow, *Soil water movement, *Soil horizons, Hydraulic conductivity, Physical properties, Soil structure, Soil texture, Tracers, Dye dispersion, Color, Voids, *Macropores, *Swelling soils, *Clay soils, Methylene blue, Pore-necks.

The hydraulic function of 3 types of macropores during saturated flow through 4 swelling fine clayey and very fine clayey soil horizons was characterized with methylene blue as a tracer and was quantified in large thin sections with the Quantimet 720. All 3 types of macropores, described as channels, vughs, and planar voids, contributed to flow. Distinction between 'smooth' and 'rough' ped faces in field structure descriptions proved meaningful for 3 soils with high linear extensibility values because vertical flow did not occur along interconnected planar voids adjacent to 'smooth' peds, whereas it did not occur along 'rough' peds. However, flow did occur along 'smooth' ped faces in the fourth soil, which had significantly lower extensibility values. Calculations of hydraulic conductivity K sub sat, based on the observed dye patterns, are difficult because the dye solution flowed in interrupted patterns along the walls of the macropores without apparently filling them, due to the occurrence of smaller pore 'necks' in overlying soil. But the number and percentages of colored pores for each of the three macropore-types showed (with one exception for planar voids) consistant differences among the four soils, which corresponded with differences in measured K sub sat values. (Visocky-ISWS)
W78-04529

THE USE OF COLOR INFRARED IMAGERY FOR THE STUDY OF MARSH BUGGY TRACKS,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 2L.
W78-04536

THE ROLE OF ALKALINE RESERVE IN MINERALIZATION OF ORGANIC SUBSTANCES. (IN RUSSIAN),
Miniskii Meditsinskii Inst. (USSR).
For primary bibliographic entry see Field 5G.
W78-04538

THE EFFECTS ON THE VEGETATION OF THE ADDITIONS OF INORGANIC NUTRIENTS TO SALT MARSH SOILS AT STIFFKEY, NORFOLK,
University of East Anglia, Norwich (England). School of Biological Sciences.
For primary bibliographic entry see Field 2L.
W78-04541

HEAVY METALS IN SEWAGE SLUDGE MAY MAKE IT UNSAFE FERTILIZER.
For primary bibliographic entry see Field 5E.
W78-04579

DECOMPOSITION OF SEWAGE SLUDGE COMPOST IN SOIL: I. CARBON AND NITROGEN TRANSFORMATION,
Agricultural Research Service, Beltsville, MD.
For primary bibliographic entry see Field 5E.
W78-04581

LAND APPLICATION GUIDELINES FOR SLUDGES CONTAMINATED WITH TOXIC ELEMENTS,
Northern Virginia Community Coll., Woodbridge. Div. of Environmental and Natural Sciences.
For primary bibliographic entry see Field 5E.
W78-04588

EFFECT OF FERTILIZERS AND COMBINED PLOWING ON THE PROTECTION OF SOD-PODZOLIC SOILS FROM EROSION, (IN RUSSIAN),
Central Inst. Agrochemistry Service, Moscow (USSR).
A. M. Gordeev, L. N. Tsurikov, and V. E. Tavtushenko.
Pochvovedenie 3, p 97-104, 1976.

Descriptors: Crops, Erosion, *Fertilizers, *Nutrients, Plowing, *Podzolic soils, *Soil erosion, Runoff, Sod, Soils, Winter, Cultivation.

Losses of nutrients on eroded soddy-podzolic soils under winter crops and on fall-plowed lands were determined. Mineral fertilizers applied before sowing winter crops and fall plowing considerably decreased the runoff and the loss of nutrients, A combined fall plowing on a slope reduced the nutrient losses from the soil.--Copyright 1976, Biological Abstracts, Inc.
W78-04598

SERVO CONTROLLED OPTIMIZATION OF NITRIFICATION-DENITRIFICATION OF WASTE WATER IN SOIL,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5E.
W78-04603

SLUDGE IMPROVES SANDY SOIL, INCREASES YIELDS WITHOUT POLLUTING.
For primary bibliographic entry see Field 5E.
W78-04608

APPLICATION OF SEWAGE SLUDGE TO GARDEN PLOTS,
Vermont Univ., Burlington. Dept. of Microbiology and Biochemistry.
For primary bibliographic entry see Field 5E.
W78-04613

A SIMPLE SOIL PERCOLATION TEST DEVICE FOR FIELD ENVIRONMENTALISTS,
Summit County Dept. of Environmental Health, Frisco, CO.
For primary bibliographic entry see Field 5A.
W78-04619

GROWTH OF LOBLOLLY PINE SEEDLINGS IN STRIP-MINED KAOLIN SPOIL AS INFLUENCED BY SEWAGE SLUDGE,
Southeastern Forest Experimental Station, Athens, GA. Inst. for Mycorrhizal Research and Development.
For primary bibliographic entry see Field 5E.
W78-04624

TRANSPORT OF HEAVY METALS IN A SLUDGE-TREATED FORESTED AREA,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-04653

FUSION METHOD FOR THE MEASUREMENT OF PLUTONIUM IN SOIL: SINGLE-LABORATORY EVALUATION OF INTERLABORATORY COLLABORATIVE TEST,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W78-04660

AIR CONTENTS IN SOILS ABOVE A HIGH WATER TABLE: APPLICATION TO DRAINAGE CLASSIFICATION OF SOILS,
Department of the Environment and Tourism, Charlottetown (Prince Edward Island). Div. of Soil Survey.
K. Michalica, M. A. Zwarich, and C. F. Shavkewich.
Can J Soil Sci. 53(3), p 325-330, 1973.

Descriptors: *Soil drainage, Classification, Drainage classification, *High water table, *Porosity(Soils).

Studies were conducted at 10 sites with a high water table with a view of classifying soil drainage status from a knowledge of water table depth and water retention properties of the soil. The parameter used to assess soil drainage status was air-filled porosity. The average error in predicting air-filled porosity in the field from water retention data was

2.3%. Air-filled porosity in the water retention samples could be predicted from soil components to within 3.4-5.9% of the actual value (on the average). This suggests that where water retention data are not available, a knowledge of soil components and water table depth may be sufficient to obtain an estimate of air-filled porosity. A system of soil drainage classification based on air-filled porosity is proposed.--Copyright 1974, Biological Abstracts, Inc.
W78-04670

IRON AND PHOSPHORUS INTERACTION IN CALCAREOUS SOILS: I. EFFECT ON GROWTH, PHOSPHORUS, AND IRON CONTENT OF PLANT,
Ain Shams Univ., Cairo (Egypt). Dept. of Soils.
M. Omar, H. Hamdi, A. M. Elgala, and I. Wafik.
U A R J Soil Sci. 11(2), p 245-257, 1971.

Descriptors: *Calcareous soils, Chlorosis, Growth rates, *Iron, Moisture content, Nutrients, *Phosphorus, Plant physiology, Soils, Absorption, *Soil moisture, *Plant growth.

Three levels of soil moisture, 50% (M1), 100% (M2), and 150% (M3) of field capacity were maintained. Fe was applied in concentrations of 0 (Fe0), 1 (Fe1), 5 (Fe2) and 10 (Fe3) ppm Fe in soil. P was added at the rate of 0 (P0), 0.033 (P1), 0.066 (P2) and 0.132 (P3)g/pot. The aboveground parts of the corn plants were harvested 1 mo. from planting and the dry weight was recorded. The plant material was analyzed for total P, total Fe and in 1 N HCl-soluble 'active Fe.' Plants showed chlorotic symptoms, and severity of chlorosis was related to the P and soil moisture levels. Fe application to the soil did not prevent chlorosis development. Dry weight increased by increasing P and soil moisture levels. Plant P concentration increased by increasing the P application level. Neither of the combined application of P and Fe nor increasing moisture level had significant effect on plant Fe concentration. The plant P uptake was affected by P and moisture levels, but not with Fe treatments. The percentage and total active Fe decreased by increasing P level. The high level of soil moisture decreased the percentage of active Fe but increased the total active Fe as a function of dry matter increase.--Copyright 1973, Biological Abstracts, Inc.
W78-04671

DISTRIBUTION OF BEETLE MITES IN IRRIGATED SOILS, (IN RUSSIAN),
Odessa State Univ. (USSR).
For primary bibliographic entry see Field 3C.
W78-04673

AQUEOUS RELEASE OF HEAVY METALS FROM TWO SEWAGE SLUDGES,
Agricultural Research Service, Morgantown, WV. Plant Sciences Div.
For primary bibliographic entry see Field 5B.
W78-04677

2H. Lakes

RESERVOIR METALIMNION OXYGEN DEMANDS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-04202

EFFECTS OF URBAN LAKES ON QUANTITY AND QUALITY OF BASEFLOW,
Wisconsin Univ.-Milwaukee. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5B.
W78-04206

THE CYCLICITY OF THE PROCESS OF CHANGES IN THE BIOMASS OF LAKE BAIKAL ZOOPLANKTON OVER MANY YEARS, (IN RUSSIAN),
Irkutskii Gosudarstvennyi Univ. (USSR). Scientific Research Inst. of Biology.
For primary bibliographic entry see Field 5C.
W78-04212

DESIGN WAVE INFORMATION FOR THE GREAT LAKES, REPORT 3, LAKE MICHIGAN,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 8B.
W78-04217

GROWTH HISTORY OF LAKE ICE IN RELATION TO ITS STRATIGRAPHIC, CRYSTALLINE AND MECHANICAL STRUCTURE,
Army Terrestrial Sciences Center, Hanover, NH. Snow and Ice Branch.
For primary bibliographic entry see Field 2C.
W78-04225

WINTER THERMAL STRUCTURE AND ICE CONDITIONS ON LAKE CHAMPLAIN, VERMONT,
Army Terrestrial Sciences Center, Hanover, NH. Snow and Ice Branch.
For primary bibliographic entry see Field 2C.
W78-04227

AN ERTS-1 INVESTIGATION FOR LAKE ONTARIO AND ITS BASIN,
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
T. W. Wagner, and D. L. Rebel.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-28489, Price codes: A05 in paper copy, A01 in microfiche. NASA Contract Report ERIM 193300-65-F, July 1975. 95 p, 23 fig, 9 tab, 39 ref, append. NASA NAS5-21783.

Descriptors: *Lake Ontario, *Basins, *Watersheds(Basins), *Remote sensing, Data processing, Water resources, Runoff, Precipitation(Atmospheric), Water balance, Land use, Lakes, Forests, Vegetation, Drainage, Hydrology, Mathematical models, *LANDSAT, *ERTS-1.

This report documented a binational study of the techniques for applying ERTS and other types of remote sensor data to terrestrial hydrology. The study site was Lake Ontario's 34,000-sq-mi local drainage basin. Methods of manual, semi-automatic, and automatic (computer) data processing were evaluated, as were the requirements for spatial physiographic and limnological information. The coupling of specially processed ERTS data with simulation models of the watershed precipitation/runoff process provides potential for water resources management. Optimal and full use of the data requires a mix of data processing and analysis techniques, including single band editing, two band ratios, and multiband combinations. A combination of maximum likelihood ratio and near-IR/Red band ratio processing was found to be particularly useful. (Sims-ISWS)
W78-04230

APPLICATION OF REMOTE SENSING IN THE DETERMINATION OF WATER QUALITY IN NEBRASKA RESERVOIRS,
Nebraska Univ., Lincoln. School of Life Sciences.
For primary bibliographic entry see Field 5A.
W78-04231

AUTOMATED GREAT LAKES WAVE FORECASTS,
National Weather Service, Silver Spring, MD. Techniques Development Lab.
N. A. Pore.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 854 Price codes: A02 in paper copy, A01 in microfiche. NOAA Technical Memorandum NWS TDL-63, February 1977. 15 p, 11 fig, 7 ref

Descriptors: *Great Lakes, *Waves(Water), *Forecasting, Winds, Weather, Lakes, Storms, Mathematical models, Weather forecasting, Ships, Navigation, Meteorology, Limnology, *Wave forecasting.

The Techniques Development Laboratory of the National Weather Service began making automated wave forecasts for the Great Lakes in January 1975. These forecasts are based on specialized wind forecasts and the wave forecast method of Bretschneider. Possible fetch lengths are measured at 15 deg intervals and are adjusted for fetch width. Duration time is determined by examining the forecast wind directions for a 45 deg change. Forecasts of wave height are made twice daily and extend to 36 hr at 12-hr intervals. These forecasts are transmitted by teletypewriter and are used operationally by Weather Service Forecast Offices in the Great Lakes area. (Sims-ISWS)
W78-04235

SEASONAL DISTRIBUTION AND ABUNDANCE OF FISHES IN THE LITTORAL ZONE OF A MICHIGAN LAKE,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station; and Michigan State Univ., Hickory Corners. Dept. of Zoology.
D. J. Hall, and E. E. Werner.
Transactions of the American Fisheries Society, Vol. 106, No. 6, 1977, p 545-555, 3 fig, 6 tab, 26 ref. NSF BMS 74-09013 A01.

Descriptors: Environmental effects, *Seasonal fish, Lakes, *Lawrence Lake(Mich), Michigan, *Distribution, Ecology, Habitats, *Temperature, *Foods chain, Food abundance, *Littoral.

The littoral zone fishes in Lawrence Lake were found to undergo significant seasonal movements which were correlated with seasonally changing food levels and vegetation development. Seasonal temperature changes set the larger bounds on the movements and the habitats utilized, but ecological interactions appeared to be responsible for the finer resolution of microhabitat utilization among size classes and species. All species exhibited less habitat segregation under conditions of warmer temperatures and abundant food. (Chilton-ORNL)
W78-04240

TRACE METAL CONTAMINATION OF BLUEGILL (LEPOMIS MACROCHIRUS) FROM TWO INDIANA LAKES,
Prudue Univ., Lafayette, IN. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5C.
W78-04243

VARIATIONS IN THE VEGETATION OF NORTHWEST GERMAN MOORLAND PONDS, (IN GERMAN),
Landesmuseum fuer Naturkunde, Muenster (West Germany).
F. Runge.
Abh Naturwiss Ver Bremem. 37(3/4), p 421-428, 1974.

Descriptors: *Moorland ponds(Northwest Germany), *Plant growth, Betula-Spp, Climates, Deschampsia-setacea, Drosera-rotundifolia, Eleocharis-multicaulis, Equisetum-limosum, Evaporation, Hydrocotyle-vulgaris, Hypericum-elodes, Juncus-bulbosus, Littorella-uniflora, Molinia-coerulea, Polygonum-spp, *Ponds, Sphagnum-auriculatum, Sphagnum-spp, *Vegetation, *Water level.

These ponds average only a few decimeters in depth and the water level varies according to precipitation and evaporation. In droughts they sometimes dry up entirely. Plant associations grow on sand or on mud and peat. Isoeto-Lobietum are most numerous in this region. The covering percentage of Eleocharis multicaulis, Hypericum elodes, Hydrocotyle vulgaris, Juncus bulbosus, Drosera rotundifolis, Molinia coerulea, Betula seedlings and Sphagnum auriculatum was compared with the water level variations from 1960-1965. At another location, the same comparision was made with the covering percentage of E. multicaulis, H. elodes, Deschampsia setacea, Littorella uniflora, J. bulbosus, H. vulgaris, Equisetum limosum, Polygonum seedlings and S. auriculatum.--Copyright 1975, Biological Abstracts, Inc.
W78-04244

WATER-QUALITY EFFECTS ON BAKER LAKE OF RECENT VOLCANIC ACTIVITY AT MOUNT BAKER, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-04260

ZOOBENTHOS OF THE SOLIGORSK RESERVOIR, (IN BELORUSSIAN),
Akademiya Navuk BSSR, Minsk. Dept. of Zoology and Parasitology.
T. I. Nyakhayeva.
Vyestsi Akad Navuk BSSR Syer Biyal Navuk. 5, p 110-113, 1974.

Descriptors: Belorussian-SSR, *Benthos, *Biomass, Reservoirs, *Seasonal, *USSR(Soligorsh Reservoir), *Zoobenthos.

The qualitative and quantitative composition of zoobenthos of the Soligorsk Reservoir in the Minsk district of the Belorussian SSR (USSR), the quantitative indices from May-Aug., and the distribution in various areas of the reservoir are given. The average seasonal biomass of benthos in 1972 was 21.52 g/m2.--Copyright 1975, Biological Abstracts, Inc.
W78-04283

HEAT CONTENT OF LAKE ONTARIO AND ESTIMATES OF AVERAGE SURFACE HEAT FLUXES DURING IFYGL,
Canada Centre for Inland Waters, Burlington (Ontario).
F. M. Boyce, W. J. Moody, and B. L. Killins.
Technical Bulletin No 101, 1977. 120 p, 12 fig, 12 tab, 11 ref, 6 append.

Descriptors: *Heat, *Heat flow, *Fluctuations, *Convection, Average, Rivers, Streams, Rain, Snow, Ice, Melting, Industrial wastes, Municipal waste, Great Lakes, *Lake Ontario, *Surface heat, Energy Balance Program.

This report is a contribution to the Energy Balance Program of The International Field Year on the Great Lakes. The net heat flux across the surface of Lake Ontario from April 1972 until June 1973 is estimated using data from 46 ship cruises and measurements of river temperatures and discharges. An effort has been made to compute the degree of uncertainty attached to the heat flux values. Results are given in graphical and tabular form; the latter are interpolated to standard weekly intervals. (WATDOC)
W78-04355

THE EUTROPHIC POTENTIAL OF WAHIAWA RESERVOIR SEDIMENTS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5C.
W78-04366

METHANE IN LAKE ERIE: ANALYSIS OF MECHANISMS OF PRODUCTION AND OF AMOUNTS PRODUCED,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W78-04373

THE CHEMICAL CONDITIONS OF THE WATER IN LAKE KAVSJON, (IN SWEDISH),
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-04434

PROCESSING LAKES WITH DAMAGED ECOSYSTEMS (IN GERMAN),
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-04436

STRATIGRAPHY AND EVOLUTION OF BOGS IN MIRE TERRITORY OF THE RIGHT-BANK FOREST-STEPPE, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Dept. of Geobotany and Palebotany.
A. I. Kuz'Mychov.
Ukr Bot Zh. 31(5), p 594-599, 1974.

Descriptors: Alder, Bank, *Bogs, *Evolution, Forests, Minerals, Mire, Nutrition, Pine, Reed, Steppe, *Stratigraphy, *Swamps, *Ukrainian-SSR, USSR, Eutrophication.

The mire area of the Right-Bank Forest-Steppe (Ukrainian SSR, USSR) is situated in the Dnieper Upland with sharp relief. The bogs appeared here in the valley-ravine network, sometimes on the pine-forest terrace and in the sand interfluves. Reed peat prevails in the peat bogs; the alder-reed and sedge-reed types of peat are rare. The peats differ in ash content. The red peat accumulation is most widely distributed, the swampy-forest and multilayer-swampy accumulations occur less frequently. Reed dominated in the plant cover at the initial stage of paludification of the valley peat bogs. In the bog terraces, development began from the forest alder stage with a prevalence of reed in the peat cover. Paludification in young postglacial, strongly entrenched ravines also began from the forest stage. The following stages of bog development depended on the degree of flow and flooding. Mineral nutrition was not decisively important as it was maintained at a rather high level. In certain bogs of the Right Bank Forest-Steppe, in the southern steppe belt in particular, where aqueous nutrition was unchanged, reed always dominated. At present the bogs in the valley-ravine network are at the eutrophic stage of development. As a result of economic activity and erosion part of the peat bogs, especially ravine bogs are covered with mineral drift.--Copyright 1975, Biological Abstracts, Inc.
W78-04475

POPULATION OF BENTHIC MACROINVERTEBRATES IN HAM'S LAKE,
Oklahoma State Univ., Stillwater. School of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-04493

LAKE CIRCULATION INDUCED BY DENSITY CURRENTS: AN EXPERIMENTAL APPROACH,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Geologisches Inst.
A. M. Lambert, and S. M. Luthi.
Sedimentology, Vol. 24, No. 5, p 735-741, October 1977. 3 fig, 2 tab, 13 ref.

Descriptors: *Density currents, *Lakes, *Water circulation, *Laboratory tests, Hydraulic models, Movement, Measurement, Currents(Water), Tracking techniques, Supercritical flow, Subcritical flow, Velocity, Profiles, Analytical techniques, Methodology, Data collections, Foreign research, Foreign countries, Tracers, Underflow, *Switzerland.

This short note reported a series of density current experiments designed to model turbidity underflows caused by flood-stage discharge of lake-tributaries. In a 5.8 m long tank filled with freshwater, saltwater was fed in continuously, flowing down a 15 deg 'delta' slope onto a horizontal floor. These density currents maintained steady-state characteristics. The main objectives of this investigation were to determine: (1) the flow regime of the density currents, and (2) the under-flow-induced movements in the freshwater. Reynolds numbers for 35 runs ranged from 70 to 4100. Experiments with laminar flow reproduced kinematic (Froudian) models of underflows measured in the Walensee (Switzerland). Flow was supercritical on the slope and subcritical on the floor. Turbulent flow experiments yielded velocity profiles (with a maximum at the flow interface) which approximate natural conditions. Movements in formerly stagnant water body are induced by interfacial shear stress: a layer of freshwater is dragged along by the density current and replaced by the backward flow of an equal amount of overlying water (mass conservation). Extrapolated to a natural setting, circulation induced by underflows is probably an important mechanism for oxygenating deep lacustrine basins. (Humphreys-ISWS)
W78-04505

UNUSUAL RESPONSE OF A CUPRIC ION ELECTRODE IN PRAIRIE LAKE WATERS,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W78-04527

THE MORPHOMETRY, BENTHOS AND SEDIMENTATION RATES OF A FLOODPLAIN LAKE IN POOL 9 OF THE UPPER MISSISSIPPI RIVER,
Luther Coll., Decorah, IO. Dept. of Biology.
J. W. Eckblad, N. L. Peterson, K. Ostlie, and A. Temte.
American Midland Naturalist, Vol 97, No 2, p 433-443. 1977. 2 fig, 5 tab, 21 ref.

Descriptors: *Wetlands, *Flood plains, *Sedimentation rates, *Rooted aquatic plants, *Benthic fauna, *Ecological distribution, Backwater, Lakes, Sedimentation, Aquatic plants, Floating plants, Aquatic animals, Invertebrates, Clams, Aquatic insects, Aquatic habitats, Biomass, Dominant organisms, Productivity, Mississippi River, *Lake sediments, *Sagittaria, Sphaerium, Hexagenic, *Big Lake(Iowa), Macroinvertebrate abundance, Backwater lake.

Big Lake is a shallow (mean depth 0.89 m) 256-ha backwater lake on the Mississippi River floodplain. Between 1896 and 1973 about 76 cm of sediment had accumulated in the original basin with a recent sedimentation rate of 1.7 cm/year. The calculated annual reduction in lake volume is 37,400 cu m/year giving the lake a projected life span of 61 years. About 16 percent of the surface area is covered by emergent stands of Sagittaria which extend out to a depth of 0.3 m. With a projected decreased depth accompanying sedimentaion, there should be continued expansion of the Sagittaria stands; a similar expansion would also be expected for floating Nulumbo lutea and Nymphaea odorata which are also common. Sphaerium and Hexegenia were the dominant macroinvertebrate taxa making up 81 percent of the biomass. Both taxa showed greatly reduced abundance and biomass among the Sagittaria stands. As Sagittaria continues to encroach on the open water, the present macroinvertebrate dominance will likely shift to a dominance of Chironomidae, Oligochaeta and Gastropoda which will also influence organisms at higher trophic levels. (Steiner-Mass)

W78-04537

HYDROLOGY OF TWO SMALL WETLAND BASINS IN EASTERN MASSACHUSETTS,
Lowell Univ., MA. Dept. of Earth Sciences.
A. L. O'Brien.
Water Resources Bulletin, Vol 13, No 2, p 325-340, April, 1977. 10 fig, 3 tab, 11 ref.

Descriptors: *Wetlands, *Hydrologic budget, *Discharge(Water), *Evapotranspiration, *Streamflow, *Peat, Freshwater marshes, Hydrology, Groundwater, Recharge, Base flow, Groundwater basins, Surface drainage, Surface-groundwater relationships, Marshes, Muck soils, *Massachusetts, *Swamps.

A hydrologic budget was prepared for two geologically different wetland basins in Eastern Massachusetts for the 1971 water-year. Water table conditions prevailed at one wetland underlain by peat while an artesian system functioned at the other wetland which was underlain by muck. Hydrologic responses were generally similar at both wetlands, although each functioned differently in detail. Both wetlands exhibited high spring discharges and depressions of low flow. Ground water accounted for an estimated 93 percent of the total annual discharge from both wetlands; in late summer the peat deposit recharged the regional groundwater body. Evapotranspiration in the spring was retarded in probable consequence of extreme wetness of the wetland soils. (Steiner-Mass)
W78-04539

PALEOECOLOGICAL ASPECTS OF THE RED LAKE PEATLAND, NORTHERN MINNESOTA,
Oslo Univ. (Norwich). Inst. of Geology.
K. O. Griffin.
Canadian Journal of Botany, Vol 55, p 172-192, 1977. 9 fig, 64 ref.

Descriptors: *Wetlands, *Bogs, *Peat, *Stratigraphy, *Succession, *Pollen, Marshes, Freshwater marshes, Fens, Humus, Soil formation, Radioactive dating, History, *Minnesota, Aquatic plants, Marsh plants, Cattails, Environmental effects, Distribution patterns, Sediments, Biological communities, Environmental gradient, Mixed forests, Forests, Grasslands, Core drilling, *Paleoecology, *Red Lake Peatland(Minn), Lake Agassiz plain(Minn).

The Red Lake Peatland, situated on the eastern arm of the Lake Agassiz plain, is composed of large black spruce raised bogs separated by sedge-covered water tracks, and teardrop-shaped forested islands. About 3 m of peat overlie a prairie soil: the basal peat is 3170 plus or minus 100 years old (C14 date). Stratigraphic distribution of pollen, macrofossils, and peat components along a small forested island was used to study the peatland development. In pollen zone 1 (lowest) the upland pollen types suggest an oak savanna with a developing mesic deciduous forest. The local pollen indicates a succession from a Typha marsh to a sedge meadow. Zone 2 shows a small rise in Pinus pollen: Ericaceae pollen and Sphagnum spores indicate the development of the bog-heath vegetation type at the site. An increase in pollen of spruce and larch marks the island forest establishment. Zone 3 (upper) is marked by a rise in Ambrosia pollen, recording agricultural land clearance in northwestern Minnesota about 1890. The upward succession of communities observed can be duplicated along a west-to-east surface traverse across the present prairie-forest transition. The stratigraphic succession thus records the westward movement of the prairie-forest transition. (Steiner-Mass)
W78-04544

PHOSPHORUS ACCUMULATION--DISCHARGE CYCLES IN MARSHES,
Wisconsin Univ.-Oshkosh. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-04545

COASTAL WETLANDS ALONG LAKE ONTARIO AND THE ST. LAWRENCE RIVER IN JEFFERSON COUNTY, NEW YORK,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
J. W. Geis, and J. L. Kee.
August, 1977, 130 p. 2 fig, 46 tab, 24 ref, 41 maps.

Descriptors: *Lake Ontario, *St Lawrence River, *Wetlands, Freshwater marshes, Lake shores, Maps, Evaluation, *New York, *Classification, Surveys, Jefferson Co(NY), Cover types.

Individual wetlands of more than 25 acres were located on panchromatic aerial photography and low elevation color photography. A system of vegetative cover description and mapping was developed for lake-level influenced wetlands in Jefferson Co., New York and applied to 41 wetlands ranging in size from 5.9 to 1007.4 acres. Descriptions of individual wetlands include location, cover types present and the area of each type, and a map. Enhancement potential is noted. A table briefly characterizes 59 smaller wetlands. Two wetland evaluation systems developed by Golet and the New York State Department of Environmental Conservation were applied to the wetlands. Scores of the two systems showed a weak positive correlation. The over 769 acres of recently killed wetland vegetation found in the larger shoreline wetlands were apparently due to high water levels during 1972-1974. (Stihler-Mass)
W78-04546

THE GREAT LAKES CLEANUP,
International Joint Commission-United States and Canada. Great Lakes Regional Office.
For primary bibliographic entry see Field 5G.
W78-04586

A TAXONOMIC AND ECOLOGICAL STUDY OF SOME ALGAE IN TWO PONDS IN SOUTH SHELBY COUNTY, TENNESSEE,
Memphis State Univ., TN.
M. P. Brown.
J Tenn Acad Sci. 49(1), p 9-10, 1974.

Descriptors: *Algae, *Cyanophyta, Ecological distribution, Physicochemical studies, Ponds, Taxonomic studies, *Tennessee.

Two ponds in south Shelby County, Tennessee, were compared with respect to algal flora and ecology. Thirty-nine genera of algae (Cyanophyta and other groups) were collected and identified and observations were made regarding the physical and chemical conditions in which they were found.--Copyright 1975, Biological Abstracts, Inc.
W78-04663

RELATIONSHIPS OF FISH YIELD TO LAKE PHYTOPLANKTON STANDING CROP, PRODUCTION AND MORPHOEDAPHIC FACTORS,
Cornell Univ., Ithaca, NY. Dept. of Natural Resources.
R. T. Oglesby.
Journal of the Fisheries Research Board of Canada, Vol. 34, 1977, p 2271-2279, 4 fig, 2 tab, 42 ref.

Descriptors: *Model studies, Ecology, Fish management, Lakes, Fish, *Phytoplankton, *Standing crops, *Primary productivity, *Morphoedaphic index.

The study makes use of models in the form of log-log regressions to relate fish yield to annual primary production, summer phytoplankton standing crop, and the morphoedaphic index for a wide variety of lake types. It was found that models which are based upon fish yield as a function of phytoplankton production or standing crop are more accurate than those related to morphoedaphic factors. It was suggested that existing fishery management approaches might be supplemented by the use of expectation-variability diagrams to obtain an overview of the problem, selection of an appropriate model to predict yield, prediction of a range of yields, and implementation of regulations which have proved successful for other lakes in the same yield category. (Chilton-ORNL)
W78-04667

AIRCRAFT AND SATELLITE MONITORING OF LAKE SUPERIOR POLLUTION SOURCES,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W78-04695

ENVIRONMENTAL MONITORING NEEDS IN REGION V,
Environmental Protection Agency, Chicago, IL. Region V.
For primary bibliographic entry see Field 5A.
W78-04698

2I. Water In Plants

CERTAIN FEATURES OF THE STRUCTURE OF FRESHWATER PHYTOPHILOUS INVERTEBRATE COMMUNITIES, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
L. N. Zimbalevskaya.
Gidrobiol Zh. 10(6), p 38-46, 1974.

Descriptors: *Freshwater invertebrate, *Metabolism, *Phytophilous invertebrates, *Respiration, Aquatic animals, Biomass.

When ranking species in communities of phytophilous invertebrates by magnitude of respiratory metabolism, an alternation of species with different modes of nutrition and with size differences is observed which may be considered manifestation of the degree of communities structure. An inverse relationship between invertebrate numbers and their size is established. Variation indices correlate with relative indices of species' predominance according to biomass.--Copyright 1975, Biological Abstracts, Inc.
W78-04239

EFFECT OF MOWING TIMES ON REGENERATION OF REED AND REEDMACE GROWTHS, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Rostov-na. Donu (USSR).
For primary bibliographic entry see Field 4A.
W78-04524

GROWTH RESPONSES OF COASTAL HALOPHYTES TO INORGANIC NITROGEN,
University of East Anglia, Norwich (England). School of Biological Sciences.
For primary bibliographic entry see Field 2L.
W78-04542

THE VEGETATION OF SALT MARSHES AT SOME COASTAL SITES IN ARCTIC NORTH AMERICA,
Toronto Univ. (Ontario). Dept. of Botany.
For primary bibliographic entry see Field 2L.
W78-04543

EVALUATION OF THE POLLUTION AND DROUGHT HYPOTHESES IN RELATION TO

LICHENS AND BRYOPHYTES IN URBAN ENVIRONMENTS,
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-04635

MOVEMENT OF MERCURY-203 IN PLANTS,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5B.
W78-04658

THE STUDY OF PARASITISM IN SIMULIDS (DIPTERA) BY THE MERMITHIDAE (NEMATODA) IN WEST AFRICA: PRELIMINARY OBSERVATIONS ON A TEMPORARY (SEASONAL) STREAM IN THE SAVANNA, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, Abidjan (Ivory Coast).
B. Mondet, B. Pendriez, and J. Bernadou.
Cah O R S T O M Ser Entomol Med Parasitol 14(2), p 141-150, 1976.

Descriptors: *Africa, *Diptera, Gastromermis-sp, *Mermithidae(Parasites), *Nematoda, Neomesomermis-sp, *Parasitism, Savannas, Seasonal, *Simuliids, Simulium-damnosum, Streams, West Africa.

Research on mermithid parasites of West African simuliids (larvae, pupae and adults) indicated that there were 5 spp. from the genera Neomesomermis, Gastromermis and a new (unnamed, undescribed) genus. All the species of Simuliidae found in the same breeding site as Simulium damnosum were parasitized by these mermithids and none were specific. New species of the new genus parasitic in S. damnosum are dealt with. Three stages were observed in the parasitic development of these mermithids. The maximum size attained by males was 10.2 mm and by females 16.2 mm. The highest number of mermithids found in a single Simulium larvae was 8. Larvae parasitized in the early instars always died before pupating and the parasites emerged through the cuticle. Larvae newly parasitized in the later instars normally pupated before the mermithid had completed development. Parasitized pupae reached eclosion. The main consequences of parasitism in female S. damnosum were atrophy of the ovaries in 98.9% of individuals, and about half the longevity as compared to non-parasitized females when both were held in the laboratory. The rate of parasitism in an isolated population of S. damnosum females was followed during the rainy season. Three phases are clearly defined in the evolution of the parasitism: a period of appearance, a period of marked increase and a period of maintenance at a high level. The incidence of parasitism in the final period was 75-80% of nulliparous females and 20-35% of the entire population.--Copyright 1977, Biological Abstracts, Inc.
W78-04672

2J. Erosion and Sedimentation

PHYSICAL AND CONCEPTUAL SIMULATION OF EFFLUENTS FROM DREDGED MATERIAL CONFINEMENT FACILITIES,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04203

RANGE, VELOCITY, AND MATERIAL FLUX OF COMPACTION FLOW IN GROWING SEDIMENTARY SEQUENCES,
Tuebingen Univ. (West Germany). Geologisch-Palaontologisches Inst.
G. Einsele.
Sedimentology, Vol. 24, No. 5, p 639-655, October 1977. 7 fig, 1 tab, 25 ref.

Descriptors: *Sediment transport, *Flow, *Velocity, *Ranges, Sedimentation rate, Erosion, Diffusion, Streamflow, Hydrology, Clays, Compaction, Material flux, Sedimentary sequences, Sediment-water interface, Compaction flow.

In growing sedimentary sequences, range and velocity of vertically ascending pore water (advection) can be determined quantitatively by using a simple graphical method. During continuing deposition and maintenance of compaction equilibrium, the pore water from deeper layers cannot reach the sediment-water interface. Range and velocity of advective flow decrease from top to bottom of a sequence and depend on the thickness affected by compaction. The velocity of pore water flow as well as the transport of solutes by advective flux are proportional to the sedimentation rate. Compaction flow also can result from underconsolidation and diagenetic reduction of pore space. At the sediment-water interface, a direct contact between the ascending pore water and the overlying water is feasible only under special conditions (interrupted sedimentation over underconsolidated material, erosion). These results were demonstrated on geometric models of sedimentary sequences, on experimentally deposited clay, and on selected examples of the Deep Sea Drilling Project. (Lee-ISWS)
W78-04209

SIGNIFICANCE OF CM DIAGRAMS OF SEDIMENTS DEPOSITED BY SUSPENSIONS,
R. Possega.
Sedimentology, Vol. 24, No. 5, p 723-733, October 1977. 3 fig, 10 ref.

Descriptors: *Graphical methods, *Particle size, *Deposition(Sediments), *Sedimentation, Environment, Currents(Water), Turbulence, Suspended load, Classification, Detritus, Indicators, Correlation analysis, *Parameters, *CM diagrams, Bottom turbulence.

CM grain-size diagrams of clastic deposits were introduced in 1957. Since that time a large number of diagrams representing most environments were constructed. Discussions of parameters C and M showed that these parameters are indicators of hydraulic conditions under which sediments were deposited. In a 1975 paper Vandenberghe discussed the CM diagram of the Boom Clay, Belgium, and concluded that CM diagrams gave indications on the mechanism of sediment deposition. In order to answer Vandenberghe's assertions, the writer systematically compared the numerous CM diagrams representing suspension deposits with the characteristics of the environments. Result of this comparison was that CM diagrams give coherent indications on deposition which agree with the known environment characteristics. The Boom Clay diagram is no exception. Another result of the present study was that, in environments as a whole, two types of currents can be recognized, distinguished by the relation between bottom turbulence and grain-size of sediment in suspension. Deposits of these two current types and distribution of bottom turbulence are indicated by CM diagrams. Characteristics of these currents vary with the environment and help the reconstruction of ancient environments. (Visocky-ISWS)
W78-04210

CHANNEL EROSION SURVEYS ALONG TAPS ROUTE, ALASKA, 1976,
Geological Survey, Anchorage, AL. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-04259

SUSPENDED SEDIMENT FLUX THROUGH A SALT MARSH DRAINAGE BASIN,
Auburn Univ., AL. Dept. of Geology; and Auburn Univ., AL. Environmental Office.
For primary bibliographic entry see Field 2L.
W78-04333

THE EFFECT OF SOIL MOISTURE ON RESISTANCE TO WIND EROSION, (IN RUSSIAN),
Akademiya Nauk Uzbekskoi SSR, Tashkent. Inst. of Mechanical Seismic Resistant Construction.
For primary bibliographic entry see Field 2G.
W78-04337

A RADIOTRACER TECHNIQUE FOR MEASURING SEDIMENT MOVEMENT,
Canada Centre for Inland Waters, Burlington (Ontario).
R. W. Durham, and R. J. Goble.
Scientific Series No. 80, 1977. 16 p, 11 fig, 5 ref.

Descriptors: *Sediment load, *Measurement, Technology, *Tracers, *Radioactivity, Movement, Erosion, Erosion control, Instrumentation, *Sediment transport.

A technique for measuring the direction of movement of sandy sediments by means of a radiotracer is described. An artificial sediment fabricated from glass containing a small percentage of arsenic is irradiated in a nuclear reactor to produce sup 76AS (T.5 equals 26.4 hr). This material is then inserted into the particular sediment to be studied and its movement followed by monitoring the 560-keV gamma-ray emission with a submersible NaI detector. A test of the method at Point Pelee on the north shore of Lake Erie with 140 g of artificial sediment containing 180 mCi of sup 76AS demonstrated that the redistribution of the radioactive material by the bottom current could be readily followed for at least three days after insertion. (WATDOC)
W78-04344

HYDROLOGIC FACTORS AND ENVIRONMENTAL IMPACTS OF MASS SOIL MOVEMENTS IN THE OREGON COAST RANGE,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
For primary bibliographic entry see Field 4D.
W78-04365

GRAVELLY FLOOD DEPOSITS OF IRVINE CREEK, ONTARIO, CANADA,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
I. P. Martini.
Sedimentology, Vol. 24, No. 5, p 603-622, October 1977. 10 fig, 1 tab, 42 ref.

Descriptors: *Floods, *Canada, *Deposition(Sediments), *Gravels, Bed load, Flash floods, Sand bars, Sediment transport, Sedimentation, Sedimentation rate, Sands, River beds, Runoff, Hydrology, *Riffle bars, Gravel deposits, Fine pebbles, *Irvine Creek(Ont).

In May 1974 a powerful flood flushed the Grand River basin, Ontario. The effects on the bedload were drastic in a narrow (30 m) and deep (40 m) rock walled and floored gorge near Elora, Ontario. Along Irvine Creek, the tributary occupying the gorge, the gravel cover was reworked in several types of bars, predominantly transverse and point bars. The bars formed very rapidly in response to essentially steady, non-uniform flow that developed during a brief period of high flood. Superimposed on major bars are several minor sedimentary features such as coarse transverse ribs, chute channels and bars, longitudinal ribs, imbrication clusters, backsets with well developed imbrication, that were formed under very high stream discharge. Structures like imbrication clusters, transverse ribs, and small riffle bars require a 'live bed' situation to form, and they develop when stones come to a stop either because they cluster during transport or because keystone effects occur along shallow channels. In Irvine Creek, very few sedimentary features were

formed during waning and low flood stages: only some shadow deposits and a few Ostler lenses. The few fines that were available were lost downstream or filled in lower parts of gravel beds. This study confirmed that in streams that experience strong seasonal fluctuations in discharge, bedforms that develop during high floods have a high probability of preservation. In gravelly deposits, foreset structures and plane beds are preserved most commonly, although they may be difficult to recognize in old deposits, which may appear massive, particularly if the gravel has been infilled with finer pebbles and sand. In the case of Irvine Creek, all deposits are organized, and lateral and vertical variations in textures, particularly imbrication and packing, are very useful in the recognition of sedimentary structures. (Lee-ISWS)
W78-04503

THE SLIDING BED FACIES IN ESKER SANDS AND GRAVELS: A CRITERION FOR FULL-PIPE (TUNNEL) FLOW,
Wilfrid Laurier Univ., Waterloo (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 8B.
W78-04504

THE ROLE OF VORTICITY IN DEVELOPING LINEATION BY WIND EROSION,
Central Michigan Univ., Mount Pleasant.
M. I. Whitney.
Geological Society of America Bulletin, Vol. 89, No. 1, p 1-18, January 1978. 9 fig, 10 ref.

Descriptors: *Wind erosion, *Erosion, *Boundary processes, *Michigan, On-site investigations, Laboratory tests, Geomorphology, Flow, Topography, Air-earth interfaces, Abrasion, Shape, Sands, Rocks, Movement, Snow, Ripple marks, Distribution patterns, Vortices, Wind blasting, Lineations, Secondary flow.

Experiments and field observations from a 15-yr investigation indicated that both the gross shaping and the sculpturing of lineation and pit details on wind-eroded surfaces may be accomplished by interfacial flow or by vorticity. The vorticity operates along lines of positive, negative, and secondary flow over all surfaces of an object. The axis of vorticity is typically normal to or at some high angle to the surface undergoing erosion. Therefore, it is not the so-called roller vortex type which has been postulated by other investigators, for one typical erosion pattern left abundantly by the vortex configuration is a round pit either helically or radically scored. Often such pits occur in chains along the beds of the lineation, which was observed in development in snow flutes under influence of normal-axis vortices. Such vortices travel singly along lines of flow, pulling particles centripetally into the vortex configurations. In snow flutes, for example, vortices become visible due to suspended snow, and the secondary flow can be delineated. Where general windflow is essentially unidirectional, the erosional result of such vorticity is the creation of cross-lineated, essentially symmetrical grooves. (Humphreys-ISWS)
W78-04517

MINIMUM STREAM POWER FOR RIVERS AND DELTAS,
San Diego State Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-04519

DESICCATION AND CONSOLIDATION OF DREDGED MATERIALS,
Northwestern Univ., Evanston, IL. Technological Inst.
For primary bibliographic entry see Field 5G.
W78-04525

THE MORPHOMETRY, BENTHOS AND SEDIMENTATION RATES OF A FLOODPLAIN LAKE IN POOL 9 OF THE UPPER MISSISSIPPI RIVER,
Luther Coll., Decorah, IO. Dept. of Biology.
For primary bibliographic entry see Field 2H.
W78-04537

2K. Chemical Processes

CHEMICAL COMPOSITION OF SNOW ON THE WATER SURFACE OF THE KAMA AND VOTKINSK RESERVOIRS,
Perm State Univ. (USSR). Lab. of Water Management Research.
For primary bibliographic entry see Field 2C.
W78-04222

ANALYSES OF NATIVE WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED FROM THE ATCHAFALAYA RIVER AND ATCHAFALAYA BAY,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-04245

ON THE WATER EXAMINATIONS OF THE RIVERS AT THE PIEDMONT DISTRICT OF MT. TOKACHI IN AND AROUND KAMIFURANO CHO, (IN JAPANESE),
Obihiro Zootechnical Univ. (Japan). Dept. of Veterinary and Public Health.
For primary bibliographic entry see Field 5B.
W78-04313

RELATIONSHIPS BETWEEN WATER CHEMISTRY AND PRIMARY PRODUCTS IN STREAMS, A LIMNOLOGIC PROBLEM, (IN GERMAN),
Zurich Univ. (Switzerland). Inst. fuer Pflanzenbiologie.
For primary bibliographic entry see Field 5C.
W78-04339

MOBILITY OF HEAVY METAL HUMATES IN SOILS AND SURFACE WATERS,
Missouri Univ., Rolla. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W78-04494

PROBLEMS WITH THE USE OF ULTRAVIOLET ABSORPTION FOR MEASURING CARBON COMPOUNDS IN A RIVER SYSTEM,
Durham Univ. (England). Dept. of Botany.
For primary bibliographic entry see Field 5A.
W78-04513

MODEL DDO/MARK V DIGITAL DISSOLVED OXYGEN ANALYZER.
National Oceanographic Instrumentation Center, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04547

BECKMAN FIELDLAB DISSOLVED OXYGEN SYSTEM.
National Oceanographic Instrumentation Center, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04548

DISSOLVED OXYGEN ANALYZER MODEL 330.
National Oceanographic Instrumentation Center, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04549

IRON AND PHOSPHORUS INTERACTION IN CALCAREOUS SOILS: I. EFFECT ON GROWTH, PHOSPHORUS, AND IRON CONTENT OF PLANT,
Ain Shams Univ., Cairo (Egypt). Dept. of Soils
For primary bibliographic entry see Field 2G
W78-04671

2L. Estuaries

WAVE PERIOD EFFECT ON THE STABILITY OF RIPRAP,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-04214

FEASIBILITY STUDY FOR DYKE MARSH DEMONSTRATION AREA, POTOMAC RIVER, VIRGINIA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 4A.
W78-04216

DISPERSION OF PROPOSED THEODORE INDUSTRIAL PARK EFFLUENTS IN MOBILE BAY, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 5B.
W78-04229

WAVE ATTENUATION BY ARTIFICIAL SEAWEED,
Coastal Engineering Research Center, Fort Belvoir, VA.
J. Ahrens.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 274, Price codes: A02 in paper copy, A01 in microfiche. Miscellaneous Report No. 76-9, June 1976. 13 p, 4 fig, 2 tab, 7 ref.

Descriptors: *Shore protection, *Waves(Water), *Laboratory tests, Ocean waves, Coasts, Beaches, Shores, Coastal engineering, *Artificial seaweed, *Wave attenuation, Wave tank tests.

A series of wave tank tests was conducted at the Army Coastal Engineering Research Center (CERC) to determine the ability of a field of low specific gravity artificial seaweed to attenuate wave action. Wave gages were located on both sides of the seaweed field to measure wave attenuation. The field consisted of seven rows of seaweed with the rows spaced 3m (10 ft) apart. Ten distinct wave conditions were tested using periods ranging from 2.6 to 8.2 sec and wave heights from 0.24 to 1.1 m (0.8 to 3.6 ft). The still-water depth for all tests was 2.4(m)(8 ft). There was a measureable level of wave attenuation for only the shortest period, 2.6 sec. For the 2.6-sec period, the reduction in wave height on passing through the seaweed field was about 12%. (Sims-ISWS)
W78-04232

GROUND-WATER RESOURCES OF THE RIVIERA BEACH AREA, PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04247

SALINE-WATER INTRUSION IN THE FLORIDAN AQUIFER IN THE FERNANDINA BEACH AREA, NASSAU COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.

W78-04248

DIGITAL FLOW MODEL OF THE CHOWAN RIVER ESTUARY, NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
C. C. Daniel, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 286, Price codes: A05 in paper copy, A01 in microfiche. Water Resources Investigations 77-63, August 1977. 84 p, 22 fig, 3 tab, 25 ref.

Descriptors: *Streamflow, *Estuaries, *North Carolina, *Computer models, *Tidal effects, Continuity equation, Streamflow, Flow rates, River basins, Tributaries, Virginia, Data collections, Marshes, Evapotranspiration, Evaporation, Rainfall, Wind tides, *Chowan River basin(NC), Blackwater River, Nottoway River, Meherrin River, Wiccacon River, Upstream tidal-flow rates.

A one-dimensional deterministic flow model based on the continuity equation had been developed to provide estimates of daily flow past a number of points on the Chowan River estuary of northeast North Carolina. The digital model, programmed in Fortran IV, computes daily average discharge for nine sites; four of these represent inflow at the mouths of major tributaries, the five other sites are at stage stations along the estuary. Because flows within the Chowan River and the lower reaches of its tributaries are tidally affected, flows occur in both upstream and downstream directions. The period of record generated by the model extends from April 1, 1974, to March 31, 1976. During the two years of model operation the average discharge at Edenhouse near the mouth of the estuary was 5,830 cfs (cubic feet per second). Daily average flows during this period ranged from 55,900 cfs in the downstream direction on July 17, 1975, to 14,200 cfs in the upstream direction on November 30, 1974. (Woodard-USGS)
W78-04250

SUBMARINE SEEPAGE OF NATURAL GAS IN NORTON SOUND, ALASKA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab., and Geological Survey, Seattle, WA. Geology Div.
For primary bibliographic entry see Field 5B
W78-04262

EXPENDABLE OCEANOGRAPHY PROBE,
Matsushita Electric Industrial Co., Ltd., Osaka (Japan). (Assignee).
For primary bibliographic entry see Field 7B.
W78-04317

SUSPENDED SEDIMENT FLUX THROUGH A SALT MARSH DRAINAGE BASIN,
Auburn Univ., AL. Dept. of Geology; and Auburn Univ., AL. Environmental Office.
J. L. Settlemyre, and L. R. Gardner.
Estuarine and Coastal Marine Science, Vol 5, No 5, p 653-663, September 1977. 3 fig, 2 tab, 20 ref. OWRT B-055-SC(6) and S-044-SC.

Descriptors: *Tidal marshes, *South Carolina, *Sediment transport, *Salt marshes, Watersheds(Basins), Coasts, Estuaries, Suspended solids, Organic matter, Tidal waters, Tidal effects, On-site investigations, Turbidity, *Charleston(SC).

The net transport of total suspended sediment (TSS), inorganic suspended sediment (ISS), and organic suspended sediment (OSS) was determined for a Charleston Harbor tidal creek during 25 randomly selected tidal cycles. The results indicated that the salt marsh basin exports OSS and imports ISS. Export of TSS and OSS occurs preferentially in the summer, whereas in winter, there is import of TSS and ISS and a general balance of OSS transport. On a seasonally adjusted basis, the yearly budgets for TSS, ISS, and OSS are respectively -393 g/sq m/yr, +280 g/sq m/yr, and -673 g/sq m/yr. Turbidity monitoring through tidal cycles indicated that import of TSS and ISS may occur at any time of the year when wind conditions maintain high suspensate concentrations in the final stage of flood flow. The supply of river-borne sediment to South Carolina estuaries and the rate of ISS import were compared to the theoretical sedimentation rate required for vertical marsh growth to keep pace with coastal submergence. OSS export was compared to the estimated above-ground production of Spartina for South Carolina marshland. Correspondence between the rates is significant but should not be interpreted too literally because of the assumptions and uncertainties involved in the extrapolation of data from a single sampling location to large areas. More data are needed to substantiate the quantities of sediment transport and relationships reported. (Humphreys-ISWS)
W78-04333

A THREE-DIMENSIONAL TURBULENT ENERGY MODEL FOR NONHOMOGENEOUS ESTUARIES AND COASTAL SEA SYSTEMS,
Rand Corp., Santa Monica, CA.
J. J. Leendertse, and S. K. Liu.
To be Published in: 'Hydrodynamics of Estuaries and Fjords,' included in the Elsevier Oceanography Series. Elsevier Scientific Publishing Company, Amsterdam. (1977). 18 p, 13 fig, 8 ref. OWRT C-7072(No 6231)(1).

Descriptors: *Three-dimensional flow, *Estuaries, *Mathematical models, Numerical methods, Tides, Fluid dynamics, Computer models, Coastal engineering, Development of models, Finite differences, Simulation, Unsteady flow, *Model studies.

Three-dimensional flows in water bodies with nonhomogeneous density can be computed effectively by use of a finite difference model which contains an equation of continuity, equations describing conservation of momentum, salinity, temperature, subgridscale energy, and an equation of state. In the model, vertical accelerations are neglected, but not the vertical velocities. The vertical exchange coefficients are computed from the subgridscale energy intensity. The introduction of turbulence closure by computing vertical exchange coefficients in the transport equations eliminates the necessity of evaluating exchange coefficients in the whole computation field, but rather requires the evaluation of only a few characteristic parameters. Experiments made with the model produced velocity distributions which typically occur in coastal areas.
W78-04343

THE DISTRIBUTION, COMPOSITION AND TRANSPORT OF SUSPENDED PARTICULATE MATTER IN THE NORTHEASTERN GULF OF ALASKA, SOUTHEASTERN BERING SHELF AND LOWER COOK INLET,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W78-04460

OPTIMIZATION OF AN OCEAN THERMAL ENERGY CONVERSION SYSTEM,
Swarthmore Coll., PA. Dept. of Engineering.
For primary bibliographic entry see Field 8C.
W78-04474

AN EVALUATION OF A COMPUTER SIMULATION MODEL OF PLANKTON DYNAMICS IN MONTEREY BAY,
Naval Postgraduate School, Monterey, CA.
For primary bibliographic entry see Field 5C.
W78-04480

VELOCITY FIELD INTERPOLATION IN STRATIFIED ESTUARIES USING A PSEUDO-POTENTIAL METHOD,
John Hopkins Univ., Baltimore. MD. Chesapeake Bay Inst.
J. R. Hunter.
Water Research, Vol. 11, No. 11, p 1001-1003, 1977. 6 ref.

Descriptors: *Estuaries, *Flow, *Velocity, *Mathematical models, Model studies, Equations, Turbulence, Salinity, Dynamics, Oceanography, *Pseudo-potential method, Vorticity.

A method of numerically deriving a steady-state three-dimensional velocity field from defined boundary values was described. The field is continuous and subject to certain constraints on the vorticity. The method appears to offer a suitable description of the stratified circulation in type 1 and type 2 estuaries. (Sims-ISWS)
W78-04514

MINIMUM STREAM POWER FOR RIVERS AND DELTAS,
San Diego State Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-04519

MEASUREMENT TECHNIQUES FOR COASTAL WAVES AND CURRENTS,
Coastal Engineering Research Center, Fort Belvoir, VA.
P. G. Teleki, F. R. Musialowski, and D. A. Prins.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 041, Price codes: A05 in paper copy, A01 in microfiche. Miscellaneous Report No. 76-11, November 1976. 75 p, 38 fig, 4 tab, 14 ref, append.

Descriptors: *Current meters, *Instrumentation, *Telemetry, *Waves(Water), *Ocean waves, Dye dispersion, Currents(Water), Beaches, Velocity, Tracers, *Shore processes, Sea sleds, Wave gages, Nearshore currents.

A Towed Oceanographic Data Acquisition System (TODAS) consisting of a towed platform (sea sled) with current meters and a wave gage was developed for collection of information on nearshore currents and waves. Data acquired by the sensors are telemetered to shore and digitally recorded. The system is used for real time evaluation of flow characteristics between shore and a depth of 9.14 m (30 ft). This mobile battery-operated system canbe used at remote locations. The system has been used principally in two experimental designs: (1) monitoring the distribution of longshore currents in shore-normal profiles, and (2) a combination of Eulerian-Lagrangian experiments where fixed-point metering is supported by aerial photography of diffusing dye plumes and concentration measurements of the dye tracers. (Adams-ISWS)
W78-04532

THE USE OF COLOR INFRARED IMAGERY FOR THE STUDY OF MARSH BUGGY TRACKS,
Louisiana State Univ., Baton Rouge.
C. A. Whitehurst, W. A. Blanchard, and L. N. Doiron.
Photogrammetric Engineering and Remote Sensing, Vol 43, No 8, p 1049-1050, August, 1977. 1 fig.

Descriptors: *Marsh plants, *Infrared radiation, *Environment effects, *Soil compaction, Wetlands, Roads, Coastal marshes, Aerial photography, *Remote sensing, Louisiana, *Marsh buggy tracks, *Louisiana delta plain.

The compaction of marsh vegetation and soils by wheeled or tracked vehicles used for transportation through marshes is viewed as a serious threat to the stability of coastal wetlands. Color infrared aerial photography was used to locate and quantify the extent of the marsh buggy routes through a south Louisiana marsh. The strong delineation of the land/water interface on color IR photographs makes identification of water filled tracks easier than from conventional color plates. Qualitative estimation of the growth stage of revegetated marsh buggy tracks is also possible with color IR imagery. The younger plants are light pink in color and more mature vegetation is a dark red. (Steiner-Mass)
W78-04536

THE EFFECTS ON THE VEGETATION OF THE ADDITIONS OF INORGANIC NUTRIENTS TO SALT MARSH SOILS AT STIFFKEY, NORFOLK,
University of East Anglia, Norwich (England). School of Biological Sciences.
R. L. Jefferies, and N. Perkins.
Journal of Ecology, Vol 65, p 867-882, 1977. 7 fig, 4 tab, 13 ref.

Descriptors: *Salt marshes, *Halophytes, *Nutrient requirements, *Fertilizers, *Standing crop, Wetlands, Marshes, Coastal marshes, Tidal marshes, Marsh plants, Saline salts, Nutrients, Deficient elements, Salts, Nitrogen, Nitrogen compounds, Census, Productivity, Reproduction, Drought resistance, Sampling, Vegetation, Vegetation establishment, *Stiffkey(England), Norfolk(England), Low marsh, High marsh.

Regular additions of mineral salts have been made over a 4- or 5-year period to sites in an upper marsh at Stiffkey, Norfolk, in order to examine the effects of these salts on the composition of the vegetation and to determine whether the upper marsh was deficient in nitrogen for plant growth. In other experiments 'pulses' of inorganic nitrogen (NH4(+) or NO3(-)) were added to field plots at different times during a single growing season and the standing crop of species measured. The plant communities exhibited a strong degree of constancy towards the nutritional perturbations. However, species characteristic of the low marsh and drainage channels showed small but significant increases in frequency in plots treated with inorganic nitrogen. In the same plots Limonium vulgare, Halimione portulacoides and Suaeda maritima showed an increased allocation of resources to sexual reproduction. Armeria maritima declined in frequency in the nitrogen-treated plots, probably as a result of competition. The standing crops of different species in plots treated with 'pulses' of inorganic nitrogen with one exception were not significantly different. The relatively poor response of species to the additions of nutrients reflects their adaptation to the presence of summer drought and hypersaline conditions in the upper marsh. (Steiner-Mass)
W78-04541

GROWTH RESPONSES OF COASTAL HALOPHYTES TO INORGANIC NITROGEN,
University of East Anglia, Norwich (England). School of Biological Sciences.
R. L. Jeffries
Journal of Ecology, Vol 65, p 847-865, 1977. 8 fig, 3 tab, 36 ref.

Descriptors: *Salt marshes, *Halophytes, *Nutrient requirements, *Nitrogen, *Standing crop, Wetlands, Marshes, Coastal marshes, Tidal marshes, Marsh plants, Saline soils, Nutrients, Deficient elements, Salts, Nitrogen compounds, Census, Productivity, Reproduction, Sea water, Sampling, Seasonal, Genetics, Stiffkey(England), Norfolk(England), Inorganic nitrogen.

Intra- and interspecific variation in growth response to inorganic nitrogen, NH4(+) or NO3(-), has been studied in halophytic species grown in sand culture. Populations of Aster tripolium, Plantago maritima, Salicornia europaea agg. and Triglochin maritima from the upper levels of a salt marsh at Stiffkey, Norfolk, have slower growth rates than corresponding populations from a low marsh. Populations of Aster tripolium and Plantago maritima from the upper marsh away from drainage channels grow slower than populations close to channels. Species characteristic of the low marsh such as Halimione portulacoides, Aster tripolium, and Suaeda maritima have fast growth rates compared with the rates of species abundant in the upper marsh such as Armeria maritima and Limonium vulgare. Although there is seasonal variation in the concentrations of soluble inorganic nitrogen in the sediments of the two marshes, the values obtained are similar for both marshes, but the upper marsh, unlike the lower marsh, becomes hypersaline in summer. It is suggested that the slower growth response to nitrogen of plants from the upper marsh away from drainage channels is the result of selection for plants with relatively low growth rates, which are able to survive the period of hypersaline stress during the summer. (Steiner-Mass)
W78-04542

THE VEGETATION OF SALT MARSHES AT SOME COASTAL SITES IN ARCTIC NORTH AMERICA,
Toronto Univ. (Ontario). Dept. of Botany.
R. L. Jeffries.
Journal of Ecology, Vol 65, p 661-672, 1977. 4 fig, 3 tab, 20 ref.

Descriptors: *Coastal marshes, *Marsh plants, *Vegetation establishment, *Polar regions, *Salinity, *Standing crop, *Ecological distribution, Wetlands, Marshes, Salt marshes, Tidal marshes, Aquatic plants, Vegetation, Shore-line cover, Coasts, Arctic, Alaska, Sea water, Biomass, Primary productivity, Distribution patterns, Pioneer stage, Succession, Bays, Inlets(Waterways), Canada, Arctic coastal marshes.

The vegetation of salt marshes was examined at seven sites on the Arctic coast of Alaska and Canada, at some of which measurements were made of the salinity of sea water, the amounts of standing crop of the vegetation and the distribution of biomass within plants. Puccinellia phryganodes, Stellaria humifusa and Cochlearia officinalis from the pioneer plant community on open coasts, but in sheltered bays and inlets, where vegetation cover is continuous, species such as Arctophila fulva, Dupontia fisheri, Hippuris tetraphylla and Carex ramenskii are frequent. The salinity of inshore sea water at most sites is very low. In this survey salinity values do not exceed 0.27 M Na(+) (about 18%). The total biomass for stands of the pioneer plants also is low (96-284 g m(-2)). The above-ground:below-ground ratios of dry matter lie between 1:0.11 and 1:3.40. A tentative estimate of the net primary production of Puccinellia phryganodes indicates that a value of 10 g m(-2) per annum appears to be an upper limit. The results are compared with similar data from Polar regions in North America and Eurasia. (Steiner-Mass)
W78-04543

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

REVERSE OSMOSIS IS EFFECTIVE METHOD FOR DESALTING WATER,
Universal Oil Products, St. Paul, MN. Johnson Div.
C. S. Crowe, and F. F. Zdenek.
Johnson Drillers Journal, Vol 49, No 6, p 6-8, November-December 1977. 1 fig.

Descriptors: *Reverse osmosis, *Desalination, *Water treatment, Distillation, Flash distillation, Electrodialysis, Economics, Costs, Energy, Arid lands.

It is often the case in arid or semi-arid regions that potential ground water supplies are vast, but are too brackish for use if left untreated. Nevertheless, it is in these regions that it becomes necessary to use this water since the cost of the treatment is still less than the expense of pumping fresh water long distances to the point of use. As energy costs increase, research and development in various desalination processes are continually turning up more economical techniques, distillation, electrodialysis, and ion exchange methods have all received study and limited use over the past few years. A fourth method, reverse osmosis, is a relatively new technology by which pump pressure overcomes natural osmotic pressure of brackish water to force pure water through a semi-permeable membrane. About 99 percent of the salt is removed while allowing water to pass freely. Cellulose acetate and polyamide are the two types of membrane used. Economic comparisons indicate reverse osmosis to be more cost effective than distillation for large operations, but additional experience is needed before these figures can be verified. (Eberle-NWWA)
W78-04297

METHOD FOR RECOVERING FRESH WATER FROM BRINE,
J. B. Maguire, Sr.
U.S. Patent No. 4,046,534, 8 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 962, No 1, p 250, September 6, 1977.

Descriptors: *Patents, *Desalination, *Desalination processes, *Water treatment, *Water purification, Water pollution treatment, Freezing, Crystallization, Nucleation, Separation techniques.

A process is disclosed for recovering fresh water from brine which includes introducing brine, which has been inoculated with a predetermined number of ice nuclei and is at about its freezing temperature, into an elongated crystal growth zone which is supplied with refrigerant along the brine flow path at a graduated rate such that more refrigerant is supplied toward the outlet of the crystal growth zone than near the inlet. Ice crystals are separated from the resulting brine-ice slurry, and the ice crystals are washed with fresh water before being melted to recover fresh water. (Sinha-OEIS)
W78-04324

POWER GENERATION AND POTABLE WATER RECOVERY FROM SALINOUS WATER,
Universal Oil Products Inc., Des Plaines IL. (Assignee).
D. B. Carson.
U.S. Patent No. 4,046,640, 8 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 962, No 1, p 281, September 6, 1977.

Descriptors: *Patents, *Desalination processes, *Saline water, Sea water, *Solar radiation, *Separation techniques, Electric power, Powerplants, Thermocline, Thermal properties, Heat exchangers.

A principal object of the invention involves the simultaneous generation of power and the recovery of potable water from a source of saline water. A corollary objective is the utilization of a combination of solar energy with the natural temperature gradients existing at varying depths of the ocean. These objects are achieved through the sequential steps of : (a) introducing saline water obtained from close to the surface of the ocean into a solar radiation heat sink (solar radiation heat sinks may take the form of flat plate collectors or a

shallow solar pond); (b) exposing the saline water to radiant solar energy for a time sufficient to raise the temperature to a level of at least about 135 degrees F; and (c) introducing the heated saline water into a series of vacuum flash separation zones, each succeeding one of which is maintained at a lower subatmospheric pressure than the preceding zone. This provides vapor phases which are utilized to vaporize hydrocarbons in separate vaporizers. The hydrocarbons vapors are passed through separate, individual turbines, or are introduced into different stages of a multistage turbine, the resulting motion from which power is generated. Potable water is recovered after condensation by contacting the vapors from the last stage with sea water. (Sinha-OEIS)
W78-04325

SIMULTANEOUS PRODUCTION OF MULTIPLE GRADES OF PURIFIED WATER BY REVERSE OSMOSIS,
Desalination Systems, Inc., Escondido, CA. (Assignee).
D. T. Bray.
U.S. Patent No. 4,046,685, 7 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 962, No 1, p 294, September 6, 1977.

Descriptors: *Patents, *Desalination, *Water purification, Water treatment, Water quality control, *Reverse osmosis, Semipermeable membranes.

A reverse osmosis apparatus comprises an elongated pressure container housing membrane semipermeable cartridges in end-to-end relationship. A separate tap from the product water collector of the semipermeable membrane cartridge or cartridges nearest the inlet of the pressure container for introduction of pressuzed feed liquid produces a high quality water product. A tap from the product water collector of the remainer of the semipermeable cartridges produces a lower quality water product. A minor amount of high quality product water and a major amount of lower quality product water may readily be produced. The process and apparatus may advantageously be employed in the second or subsequent or final step of a multistage process for converting sea water to potable water. (Sinha-OEIS)
W78-04326

RECLAMATION OF BRACKISH WATERS FOR IRRIGATION: OPTIMIZATION OF PROCESS PARAMETERS FOR FERTILIZER-DRIVEN OSMOSIS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
J. O. Kessler, and C. D. Moody.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 709, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, September 1977. 51 p, 7 ref, 2 append. OWRT B-053-ARIZ(3), 14-34-0001-7137.

Descriptors: *Osmosis, *Desalination, *Membrane processes, Separation techniques, Cost analysis, Reclamation, Agriculture, Irrigation water, Greenhouses, *Brackish water, *Optimization, Salt tolerance, Fertilizers, Direct osmosis, *Forward osmosis, *Yuma desalting plant(Ariz), *Concentration polarization.

Irrigation water can be extracted from a salt water source by fertilizer-driven forward osmosis (FDFO). The optimum design and economic utility of FDFO extractors depend on the salt concentration of the available water, the transport properties of available semipermeable membranes, the cost of membranes, associated equipment, and operating personnel, the salt tolerance of crops, and the current local value of purchased irrigation water. The operating point of an extractor is determined by setting equal the marginal cost of an increase in FDFO output and the cost of locally available purchased water. This operating point determines the overall average cost of the water extracted by FDFO, the quantity of water per fertilizer unit that can be extracted, and the fraction of the irrigation requirement that can be supplied. The results show that FDFO can extract 80 kg of water per kg of fertilizer from 3200 mg/l brackish water and 14 kg of water per kg of fertilizer from seawater. The report analyzes the feasibility of applications to controlled environment agriculture in general, and to a particular example, the proposed Yuma desalting plant. Some aspects of concentration polarization effects are also considered.
W78-04363

NEW POLYMERIC MEMBRANE CONTAINING PHOSPHONATE ESTER GROUPS FOR DESALINATION,
Gulf South Research Inst., New Orleans, LA.
I. Cabasso, and C. N. Tran.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 038, Price codes: A04 in paper copy, A01 in microfiche. Report OWRT/S--78/4, November 15, 1977. 56 p, 17 fig, 10 tab, 29 ref, 2 append. 323-827-10, 14-34-0001-6523.

Descriptors: *Desalination, *Membranes, *Reverse osmosis, *Polymers, Chlorine, Chemical stability, Mechanical stability, Hydrogen ion concentration, Membrane processes, Desalination processes, Polyphosphonate, *Cellulose acetate, Alloy membranes, *Composite membranes.

A membrane consisting of poly(2,6-dimethyl-1,4-bromophenylene oxide) dimethyl phosphonate ester alloyed with cellulose acetate was developed and was efficient in separating salt from saline solution in the reverse osmosis process. The membrane was cast to have an asymmetric morphology. The casting solution was polyphosphonate/cellulose acetate (1/1 by weight). The membrane displayed high salt rejection, a high water permeation rate, and excellent chemical and mechanical stability. Although further characterization and development of the alloy membrane are needed, the following conclusions are valid on the basis of work completed. (1) The ring bromination of the polyphenylene oxide prior to phosphonylation proved to be a proper route for the fabrication of a membrane that is insensitive to trace quantities of chlorine. (2) The incorporation of the phosphoryl ester as a pendent group to a relatively hydrophobic polymer imparts a hydrophilicity to that polymer. The hydrophobic-hydrophilic balance can then be changed at will. (3) Composite membranes were prepared by depositing the polyphosphonate thin film on a porous support. Commerically available porous supports were insufficient when coating deposition was from an organic solvent. New porous supports that are not solvent sensitive are needed for production of reproducible composite membranes, and alternative porous substrates will be investigated to the continuation program. Alloying the PPNs with other compounds such as Ethocel or cellulose triacetate has also begun.
W78-04500

3B. Water Yield Improvement

ACCIDENTAL AND PLANNED WEATHER MODIFICATION IN ILLINOIS,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr.
Water Resources Bulletin, Vol. 13, No. 6, p 1165-1174, December 1977. 1 fig.

Descriptors: *Weather modification, *Precipitation(Atmospheric), *Illinois, Projects, Research and development, Cities, Effects, Rainfall, Hail, Agriculture, Industry, Powerplants, Climatology, Weather, Meteorology, Urban effects, Climatic changes.

Weather modification, both planned by man and that accidentally produced by man, has been under intensive study in Illinois for ten years. Most everyone in Illinois and the Midwest is living in a climate that now is modified inadvertently from its natural state. State atmospheric scientists have tackled weather modification through a series of interrelated studies beginning with climatic studies (to establish the background), experimental design studies, experimental field studies to verify changes and their causes, and finally socio-economic and environmental studies to measure the impacts of weather modification. Studies at St. Louis showed that the city acts as a trigger of summer clouds and rainfall leading to 4 to 6 summer days with 3 cm or more rain somewhere just east of the city. Power plants and jet aircraft also accidentally produce climatic changes. A focus on planned weather modification has been on the design of needed midwestern experiments in rainfall enhancement and hail suppression, including the societal and environmental impacts. (Sims-ISWS)
W78-04205

METHOD OF FORMING A SUBTERRANEAN WATER BARRIER AND A PLOW FOR USE THEREWITH,
Kabushiki Kaisha Komatsu Seisakusho, Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 3F.
W78-04330

ON MELTING ICEBERGS,
Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.
For primary bibliographic entry see Field 2C.
W78-04515

3C. Use Of Water Of Impaired Quality

BRINE CHEMISTRY, SCALING AND CORROSION: GEOTHERMAL RESEARCH STUDY IN THE SALTON SEA REGION OF CALIFORNIA,
California Inst. of Tech., Pasadena. Environmental Quality Lab.
For primary bibliographic entry see Field 8G.
W78-04303

A SALINITY MANAGEMENT STRATEGY FOR STREAM-AQUIFER SYSTEMS,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04374

SALINITY MANAGEMENT STRATEGIES FOR THE LOWER SAN LUIS REY RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04499

QUALITY ASPECTS OF AGRICULTURAL RUNOFF AND DRAINAGE,
American Society of Civil Engineers, New York. Task Committee on Agricultural Runoff and Drainage of the Water Quality.
For primary bibliographic entry see Field 5B.
W78-04523

DISTRIBUTION OF BEETLE MITES IN IRRIGATED SOILS, (IN RUSSIAN),
Odessa State Univ. (USSR).
T. F. Krutogolova.
Ekologiya 5(5), p 85-89, 1974.

Descriptors: Anoribatella-ornata, *Beetle mites, Belba-verrucosa, Ceratozetes-mediocris, Corn(Field), *Distribution, Euphthiracarus-eribrarius, Furcoribula-furcillata, Gamasid, Mites,

Oppia-nova, Oppia-obsoleta, Oppia-splendens, Potato, Soils, Tarsonid, Temperature, Wheat, Winter, Zygoribatula-frisiae, *Irrigated soils, Soil moisture.

The effect of irrigation on beetle mites (Oribatidae) of soil was studied in medium-clay chernozem soil. A total of 30 spp. of Oribatidae were found; there were even more gamasids and tarsonoids. Oribatids (26 spp.) were found in irrigated potato soil, 15 spp. in corn soil, and 13 spp. in winter wheat soil. Oppia nova and Zygoribatula frisiae were found in all sections of the soil. O. obsoleta, O. splendens, Euphthiracarus eribrarius, Belba verrucosa and Furcoribula furcillata were recorded only from the irrigated potato soil. Ceratozetes mediocris was only found in the irrigated corn soil. Z. frisiae were predominent in irrigated sections and Anoribatella ornata in unirrigated sections. The number of mites decreased from spring to summer and increased toward fall. The mite population was affected by moisture and temperature in the 0-30 cm layer by the behavior of the dominant mite species, the type of crop grown and mechanical turning of the soil. Irrigation depressed the mite population, evidently due to the resulting decrease in soil aeration.--Copyright 1977, Biological Abstracts, Inc.
W78-04673

3D. Conservation In Domestic and Municipal Use

SURFACE WATER-ESKER RECHARGE STUDY EAST LANSING-MERIDIAN TOWNSHIP, MICHIGAN,
Williams and Works, Grand Rapids, MI.
For primary bibliographic entry see Field 4B.
W78-04208

DOMESTIC WATER CONTROL UNIT,
Braukmann Armaturen A.G., Rothrist (Switzerland). (Assignee).
B. W. Braukmann, and R. Vollmer.
U.S. Patent No. 4,046,692, 6 p, 3 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 962, No 1, p 296, September 6, 1977.

Descriptors: *Patents, *Domestic water, Flow control, *Filtration, Valves, *Flow rates.

This invention relates to a domestic-water control unit having connections for a supply line from the water main and a domestic water line, an inlet-pressure gauge and an outlet pressure gauge, a filter, a pressure-reducer, and a return-flow check valve. The control unit is formed of a housing containing a filter with an inlet and outlet in line above the filter, the latter forming a channel with the housing. The pressure reducer is positioned between the inlet and outlet above the filter. A rotary valve positioned between the filter and the pressure reducer reverses the flow in the unit. A plug-valve is located in the housing to provide drainage and is connected to the rotary valve so that on reversal of flow, the plug-valve opens to drain the unit. (Sinha-OEIS)
W78-04328

3E. Conservation In Industry

ENVIRONMENTAL CONSIDERATIONS AND THE MODERN ELECTROLYTIC ZINC REFINERY.
For primary bibliographic entry see Field 5D.
W78-04277

POSSIBILITIES OF TREATING ELECTROPLATING SHOP WASTE WATERS WITHOUT GENERATING SPECIAL WASTES. METAL RECOVERY IN PLACE OF SLUDGE DISPOSAL (MOEGLICHKEITEN ZUR BEHANLDLUNG GALVANISCHER ABWAESSER UNTER VERMEIDUNG VON SONDERABFAELLEN, METALLRUECKGEWINNUNG STATT SCHLAMMDEPONIE),
For primary bibliographic entry see Field 5D.
W78-04278

REDUCING POLLUTION CONTROL COSTS OF ELECTROPLATING PROCESSES,
IBM Corp., San Jose, CA. General Products Div.
For primary bibliographic entry see Field 5D.
W78-04279

CAN WETOX HANDLE SPENT SULFITE LIQUOR.
For primary bibliographic entry see Field 5D.
W78-04282

RECOVERY OF USEFUL BY-PRODUCTS FROM TEXTILE WASTES,
Shri Ram Inst. for Industrial Research, Delhi (India). Environmental Protection Cell.
For primary bibliographic entry see Field 5D.
W78-04284

AQUIFER STORAGE OF HEAT,
Auburn Univ., AL. Water Resources Research Inst.
For primary bibliographic entry see Field 4B.
W78-04292

THE PROCESS OF HEAT ACCUMULATION AND GEOTHERMAL RESOURCE FORMATION,
For primary bibliographic entry see Field 4B.
W78-04301

CONSERVATION OF WATER, CHEMICALS, AND ENERGY IN DYEING NYLON CARPET,
Georgia Inst. of Tech. Atlanta. School of Textile Engineering.
W. C. Tincher.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 988, Price codes: A04 in paper copy, A01 in microfiche. Georgia Environmental Resources Center, Atlanta, Report No. ERC 07-77, November, 1977. 61 p, 32 tab, 10 ref, 3 append. OWRT A-064-GA(1), 14-31-0001-5010.

Descriptors: *Textiles, *Water conservation, *Water reuse, *Chemicals(Dyes), Recycling, Industrial water, Dyes, *Dyeing, *Energy conservation.

Reduction in the requirements for water, energy, and chemicals have been achieved by changes in carpet beck dyeing procedures. Instead of discharging the dyebath following each dye cycle, in the new procedure the spent bath is analyzed, reconstituted to the desired concentration of dyes and auxillary chemicals, and reused. Bench scale dyeings were conducted initially to define operational parameters for coloring commerical nylon carpet a variety of shades with both acid and disperse cyes. The procedures developed were employed in pilot scale equipment for dyeing carpets with reuse of the dye bath for up to 5 dyeings before dumping. Within-sample end-to-end variations and between-sample variations in color were assessed by instrumental techniques. Results suggest that commercially acceptable carpet dyeings can be achieved in recycled dyebaths. Compared with conventional carpet beck dyeing, the modified procedures make possible savings of 65 percent in chemical costs, 64 percent in water requirements, and 20 percent in energy requirements. Reduction in quantities of chemicals required by dyeing in recycled dye baths will give a significant reduction in the quantities of materials that must be removed from the plant effluent in waste treatment facilities. This new dyeing technique has been extended to dyeing of nylon hosiery and polyester yarn. In-plant demonstrations on commercial scale equipment are planned.
W78-04370

PILOT DEMONSTRATION OF RENOVATION AND REUSE OF WASTEWATERS FROM ORGANIC CHEMICAL MANUFACTURING.
Union Carbide Corp., South Charleston, WV
For primary bibliographic entry see Field 5D.
W78-04382

DIAMONDS ARE FOREVER, SAYS THE MAN WHO GIVES THEM NEW LIFE.
For primary bibliographic entry see Field 5G.
W78-04386

REVERSE OSMOSIS PROVIDES REUSABLE WATER FROM ELECTRONICS WASTE,
IBM Corp., Manassas, VA.
For primary bibliographic entry see Field 5D.
W78-04400

THE BUILDUP OF DISSOLVED ELECTROLYTES IN A CLOSED PAPER MILL SYSTEM,
Scott Paper Co., Philadelphia, PA.
For primary bibliographic entry see Field 5D.
W78-04407

PRECIPITATOR RECLAIMS WATER FROM WASTE STREAMS.
For primary bibliographic entry see Field 5D.
W78-04411

A PRELIMINARY REPORT ON STUDIES TO DEVELOP ALTERNATIVE METHODS OF REMOVING POLLUTANTS FROM TUNA (ALBACORE) PROCESS WASTEWATERS,
National Marine Fisheries Service, WA. Pacific Utilization Research Center.
For primary bibliographic entry see Field 5D.
W78-04430

WATER QUALITY AT FIVE PROPOSED INDUSTRIAL SITES ON THE ROANOKE AND NEW RIVERS,
Nuclear Regulatory Commission, Washington, DC. Office of Nuclear Reactor Regulation.
For primary bibliographic entry see Field 5C.
W78-04497

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY RESOURCE DEVELOPMENT.
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 443, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/9-77-032, Executive Summary, October 1977. 12 p, 9 fig, 2 tab, 2 ref. EPA 68-01-1916.

Descriptors: *Energy, *Technology, *Resources development, *Regional development, Regional analysis, Forecasting, Environmental effects, Ecology, Montana, North Dakota, South Dakota, Wyoming, Utah, Colorado, Arizona, New Mexico, Coal mines, Oil shales, Natural gas, Transportation, Employment, Economic impact, Water quality, Public health, *Technology assessment, Uranium, Air quality.

Impacts associated with three levels of Western United States energy resource development (nominal, low demand, and low nuclear availability for 1980, 1990, and 2000) were assessed. Energy development scenarios within the eight state area

(Montana, North Dakota, South Dakota, Wyoming, Utah, Colorado, Arizona, and New Mexico) at six sites examined five development alternatives: surface and underground mining of coal; conversion and exportation of coal; surface retorting of oil shale; milling of uranium ore; conventional crude oil and natural gas production. Transportation by rail, pipeline, and extra high voltage transmission lines were combined with energy development technologies, both state-of-the-art and projected. Accordingly, site-specific and regional impacts likely to occur when Western U.S. energy resources are developed were identified and analyzed in terms of: air quality; water availability and quality; social, economic, political, and ecological impacts; and regional health effects, transportation, noise, and aesthetics. Impacts predicted include water shortages, water pollution, air pollution, and population dislocation. Policy implications are discussed in terms of required energy resource development planning, cooperation between energy developers and local governments, and improved environmental and ecological controls. (Wares-IPA)
W78-04657

3F. Conservation In Agriculture

AGROMETEOROLOGICAL STUDIES IN THE TURKMEN SSR, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 2B.
W78-04241

THE DEVELOPMENT OF METEOROLOGICAL STUDIES IN THE TURKMEN SSR, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 2B.
W78-04242

THE 1977 IRRIGATION SURVEY.
Irrigation Journal, Vol. 27, No. 6, p 19-26, November-December, 1977. 51 tab.

Descriptors: *Irrigation, *Irrigated land, *Sprinkler irrigation, Surveys, Statistics, Acreage, Irrigation wells, Pumps, Crops.

The IRRIGATION JOURNAL has published its 1977 Irrigation Survey of the United States. Information is given in a state-by-state format, and includes: (1) total irrigated acreage in each state between 1968 and 1977; (2) type of irrigation power units; (3) acreage irrigated by various methods; (4) number of irrigation wells and their average size, and; (5) acreage irrigated, broken down by crop. Overall, the survey indicates that 1977 was not a year for growth in the irrigation industry. Drought conditions, low farm commodity prices, and uncertainties in the golf course and turf markets are thought by the IRRIGATION JOURNAL staff to be the major culprits in slowing investment in irrigation equipment. Reprints of the survey are available from the Journal for $10 per copy (address: P.O. Drawer 77, Elm Grove, WI, 53122). (Eberle-NWWA)
W78-04294

WELLS RECHARGED BY GRAVITY IN AHMEDABAD,
For primary bibliographic entry see Field 4B.
W78-04295

NEW MEXICO PUMP STUDY POINTS TO FARMERS' NEED FOR EFFICIENCY KNOWLEDGE,
F. Buckingham.
Irrigation Age, Vol 12, No 4, p 34-35+, January, 1978, 3 tab.

Descriptors: *Irrigation systems, *Natural gas, *Pumping, Performance, Efficiencies, Costs, Conservation, Irrigation design, *New Mexico, Engineering.

A New Mexico irrigation pump study suggests that farmers should know more about pump efficiency and should have more expert help in selecting pumps. The study zeroed in on pumps fueled by natural gas. Results of earlier work indicate the average natural gas pumping system's efficiency is only slightly over 10%. If the average could be improved to 15%, over a million cubic feet of gas used for irrigation pumping in New Mexico could be saved. Such savings are possible through improved selection and maintenance of existing pumping plants. Because engine and pump efficiency are hard to separate, there is no easy way for a farmer to evaluate overall pumping efficiency. Researchers have found that many newly-installed pumps operate at poor efficiency, indicating widespread lack of selection practice knowledge. In the future, natural gas pumping systems will need to be much better engineered to combat inflation and avoid fuel curtailments as natural gas supplies dwindle. (Eberle-NWWA)
W78-04300

METHOD AND APPARATUS FOR REVERSIBLY POWERING A MOBILE IRRIGATION SYSTEM,
MAC Corp., San Jose, CA. (Assignee).
R. M. Sherman.
U.S. Patent No. 4,043,505, 10 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 961, No 4, p 1622, August 23, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Irrigation practices, Application equipment, Pipes, Remote control, Internal combustion engine.

An improved mobile irrigating system has a centralized, internal combustion engine powered unit which may be driven in either of two directions from a control mounted at the end of a coupled line of irrigating pipes. The end-mounted control unit transmits a control signal to the centralized power unit in part through the coupled line of irrigating pipes and in part through an insulated electrical cable. (Sinha - OEIS)
W78-04311

FILTER FOR USE WITH IRRIGATION SYSTEMS,
N. Man.
U.S. Patent No. 4,043,915, 3 p, 1 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 961, No 4, p 1751, August 23, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Filtration, *Irrigation efficiency, Irrigation practices, Filters.

A filter used in irrigation systems comprises a hollow screening and filtering body with inlet and outlet ports. A Venturi pipe is connected with the interior of the filter body. The screening and filtering body is placed in a casing which has an outlet. A conduit leads from the interior of the filter into a container. From the interior of that container a further conduit leads to a point substantially co-incident with the throat of the Venturi pipe. The conduit is closed at its end positioned within the container. The portion of the conduit which extends within the container is permeable to liquid. The container has a flushing inlet and a flushing outlet. The irrigation water is passed through the filter before it reaches the water dispensing or irrigation devices. (Sinha - OEIS)
W78-04316

METHOD OF FORMING A SUBTERRANEAN WATER BARRIER AND A PLOW FOR USE THEREWITH,
Kabushiki Kaisha Komatsu Seisakusho, Tokyo (Japan). (Assignee).
Y. Tamura, K. Hirosawa, and K. Ogaki.
U.S. Patent No. 4,047,387, 12 p, 15 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 962, No 2, p 530, September 13, 1977.

Descriptors: *Patents, *Water conservation, Soil treatment, *Soil sealants, *Soil water movement, Soil properties, Equipment, Plows.

A method is described for forming a horizontal barrier in situ at a preselected depth beneath the soil surface and in a plane substantially parallel to the soil surface. The barriers are made of a thermoplastic material such as asphalt and are used to improve soil having a poor water retention property. A cavity in a plow is filled with the barrier forming material. The material is spread by an ironing portion of the plow and is prevented from contact with air at all times. A pressure control means is provided on the side of a barrier forming material supply in order to maintain the amount of material being supplied. A subterranean water barrier is thus formed. (Sinha-OEIS)
W78-04330

IRRIGATED AND NONIRRIGATED SOYBEAN, CORN, AND GRAIN SORGHUM ROOT SYSTEMS,
Kansas Agricultural Experiment Station, Manhattan. Evapotranspiration Lab.
W. C. Mayaki, L. R. Stone, and I. D. Teare.
Agronomy Journal, Vol 68, No 3, p 532-534, May-June 1976. 1 fig, 1 tab, 4 ref. OWRT A-060-KAN(4).

Descriptors: *Root distribution, Irrigation, Irrigation effects, *Soybeans, *Corn(Field), *Grain sorghum, Furrow irrigation, Soil water, *Root systems.

Knowledge of rooting patterns of various crops is important in designing irrigation systems and assessing water extration capabilities. We investigated root depth and distribution under irrigated and nonirrigated conditions for soybeans, corn, and grain sorghum. Soil cores 6.7 cm in diam. were taken to 180 cm deep in the crop row, 1/4 row, and 1/2 row (furrow) for each crop at physiological maturity. The cores were sectioned in 30-cm increments and washed through 35-mesh screen (0.73 mm opening), and the roots oven dried. The study soil was deep, barrier-free, Muir silt loam (finesilty, mixed, mesic, Pachic Haplustoll). Approximately 71, 64, and 86% of the total root dry matter were in the upper 30 cm for irrigated soybeans, corn, and grain sorghum, respectively. Approximately 67, 39, and 79% of the total root dry matter were in the upper 30 cm for nonirrigated soybeans, corn, and grain sorghum, respectively. Only corn did not have roots in the 150 to 180-cm zone. Seasonal water uses under irrigated conditions (neglecting water flux into or from the root zone) were 65 cm, and 53 cm in soybeans, corn, and grain sorghum, respectively. Seasonal water use was approximately 44 cm by each of the three crops under nonirrigated conditions. (Skogerboe-Colorado State)
W78-04340

SOYBEAN ROOT DEVELOPMENT AND SOIL WATER DEPLETION,
Kansas Agricultural Experiment Station, Manhattan. Evapotranspiration Lab.
L. R. Stone, I. D. Teare, C. D. Nickell, and W. C. Mayaki.
Agronomy Journal, Vol. 68, No. 4, p 677-680, July-August 1976. 6 fig, 14 ref.

Descriptors: *Soybeans, *Root development, Soil moisture, *Soil water, Model studies, *Moisture depletion(Soils).

A field study to investigate soybean root growth and water depletion patterns was conducted. Field water depletion and rooting data are needed to assist in developing and refining models that consider root-soil-water interactions. Irrigated and nonirrigated soybeans were grown on a deep, barrier-free, Muir silt loam. Soil water content, determined using neutron moderation, was used to calculate water depletion rates. Soil water content and desorption curves were used to estimate soil water potential. Available soil water was estimated using--15 bars soil water potential as the lower limit of availability. We collected soil volumes 76 cm wide, 7.6 cm thick, and 180 cm deep and washed roots free using a 35-mesh screen. During the first half of out study, maximum root and water depletion depths were nearly equal. Later, water depletion tended to be about 15 cm deeper than root growth (possibly as a result of upward water movement into the water-depleted root zone. (Skogerboe-Colorado State)
W78-04341

AN APPLICATION OF INTERACTIVE MULTIOBJECTIVE WATER RESOURCES PLANNING,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6A.
W78-04476

DRAIN DISCHARGE FROM A LEVEL AGRICULTURAL WATERSHED,
Guelph Univ. (Ontario). School of Engineering.
For primary bibliographic entry see Field 4D.
W78-04522

SOIL WATER FLOW AND DISTRIBUTION IN HORIZONTAL AND VERTICAL DIRECTIONS AS INFLUENCED BY INTERMITTENT WATER APPLICATION,
Fruit and Fruit Technology Research Inst. Stellenbosch (South Africa).
For primary bibliographic entry see Field 2G.
W78-04528

EFFECT OF FERTILIZERS AND COMBINED PLOWING ON THE PROTECTION OF SOD-PODZOLIC SOILS FROM EROSION, (IN RUSSIAN),
Central Inst. Agrochemistry Service, Moscow (USSR).
For primary bibliographic entry see Field 2G.
W78-04598

A FIELD STUDY OF THE AGRICULTURAL USE OF SEWAGE SLUDGE: I. EFFECT ON CROP YIELD AND UPTAKE OF N AND P,
Ball State Univ., Muncie, IN. Dept. of Natural Resources.
For primary bibliographic entry see Field 5E.
W78-04609

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

HYDROLOGIC CONSIDERATIONS OF THE UPPER ST. JOHNS RIVER BASIN, FLORIDA,
Florida State Dept. of Environmental Regulation, Tallahassee.
For primary bibliographic entry see Field 2E.
W78-04204

APPLICATIONS OF REMOTE SENSING TECHNIQUES TO COUNTY LAND USE AND FLOOD HAZARD MAPPING,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 7C.
W78-04215

FEASIBILITY STUDY FOR DYKE MARSH DEMONSTRATION AREA, POTOMAC RIVER, VIRGINIA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
M. R. Palermo, and T. W. Zeigler.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 524, Price codes: A07 in paper copy, A01 in microfiche. Technical Report D-76-6, November 1976. 20 fig, 5 tab, 24 ref, 2 append.

Descriptors: *Dredging, *Virginia, *Spoil banks, *Marshes, Wetlands, Construction, Dikes, Sediments, Hydraulic structures, Weirs, Sluices, Rivers, Environment, Habitats, Engineering, Civil engineering, Estuaries, *Containment facilities, *Dyke Marsh(Va), *Potomac River, Dredged materials.

Results of an investigation conducted to determine the engineering feasibility of using dredged material to expand an existing marshland area were presented. Dredged material obtained from maintenance dredging operations was found suitable for use as marsh substrate, and site conditions were found adequate for construction of a containment facility. Factors evaluated in the study included site-specific feasibility of marsh expansion using dredged material, sizing of the demonstration area to meet water quality and storage needs, preliminary design of the containment facility, procedures for placement of dredged material, and identification of alternative construction methods, materials, and costs. Overall feasibility of marsh expansion was demonstrated, and additional investigations were recommended for the project. (Sims-ISWS)
W78-04216

CENTRAL AVALANCHE HAZARD FORECASTING- INTERIM REPORT, PHASE II,
Washington Univ., Seattle. Dept. of Atmospheric Sciences.
For primary bibliographic entry see Field 2C.
W78-04219

UTILITY OF A SCANNING DENSITOMETER IN ANALYZING REMOTELY SENSED IMAGERY,
National Aeronautics and Space Administration, Cleveland, OH. Lewis Research Center.
For primary bibliographic entry see Field 7B.
W78-04220

AN ERTS-1 INVESTIGATION FOR LAKE ONTARIO AND ITS BASIN,
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
For primary bibliographic entry see Field 2H.
W78-04230

AUTOMATED GREAT LAKES WAVE FORECASTS,
National Weather Service, Silver Spring, MD. Techniques Development Lab.
For primary bibliographic entry see Field 2H.
W78-04235

THE EFFECT OF THE FAKA UNION CANAL SYSTEM ON WATER LEVELS IN THE FAKAHATCHEE STRAND, COLLIER COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B
W78-04249

FLOOD-FREQUENCY ANALYSIS FOR SMALL NATURAL STREAMS IN GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div
For primary bibliographic entry see Field 2E
W78-04257

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 1. COLORADO RIVER BASIN, SOUTHERN GREAT BASIN FROM MEXICAN BORDER TO MONO LAKE BASIN, AND PACIFIC SLOPE BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04266

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 4. NORTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM HONEY LAKE BASIN TO OREGON STATE LINE.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04267

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 3. SOUTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM WALKER RIVER TO TRUCKEE RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04268

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 2. PACIFIC SLOPE BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Menlo Park, CA. Water Resources Div.
Water-Data Report CA-76-2, October 1977. 499 p, 3 fig, 1 tab.

Descriptors: *California, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Pacific Slope basins(Calif).

Volume 2 of water resources data for the 1976 water year for most of the Pacific Slope basins in California consists of records of stage, discharge, and water quality of streams and wells; stage, contents, and water quality in lakes and reservoirs; and water levels in wells. This report contains discharge records for 173 gaging stations, stage and contents for 20 lakes and reservoirs, water quality for 119 stations and 17 wells, and water levels for 25 observation wells. Also included are 20 crest-stage partial-record stations and 8 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collction program, and are published as special investigations and miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W78-04269

COSTS AND PRODUCTIVITY IN HARVESTING OF AQUATIC PLANTS,
Wisconsin Univ.-Madison. Dept. of Agricultural Engineering.
R. G. Koegel, D. F. Livermore, and H. D. Bruhn.
Journal of Aquatic Plant management, Vol 15, p 12-17, June 1977. 5 fig, 4 tab. OWRT A-050-WIS(2), NSF-RANN GI-39133.

Descriptors: *Aquatic weed control, *Costs, *Harvesting, Mechanical control, Wisconsin, Equipment, Lakes, Efficiencies, *Madison(WI), *Dane County(WI), Grinwald-Thomas Harvester, Aquamarine Trio Harvester.

Harvesting has been the principal method of nuisance aquatic plant control on the Madison area lakes of southern Wisconsin since 1965, carried out by the City of Madison, and, more recently, by Dane County. Costs and productivity of two harvesting systems used by the county are presented: (1) a Grinwald-Thomas Harvester was modified to include a forage chopper on the harvester deck from which plants are continuously conveyed to a transport barge coupled to the harvester; the filled barge proceeds to shore for unloading, while an empty barge is coupled to the harvester. (2) In the Aquamarine Trio system, cut vegetation is tranferred to a barge at intervals, and then transported to shore. A shoreline conveyor moves the plants to a waiting truck. Conveyor mesh covering the decks of both harvester and barge permit mechanical loading and unloading of harvested vegetation. Both harvesters are driven by hydraulically-powered paddle wheels, and employ reciprocating cutter bars ahead of inclined porous elevating conveyors. Maneuverability of the Ginwald-Thomas unit is severely limited by the attached barge, and the unit is used primarily for cutting long narrow weed beds parallel to shore. This machine harvested an average of 0.94 acres/hr (ave. of 5,930 lbs/hr) at an ave. harvesting cost of $64/hr or $68/acre. Machine 2 harvested 0.63 acres/hr (3,525 lgs/hr) at a cost of $59/hr or $94/acre. Prorated investment costs were included in these figures. (Lynch-Wisconsin).
W78-04338

GROUNDWATER AND SURFACE WATER IN THE PERMAFROST REGION,
For primary bibliographic entry see Field 2C.
W78-04352

STREAMFLOW REGIONALIZATION IN BRITISH COLUMBIA, NO. 3, STATISTICS OF MEAN ANNUAL FLOW,
Department of the Environment, Ottawa, (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2E.
W78-04356

AN APPLICATION OF INTERACTIVE MULTIOBJECTIVE WATER RESOURCES PLANNING,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6A.
W78-04476

APPLICATION OF STOCHASTIC METHODS IN WATER RESOURCES STUDIES,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 6A.
W78-04484

WATER RESOURCES PLANNING (AN ILLUSTRATION ON MANAGEMENT OF SURFACE AND GROUNDWATERS),
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04487

APPLICATION OF STATISTICAL DECISION THEORY,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 6A.
W78-04488

PARAMETER REGIONALIZATION AND NETWORK DESIGN,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04489

PREDICTING POLLUTANT DISPERSION IN RIVERS,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-04495

EFFECT OF MOWING TIMES ON REGENERATION OF REED AND REEDMACE GROWTHS, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Rostov-na. Donu (USSR).
A. G. Shekhov.
Gidrobiol Zh. 10(3), p 61-65, 1974.

Descriptors: Growth rates, Limans, Mowing, Phragmites-Communis, *Reed, *Reedmace, Regeneration, Typha-angustifolia, USSR, *Harvesting(Aquatic plants).

Experiments established that 2-fold mowing of reed (Phragmites communis) and lesser reedmace (Typha angustifolia) is most effective for controlling overgrowth of water bodies by these plants. The 1st mowing should begin when the shoots appear above water and the 2nd 20-30 days later. In this case the reed and reedmace in the Kuban limans (USSR) almost ceased to grow back for 4-5 yr.--Copyright 1975, Biological Abstracts, Inc.
W78-04524

ON THE TIME TO FIRST OVERFLOW IN DAMS WITH INPUTS FORMING A MARKOV CHAIN,
Stanford Univ., CA. Dept. of Operations Research.
For primary bibliographic entry see Field 8B.
W78-04535

COASTAL WETLANDS ALONG LAKE ONTARIO AND THE ST. LAWRENCE RIVER IN JEFFERSON COUNTY, NEW YORK,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 2H.
W78-04546

4B. Groundwater Management

SURFACE WATER-ESKER RECHARGE STUDY EAST LANSING-MERIDIAN TOWNSHIP, MICHIGAN,
Williams and Works, Grand Rapids, MI.
J. C. Sutherland, and R. M. Bruce.
Water Resources Bulletin, Vol. 13, No. 6, p 1215-1225, December 1977. 6 fig, 2 tab, 2 ref.

Descriptors: *Groundwater, *Recharge, *Municipal water, *Water supply, *Michigan, Artificial recharge, Pit recharge, Groundwater recharge, Recharge ponds, Rivers, Wells, Water wells, Water resources, Recreation, Economics, Cost analysis, Cost comparisons, Water supply development, *East Lansing-Meridian Township(Mich).

The East Lansing-Meridian Water and Sewer Authority studied a sand-gravel esker near the existing water treatment plant to determine its potential as an independent surface water supply. The nearby Red Cedar River also was investigated as a possible source of water for immediate treatment or for recharge of the esker. Although the bedrock aquifer (Grand River and Saginaw Formations) yields water adequate for the next 20 years, potential savings in treatment (hardness, iron) and pumping costs, estimated at $30,000 per year for present demand of 5 MGD, are attractive incentives for a surface water-esker recharge program. Operation savings also would be realized by constructing additional bedrock wells in new areas. The river-esker-recharge and new wellfield alternatives were compared for cost-effectiveness. Land costs make the recharge alternative more expensive. The land is undeveloped suburban property with potential for recreational use in conjunction with water supply. More places of outdoor retreat and aesthetics are needed in the Lansing Metropolitan area. A portion of the land costs would have to be borne by these or other interests for the river recharge scheme to be economically feasible. (Sims-ISWS)
W78-04208

GROUND-WATER APPRAISAL OF THE PINELAND SANDS AREA, CENTRAL MINNESOTA,
Geological Survey, St. Paul, MN. Water Resources Div.
J. O. Helgesen.
Water-Resources Investigations 77-102 (open-file report), 1977. 49 p, 19 fig, 3 plates, 4 tab, 21 ref.

Descriptors: *Groundwater resources, *Aquifers, *Hydrologic budget, *Mathematical models, *Minnesota, Forecasting, Groundwater availability, Irrigation, Drawdown, Water yield, Aquifer characteristics, Sand aquifers, Groundwater recharge, Precipitation(Atmospheric), Surface-groundwater relationships, *Pineland Sands(Central Minnesota), *Outwash plains.

The Pineland Sands area consists of about 770 square miles of surficial glacial outwash which is undergoing increasing ground-water development for irrigation. The aquifer material is commonly very fine sand to fine gravel. Grain size and thickness generally increase from south to north. Test augering and pumping tests indicate that well yields exceeding 1,000 gallons per minute can be expected in about 15 percent of the study area, mostly in the northern part. Water in the aquifer is of the calcium bicarbonate type and is chemically suitable for irrigation. The average water budget for the aquifer involves inflow and outflow of about 295 cubic feet per second. Most recharge to the aquifer is directly from precipitation and most discharge is base flow to streams and lakes. Mathematical-modeling results show that much of the aquifer system can safely support long-term, large-scale withdrawals. Most pumpage would be derived from intercepted base flow to streams. (Woodard-USGS)
W78-04246

GROUND-WATER RESOURCES OF THE RIVIERA BEACH AREA, PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
L. F. Land.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 377, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-47, September 1977. 38 p, 23 fig, 4 tab, 6 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, *Florida, Water supply, Water levels, Hydrogeology, Water wells, Saline water intrusion, Evaluation, Palm Beach County(Fla), *Riviera Beach(Fla).

The so-called 'shallow aquifer' composed chiefly of sand, shells, sandstone, and limestone, is the principal source of freshwater in the Riviera Beach area, Fla. The major water-bearing zone consists of cemented layers of sand and shells, about 100 ft thick, in the lower part of the aquifer. The quality of the water in the shallow aquifer is generally suitable for public supply except locally along C-17 Canal where the dissolved solids concentration exceeds 500 milligrams per liter. The configuration of the water table is greatly influenced by Lake Worth, C-17 Canal, West Palm Beach water catchment area, rainfall, and municipal pumpage. The major threat to development of water supplies, and possibly to the continuation of a current withdrawal rate of over 5 mgd, is seawater (Lake Worth), but the combined effects of increased pumpage, reduced recharge resulting from increased land development, and below normal rainfall, have caused seawater to advance inland in the aquifer. Additional supplies could be developed to the west. (Woodard-USGS)
W78-04247

SALINE-WATER INTRUSION IN THE FLORIDAN AQUIFER IN THE FERNANDINA BEACH AREA, NASSAU COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
R. W. Fairchild, and C. B. Bentley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 015, Price codes: A03 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 77-32, September 1977. 27 p, 13 fig, 9 ref.

Descriptors: *Drawdown, *Artesian aquifers, *Saline water intrusion, *Pumping, *Water supply, Florida, Water wells, Hydrology, Groundwater movement, Water levels, Data collections, Water quality, Chlorides, Evaluation, Water pollution control, Nassau County(Fla), *Floridan aquifer, Fernandina Beach area(Fla).

The Floridan aquifer is the major source of water for municipal and industrial use in northeastern Nassau County, Florida. Pumpage from the aquifer at Fernandina Beach has created a cone of depression in the potentiometric surface which is at or below sea level in a 35-square mile area. Since 1880 water levels have declined more than 120 feet near the center of pumping, and chloride concentrations have increased from about 20 to a maximum of 800 milligrams per liter in some deep wells. The saline water probably is connate water which comes from zones below 1,250 and 2,000 feet. Several alternate methods to control the migration of saline water are discussed. (Woodard-USGS)
W78-04248

THE EFFECT OF THE FAKA UNION CANAL SYSTEM ON WATER LEVELS IN THE FAKAHATCHEE STRAND, COLLIER COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
L. J. Swayze, and B. F. McPherson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 670, Price codes: A02 in paper copy, A01 in microfiche. Geological Survey Water-Resources Investigations 77-61, September 1977. 19 p, 9 fig, 1 tab, 7 ref

Descriptors: *Florida, *Canals, Effects, *Groundwater, *Water levels, Surface waters, Flow rates, Aquifers, Inflow, Impounded waters, Groundwater movement, Surface drainage, Environmental effects, Water management(Applied), Collier County(Fla), *Faka Union Canal System(Fla), *Fakahatchee Strand(Fla), *Big Cypress Swamp(Fla).

The Faka Union Canal system, constructed in the western Big Cypress Swamp, Fla., in the early 1970's, lies about 3.5 miles west of the centerline of the Fakahatchee Strand, a forested water course which the State of Florida has designated as an Area of Critical State Concern in order to conserve natural resources. Between 1970 and 1975 the canal system annually discharged to the Gulf of Mexico from 143,200 to 275,600 acre-feet of freshwater. Discharge lowered ground-water levels as much as 4 feet near the eastern canal and created a water-level gradient that indicates water flowed from the Fakahatchee Strand west toward the canal during most of the year. In June 1975, water from early summer rains was impounded in the eastern canal upstream of the control structure at Janes Scenic Drive, and, as water levels rose in this reach, water flowed from the canal into the aquifer and around the control structure. The annual low-water level in the center of the Fakahatchee Strand declined from nearly 3 feet above mean sea level in 1972 to 1 foot above mean sea level in 1974. (Woodard-USGS)
W78-04249

A DIGITAL MODEL OF THE FLORIDAN AQUIFER, NORTH OF TAMPA, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-04251

GROUND-WATER BASIC DATA FOR MORTON COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04252

GROUND-WATER RESOURCES OF GRIGGS AND STEELE COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
J. S. Downey, and C. A. Armstrong.
North Dakota County Ground-Water Studies 21--Part III, and North Dakota Geological Survey Bulletin 64--Part III, Bismarck, 1977. 33 p, 9 fig, 2 plates, 2 tab, 51 ref.

Descriptors: *Groundwater resources, *North Dakota, *Aquifer characteristics, *Water yield, *Water quality, Chemical properties, Water supply, Groundwater availability, Hydrogeology, Water wells, Water level fluctuations, Data collections, Maps, Hydrographs, Water utilization, Griggs County(N Dak), Steele County(N Dak).

Griggs and Steele Counties, in east-central North Dakota, are underlain by bedrock of Ordovician, Jurassic, and Cretaceous eggs. The Fall River and Lakota Formations of Cretaceous age form the Dakota aquifer. The fractured upper part of the Pierre Formation (shale), also of Cretaceous age, forms another bedrock aquifer. The Dakota aquifer, which consists mainly of interbedded shale and sandstone units, may yield as much as 500 gpm (gallons per minute) of sodium sulfate water to wells at selected locations. The Pierre aquifer yields from 1 to 10 gpm of sodium bicarbonate or sodium sulfate water to wells. Four major glacial-drift aquifers are in the study area. The Spiritwood aquifer system may supply as much as 1,500 gpm of water to wells. Water samples contained dissolved-solids concentrations ranging from 244 to 9,800 mg/liter. The Galesburg aquifer will yield as much as 1,000 gpm of water to wells. Water samples contained dissolved-solids concentrations ranging from 317 to 2,170 mg/liter. The McVille aquifer will yield as much as 500 gpm to wells. Water samples contained dissolved-solids concentrations ranging from 449 to 2,200 mg/liter. The Elk Valley aquifer could yield 30 gpm to wells. Water samples contained dissolved-solids concentrations ranging from 397 to 2,890 mg/liter. Six communities in the project area use ground-water supplies. Rural water districts are being developed in the two-county area that will provide dependable ground-water supplies for many farms and small municipalities. The Spiritwood aquifer system and the McVille and Galesburg aquifers are capable of supplying the water needs of these districts and could also provide water for irrigation. (Woodard-USGS)
W78-04253

GROUND-WATER RESOURCES OF CAVALIER AND PEMBINA COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
R. D. Hutchinson.
North Dakota County Ground-Water Studies 20--Part III, and North Dakota Geological Survey Bulletin 62--Part III, Bismarck, 1977. 68 p, 27 fig, 3 plates, 6 tab, 59 ref.

Descriptors: *Groundwater resources, *North Dakota, *Aquifer characteristics, *Water yield, *Water quality, Chemical properties, Water supply, Groundwater availability, Hydrogeology, Water wells, Data collections, Water level fluctuations, Maps, Hydrographs, Water utilization, Cavalier County(N Dak), Pembina County(N Dak).

Cavalier and Pembina Counties, N. Dak., are underlain by bedrock of Precambrian, Ordovician, Silurian, Devonian, Mississipian, Triassic and Jurassic, and Cretaceous ages. The principal bedrock aquifers are the Cretaceous Dakota Group and the Pierre Formation. The Dakota aquifer consists of sandstone with interlayered shale and may yield as much as 500 gpm (gallons per minute) locally to individual wells. The Pierre aquifer, which consists of fractured shale, generally does not yield more than 10 gpm. Water from both aquifers is of poor quality, but is extensively utilized. The pre-Dakota bedrock aquifers yield a highly mineralized sodium chloride type water. Yields greater than 500 gpm may be available locally from the Ordovician carbonate-rock aquifers. The Munich aquifer, located in southwestern Cavalier County, is the most productive glacial-drift aquifer. It is capable of yielding slightly saline sodium sulfate type water at rates up to 500 gpm. Pembina County contains four major glacial-drift aquifers. The Pembina River aquifer yields calcium magnesium bicarbonate water at rates up to 250 gpm. The Icelandic, Pembina Delta, and Hamilton aquifers are each capable of yields up to 50 gpm. Water from the Icelandic and Pembina Delta aquifers is a calcium magnesium bicarbonate type, but the Hamilton aquifer yields sodium chloride water. Several smaller aquifers will supply relatively small quantities of good to poor quality water. A large saline soil area and small saline lakes are located in eastern Pembina County as the result of natural discharge from a regional ground-water flow system. The total ground-water pumpage in 1970 averaged an estimated 1.3 million gallons per day. (Woodard-USGS)
W78-04254

GROUND-WATER LEVELS IN THE UNITED STATES, 1973-74. NORTHEASTERN STATES.
Geological Survey, Reston, VA. Water Resources Div.
Available from Branch of Distribution, USGS, 1200 S. Eads St., Arlington, VA 22202, Price $2.50. Water-Supply Paper 2164, 1977. 126 p, 14 fig.

Descriptors: *Water levels, *Groundwater, *Water wells, *Well data, *Northeast US, Measurement, Basic data collections, Aquifers, Connecticut, Delaware, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island, Vermont.

This report was prepared from ground-water levels measured during 1973-74, by the U.S. Geological Survey in cooperation with the States of Connecticut, Delaware, Indiana, Maine, Massachusetts, Michigan, New Hampshire, New Jer-

sey, New York, Ohio, Pennsylvania, Rhode Island, and Vermont, and with other agencies. Water-level measurements in wells are given in feet with reference to either mean sea level or land-surface datum. Mean sea level is the datum plane on which the national network of precise levels is based; land-surface datum is a datum plane that is approximately at land surface at each well. If known, the altitude of the land-surface datum above mean sea level is given in the well description. The height of the measuring point above or below land-surface datum is given in each well description. (Woodard-USGS)
W78-04255

GEOHYDROLOGY OF NORTH EASTERN PROVINCE, KENYA,
Geological Survey, Reston, VA. Water Resources Div.
W. V. Swarzenski, and M. J. Mundorff.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price $3.30. Water-Supply Paper 1757-N, 1977. 68 p, 3 fig, 5 plates, 13 tab, 27 ref.

Descriptors: *Water resources development, *Africa, *International commissions, *Available water, *Hydrogeology, Data collections, Hydrologic data, Groundwater resources, Boreholes, Groundwater availability, Water quality, Surface waters, Water storage, Ponds, Reservoirs, Dug wells, Water supply, Livestock, Range management, Foreign countries, Maps, Rainfall, Discharge(Water), Geologic units, Aquifers, *Kenya, Agency for International Development.

The Government of Kenya, with international assistance, has been engaged since 1968 in a long-term project to develop the livestock resources of the country. Under the first phase of the project, a cooperative agreement between Kenya's Ministry of Agriculture and the U.S. Agency for International Development provided for a survey to evaluate the water resources of the North Eastern Province. This report largely concerned with ground water, is based on the findings of the water-resources investigation undertaken under Phase I (1968-73) of the project. The North Eastern Province of Kenya is a perennially water-deficient region of about 127,000 square kilometers. There are no perennial streams within the province, and water supplies for livestock, villages, and small municipalities are obtained from natural ponds, reservoirs, shallow dug wells, and boreholes. An important aspect of the livestock development project is management of the range to mitigate overgrazing; measures employed are pasture rotation and installation of additional temporary and permanent watering points. In the Mado Gashi-Kalalut range management pilot study, in an area of 7,300 square kilometers located in the western part of the province, 66 small and large reservoirs individually storing from a few hundred to as much as 40,000 cubic meters of water, and 10 boreholes have been constructed under the project. In addition, the geohydrologic data provided by about 75 boreholes, drilled elsewhere in the province for range management or public supply, provided the basis for delineating zones of fresh and saline ground water and permitted a reconnaissance evaluation of the occurrence of ground water in most of the North Eastern Province. (Woodard-USGS)
W78-04256

SUMMARY OF BASIC HYDROLOGIC DATA COLLECTED AT COSO HOT SPRINGS, INYO COUNTY, CALIFORNIA,
Geological Survey, Luguna Niguel, CA. Water Resources Div.
V. R. Moyle, Jr.
Open-file report 77-485, September 1977. 93 p, 2 fig, 1 plate, 6 tab, 103 ref.

Descriptors: *Geothermal studies, *Hot springs, *Hydrologic data, *Water temperature, *California, Chemical analysis, Water quality, Well data, Water levels, Water users, Water utilization, Steam, Thermal springs, Thermal properties, Flow rates, *Coso Hot Springs(Calif), Inyo County(Calif).

More than 200 wells and springs were visited within a 20-mile radius of Coso Hot Springs, Calif. Hydrologic and geothermal data were collected for each well or spring site. The data includes depth, chemical quality, temperature and specific conductance of water, quantity of flow, well construction, and well logs. These data show that the normal temperature gradient in the ground is about 1.1 degrees Celsius (2 degrees Fahrenheit) per 100 feet. The temperature gradient in the thermal areas is as high as 24.4 degrees Celsius (44 degrees Fahrenheit) per 100 feet. The highest temperature measured for all the wells and springs was 142.2 degrees Celsius (288 degrees Fahrenheit). The chemical quality of water in the study area is generally good except in areas where water evaporates from land surface at Owens Valley playa or where steam escapes into the atmosphere from land surface. Computerized hydrologic and geothermal data are being stored for future use at the U.S. Geological Survey office, Laguna Niguel, Calif. (Woodard-USGS)
W78-04258

GEOCHEMICAL EFFECTS OF RECHARGING THE MAGOTHY AQUIFER, BAY PARK, NEW YORK, WITH TERTIARY-TREATED SEWAGE,
Geological Survey, Mineola, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-04261

GEOLOGY AND WATER RESOURCES OF THE NORTHERN PART OF THE JUDITH BASIN, MONTANA,
Geological Survey, Billings, MT. Water Resources Div.
R. D. Feltis.
Montana Bureau of Mines and Geology Bulletin 101, 1977. Montana College of Mineral Science and Technology, Butte, 65 p, 13 fig, 2 plates.

Descriptors: *Groundwater resources, *Hydrogeology, *Water quality, *Groundwater recharge, *Montana, Streamflow, Low flow, Chemical analysis, Aquifer characteristic, Groundwater movement, Water level fluctuations, Water supply, Domestic water, Irrigation, Precipitation(Atmospheric), *Judith River basin(Mont).

Northern Judith Basin contains artesian sandstone and limestone aquifes and is part of the hydrologic system of Judith Basin in central Montana. Sandstone aquifers supply water suitable for domestic and stock use; however, deeper undeveloped limestone aquifers are potential sources of water for irrigation and industry. Recharge to the aquifers is mostly from infiltration of precipitation and runoff in the foothills and mountains surrounding Judith Basin. Streamflow measurements along a stream crossing the cavernous limestone of the Madison Group in the Little Belt Mountains showed a streamflow loss of 164 cfs. In northern Judith Basin the depth to the Madison ranges from 1,965 to 3,748 feet below land surface. Oil wells have flowed water the limestone or recorded pressure heads higher than land surface. The quality of water in the Madison is poorly known; water entering the limestone contains less than 300 mg/liter dissolved solids. Water samples from the upper part of the limestone from an oil well 20 miles from the recharge area contained 4,020 mg/liter. The Judith River is the eastern boundary of the area and the mean-annual flow near the headwaters is 38,820 acre-feet and has ranged from 6,340 to 102,000 acre-feet. During 1970 water year, a year of above-average streamflow, the total streamflow of the Judith River, including principal streams from southern and eastern Judith Basin, was about 470,000 acre-feet.
W78-04263

APPROXIMATE AREAS OF RECHARGE TO THE CHICOT AND EVANGELINE AQUIFER SYSTEM IN THE HOUSTON-GALVESTON AREA, TEXAS,
Geological Survey, Houston, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04264

WATER-LEVEL CHANGES IN THE NORTHERN HIGH PLAINS OF COLORADO, 1964 TO 1976 AND 1972 TO 1976,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04265

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 1. COLORADO RIVER BASIN, SOUTHERN GREAT BASIN FROM MEXICAN BORDER TO MONO LAKE BASIN, AND PACIFIC SLOPE BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04266

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 4. NORTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM HONEY LAKE BASIN TO OREGON STATE LINE.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
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WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 3. SOUTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM WALKER RIVER TO TRUCKEE RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
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WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 2. PACIFIC SLOPE BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-04269

NWWA RESEARCH FACILITY: AN OVERVIEW.
Water Well Journal, Vol 32, No 2, p 44-45, February, 1978.

Descriptors: *Groundwater, *Research facilities, *Libraries, National Water Well Association.

The National Water Well Association's Research Facility is dedicated to the advancement of all knowledge which could result in the development of protection of the world's ground water resources. Objectives of the NWWA Research program are: (1) to help answere the public's questions about wells and ground water supply; (2) to assist consultants, engineers, and contractors who have problems related to ground water and

well technology; (3) to help state and federal agencies develop codes and regulations for ground water pollution control and water well construction; (4) to advise private and governmental agencies in ground water research, and; (5) to undertake research projects that touch upon all aspects of ground water science. In addition, the Research Facility's library is currently expanding its collection and is now aiding the scientific community through literature searches and loan of materials. Major projects of the facility, both past and present, are also listed in this overvies. (Eberle-NWWA)
W78-04289

A LOOK AT GROUND WATER RESEARCH.
For primary bibliographic entry see Field 2F.
W78-04290

REGIONAL GEOLOGY SERIES: PART 1, GLACIATED APPALACHIAN REGION,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 2F.
W78-04291

AQUIFER STORAGE OF HEAT,
Auburn Univ., AL. Water Resources Research Inst.
F. J. Molz, and J. Warman.
Water Well Journal, Vol. 32, No. 2, p 45-47, February, 1978.

Descriptors: *Heat storage wells, *Aquifers, *Heated water, *Energy, Injection wells, Cooling water, On-site investigations, Environmental effects.

Researchers from Auburn University are conducting the world's first field experiments on the conservation of thermal energy by storing it as hot water in an artesian aquifer for later recovery. Such procedures for the storage and use of energy may be particularly applicable to the utilization of cooling water from power plants. This research was initially funded by the USGS in order to obtain field data to verify mathematical predictive models. Additional funding was provided by ERDA to expand the scope of the study to include practical problems likely to be encountered in the operation of a commercial facility for storage and recovery of energy. A 200-ft. deep heat storage well was drilled at the site along with 10 temperature monitoring wells. A thermal recovery factor of 0.68 has been obtained, considered encouraging by the researchers. A preliminary report on the study voices some concern about suspended solids in injected water, swelling clays in the aquifer, ground water drift, avoidance of excessive injection pressure, and the effects of storing higher-temperature water. (Eberle-NWWA)
W78-04292

THE 1977 IRRIGATION SURVEY.
For primary bibliographic entry see Field 3F.
W78-04294

WELLS RECHARGED BY GRAVITY IN AHMEDABAD,
S. K. Gupta.
Johnson Drillers Journal, Vol. 49, No. 6, p 4-5, November-December, 1977. 1 fig.

Descriptors: *Artificial recharge, *Siphons, Groundwater, Injection wells, Artesian wells, Monsoons, *India(Ahmedabad).

An unusual system for artificial recharge to utilize water available from the Sabarmati river during periods of excess flow has been put into practice for the city of Ahmedabad, India. In effect, a siphon is used to take water from the water-table aquifer on the bank of the river and deliver the water into an injection well penetrating nearby artesian strata which furnish 90 percent of the city's water supply. The recharge water is obtained from a relatively shallow well about 21 meters deep. The siphon arrangement conducts water to the 238 meter recharge well by gravity flow without the use of a pump. The water level in the supply well is of such height to permit the siphon to work only when the river carries excess water during the monsoon rains which occur from June to October. The system is metered and utilizes a control valve. Recharge was begun on May 20, 1977, and has continued uninterrupted without the aid of any external energy source. (Eberle-NWWA)
W78-04295

NEWER TECHNIQUES AID SEARCH FOR GROUND WATER,
Universal Oil Products, St. Paul, MN. Johnson Div.
For primary bibliographic entry see Field 7B.
W78-04296

THE PROCESS OF HEAT ACCUMULATION AND GEOTHERMAL RESOURCE FORMATION,
W. H. Austin, Jr.
Canadian Mining Journal, Vol. 98, No. 10, p 36-40, October, 1977. 4 fig, 2 tab.

Descriptors: *Geothermal reservoirs, *Thermal waters, Heat flow, Mantle, Rift zones, Intrusions, Convection, Faults(Geology), Silicates, Remote sensing, Geophysics, Thermal powerplants, Costs.

A possible scenario for the formation of a geothermal resource area in the western U.S. might be as follows: (1) upward bulge of mantle aong plate boundary or rift zone; (2) heat flow from linear matle bulge causes localized melting at regular intervals along the plate boundary, rift, or fault zones, in turn causing formation of a series of batholithic zones which are either adjacent or overlapping along the zones of weakness; (3) differentiation causes upper portions of these melt areas to form acid intrusive rocks, with either continue moving upward or become mobile and detach from parent zone; (4) absorption of water, formation of plugs and stocks as intrusion continues; (5) extensive volcanic activity resulting in collapse of dome(s) formed by intrusion(s). Enormous quantities of hydrothermal fluids released to lost rock during cooling of intrusions;)6) convection currents in fractured rocks above intrusives from a carbonate or silicate seal, ultimately enclosing a geothermal reservoir. The article closes with discussion of the huristics of geothermal exploration, suggesting a step by step approach incorporating infrared, photographic, geochemical, heat flow, aeromagnetic, seismic, and surface electrical analyses. Costs of thermal powerplant development are briefly commented upon. (Eberle-NWWA)
W78-04301

LIMITATIONS OF BANK-STORAGE MODEL ASSUMPTIONS,
Missouri Univ.- Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W78-04335

GROUNDWATER AND SURFACE WATER IN THE PERMAFROST REGION,
For primary bibliographic entry see Field 2C.
W78-04352

A SALINITY MANAGEMENT STRATEGY FOR STREAM-AQUIFER SYSTEMS,
California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04374

WATER RESOURCES PLANNING (AN ILLUSTRATION ON MANAGEMENT OF SURFACE AND GROUNDWATERS),
Colorado State Univ , Fort Collins Dept of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04487

HYDROGEOLOGY AND DELINEATION OF BURIED GLACIAL RIVER VALLEY AQUIFERS IN NORTHWESTERN MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W78-04496

SALINITY MANAGEMENT STRATEGIES FOR THE LOWER SAN LUIS REY RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04499

APPLICATION OF THE DRILL-STEM TEST TO HYDROGEOLOGY,
Research Council of Alberta, Edmonton. Groundwater Div.
For primary bibliographic entry see Field 8B.
W78-04508

CYCLIC STORAGE, WHERE ARE YOU NOW,
H. E. Thomas.
Ground Water, Vol 16, No 1, p 12-17, January-February 1978. 20 ref.

Descriptors: *Groundwater, *Artificial recharge, *Water storage, *California, Groundwater recharge, Water resources, Water supply, Water resources development, Dams, Reservoirs, Irrigation, Droughts, Water demand, Water policy, Water management(Administrative), Water rights, Hydrology, Geohydrology, Cyclic storage.

This paper presented 10 theses summarizing: the cyclic pattern of precipitation and runoff in the Central Valley of California and the need for cyclic storage to insure regularity and continuity in water supply; the inadequacy of surface water storage because of evaporation losses and probable interference with groundwater recharge; the blasted hopes of Federal and State water agencies for control and management of the groundwater reservoir, because of potential conflict with private property rights; the artificial recharge by private and local enterprise; increasing emphasis in Federal and State programs upon surface reservoirs at increasing cost in money and water; the tendency of Federal policy to focus on the needs and clamors for irrigation water, with subsidies; and the availability of water from Federal projects now under construction for artificial recharge and subsurface storage, a first step to a long-range program of cyclic storage. (Sims-ISWS)
W78-04509

HYDRAULIC CONDUCTIVITY MEASUREMENTS UTILIZING HEAT-SHRINKABLE TUBING,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
For primary bibliographic entry see Field 8G.
W78-04510

HYDROLOGY OF TWO SMALL WETLAND BASINS IN EASTERN MASSACHUSETTS,
Lowell Univ., MA. Dept. of Earth Sciences.
For primary bibliographic entry see Field 2H.
W78-04539

GROUND WATER AND VEGETATIONAL STRUCTURES, GROUND WATER COURSE COINCIDENCE METHOD AND VARIABILITY

DIAGRAM IN CONTEXT OF ECOLOGICAL INVESTIGATIONS ON VEGETATIONAL UNITS AFFECTED BY GROUND WATER, NOVA ACTA LEOPOLDINA, VOL. 38, NO. 6, (IN GERMAN),
For primary bibliographic entry see Field 2F.
W78-04599

4C. Effects On Water Of Man's Non-Water Activities

ACCIDENTAL AND PLANNED WEATHER MODIFICATION IN ILLINOIS,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 3B.
W78-04205

CHANNEL EROSION SURVEYS ALONG TAPS ROUTE, ALASKA, 1976,
Geological Survey, Anchorage, AL. Water Resources Div.
P. F. Doyle, and J. M. Childers.
Open-file report 77-170 (basic data), 1976. 77 p, 50 fig, 2 tab, 6 ref.

Descriptors: *Channel erosion, *Alaska, *Pipelines, *Oil, *Conveyance structures, Environmental effects, Floods, Rivers, Data collections, On-site investigations, Aerial photography, Evaluation, *Trans-Alaska pipeline river crossings.

Channel surveys were made along the TAPS (Trans-Alaska Pipeline System) route during 1976 at the same 27 sites that were surveyed in 1975. One additional site was put under surveillance in 1976. Except for construction changes wrought by installation of the pipeline, most of the sites surveyed showed very little change since the 1975 surveys. Some of the significant events of 1976 at the monitored crossing sites include: glacier-dammed lake break-out floods on the Tazlina and Tsina Rivers, severe icings on the Gulkana River which resulted in a spring flood 3-4 feet (1 meter) over banktop, and virtual completion of all the buried crossings and all but one overhead crossing before the 1976 channel erosion resurveys were made. Aerial photogrammetric surveys were used again in 1976 on the same seven sites as in 1975. Comparison of the photogrammetric surveys with each other and with on-the-ground surveys indicate that the method is generally applicable for channel erosion studies. However, it requires engineering judgement and personal knowledge of the site to avoid reaching inaccurate conclusions about channel change in some instances. (Woodard-USGS)
W78-04259

THE USE OF COLOR INFRARED IMAGERY FOR THE STUDY OF MARSH BUGGY TRACKS,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 2L.
W78-04536

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY RESOURCE DEVELOPMENT.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 3E.
W78-04657

4D. Watershed Protection

EFFECTS OF URBAN LAKES ON QUANTITY AND QUALITY OF BASEFLOW,
Wisconsin Univ.-Milwaukee. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5B.
W78-04206

CHANNEL EROSION SURVEYS ALONG TAPS ROUTE, ALASKA, 1976,
Geological Survey, Anchorage, AL. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-04259

HYDROLOGIC FACTORS AND ENVIRONMENTAL IMPACTS OF MASS SOIL MOVEMENTS IN THE OREGON COAST RANGE,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
G. Ketcheson, and H. A. Froehlich.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 710, Price codes: A06 in paper copy, A01 in microfiche. Water Resources Research Institute, Oregon State University, Completion Report WRRI-56, January 1978. 94 p, 8 fig, 14 tab, 57 ref, 3 append. OWRT A-040-ORE(1).

Descriptors: Soil movement, Erosion, Avalanches, Watershed erosion, Landslides, *Oregon, Coasts.

Mass soil movements of four types; debris avalanche, debris torrent, debris slide and bank slough, were field inventoried in the Oregon Coast Range. A total of 104 mass movements were located in 21 undisturbed watersheds and 13 clearcuts harvested in the last six years. Failures associated with roads and landings were not included in this inventory. Failure volume ranged from 2 yd3 to 196 yd3. The average volume of all failure types ten cubic yards or more in volume is 41 yd3 in undisturbed watersheds and 47 yd3 in clearcuts. Failures less than ten cubic yards are of little significance in terms of initial volume moved, but in undisturbed watersheds they account for over one-fourth of the channel impact by mechanical scour and deposition. The frequency of all failures is similar in clearcuts and undisturbed watersheds, one in 19 acres and one in 17 acres, respectively. The results are compared with other studies in the Pacific Northwest and the differences are discussed. Natural variation accounts for much of the differences. Guidelines are given for assessing the risk of damage by debris avalanche and torrent type failures in proposed timber harvest areas. (Buckley-Ore St)
W78-04365

THE ROLE OF VORTICITY IN DEVELOPING LINEATION BY WIND EROSION,
Central Michigan Univ., Mount Pleasant.
For primary bibliographic entry see Field 2J.
W78-04517

DRAIN DISCHARGE FROM A LEVEL AGRICULTURAL WATERSHED,
Guelph Univ. (Ontario). School of Engineering.
T. C. Sharma, and R. W. Irwin.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 103, No IR4, Proceedings Paper 13399, p 429-443, December 1977. 7 fig, 3 tab, 12 ref.

Descriptors: *Drainage, *Agricultural watersheds, *Discharge(Water), Drainage patterns(Geologic), Hydraulic conductivity, Hydrography, Hydrology, Model studies, Surface runoff, Tile drainage, Watersheds(Basins), Subsurface drainage, Two parallel linear reservoir model.

A hypothesis was developed that watershed discharge from rainfall, for nonfreezing periods from a tile drained level watershed, was mainly tile flow with negligible amounts of surface runoff and base flow. Daily discharges at the watershed oulet were due to depletion of 2 parallel iinear reservoirs. A fast reacting reservoir, represented by the physical shallow plowed layer, constituted nearly 40% of the total runoff volume. The slow reacting reservoir, represented by the subsoil zone, contributed nearly 60% of the total runoff volume. (Lee-ISWS)
W78-04522

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

RESERVOIR METALIMNION OXYGEN DEMANDS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
J. A. Gordon, and B. A. Skelton.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 103, No. EE6, Proceedings Paper 13437, p 1001-1011, December 1977. 10 fig, 1 tab, 14 ref, 2 append.

Descriptors: *Reservoirs, *Oxygen demand, *Water quality, Temperature, Thermocline, Density, Lakes, Bacteria, Algae, Dissolved oxygen, Phytoplankton, Zooplankton, Chlorophyll, Biochemical oxygen demand, On-site investigations, On-site data collections, Model studies, Mathematical models, Metalimnion.

Field data showed that oxygen demanding substances, both biotic and abiotic, are concentrated in the metalimnions of stratified lakes and reservoirs. The result is that high rates of oxygen depletion occur in the depth zone, and the dissolved oxygen is often depleted. Consideration of the settling dynamics of organic particles according to Stoke's Law showed that the changes in water density and viscosity with temperature result in reduced terminal settling velocities through the metalimnion. Thus, these particles are settling into the metalimnion faster than they are settling out, and higher concentrations are effected. The calculated changes in settling velocities were compared to changes in dissolved oxygen, chlorophyll a, phytoplankton, zooplankton, and BOD. These materials are concentrated in the metalimnions of lakes and reservoirs, and the result is loss of dissolved oxygen in this critical depth zone. (Sims-ISWS)
W78-04202

UTILITY OF A SCANNING DENSITOMETER IN ANALYZING REMOTELY SENSED IMAGERY,
National Aeronautics and Space Administration, Cleveland, OH. Lewis Research Center.
For primary bibliographic entry see Field 7B.
W78-04220

CHEMICAL COMPOSITION OF SNOW ON THE WATER SURFACE OF THE KAMA AND VOTKINSK RESERVOIRS,
Perm State Univ. (USSR). Lab. of Water Management Research.
For primary bibliographic entry see Field 2C.
W78-04222

APPLICATION OF REMOTE SENSING IN THE DETERMINATION OF WATER QUALITY IN NEBRASKA RESERVOIRS,
Nebraska Univ., Lincoln. School of Life Sciences.
G. L. Hergenrader.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-30633, Price codes: A02 in paper copy, A01 in microfiche. NASA Contract Report 148776, July 22, 1976. 10 p, 5 tab.

Descriptors: *Pollutant identification, *Remote sensing, *Water quality, *Lakes, Satellites(Artificial), Turbidity, Suspended solids, Chlorophyll, Regression analysis, Correlation analysis, Data processing, On-site data collections, Trophic level, Eutrophication, *LANDSAT, *Lake McConaughy(Neb), Nebraska.

In June, July and August 1975, ground truth was collected from Lake McConaughy, a 35,000 acre reservoir in western Nebraska, coincident with the over-flights of LANDSAT. Water samples were collected on 6 different dates and were analyzed for turbidity, suspended solids, and chlorophyll. The objective of the research was to confirm earlier observations that reflectance data from LANDSAT CCT's correlate very well with certain water quality parameters, especially suspended solids, turbidity, and chlorophyll concentration. The additional data collected have resulted in even stronger correlations than were reported earlier. However, an unfortunate aspect is that the confidence intervals associated with the regression equations are extremely broad, suggesting that even though the parameters can be detected and measured by remote sensing, the accuracy of the measurements is questionable. The measurements were not precise enough to detect subtle changes in the trophic status of a lake or reservoir or to allow categorization of groups of lakes closely placed along the trophic spectrum. They can, however, be used with confidence to distinguish between and to classify lakes at the ends of the trophic spectrum from oligotrophic to eutrophic. (Sims-ISWS)
W78-04231

ANALYSES OF NATIVE WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED FROM THE ATCHAFALAYA RIVER AND ATCHAFALAYA BAY,
Geological Survey, Baton Rouge, LA. Water Resources Div.
C. R. Demas.
Open-file report 77-769, November 1977. 17 p, 1 plate, 5 tab, 12 ref.

Descriptors: *Channel improvement, *Water quality, *Pesticides, *Heavy metals, *Louisiana, Environmental effects, Baseline studies, Basic data collections, Chemical analysis, Water analysis, Core drilling, Sampling, Rivers, Channels, Bays, *Atchafalaya River(La), *Atchafalaya Bay, Pre-channel improvement study, Elutriate samples.

During October and November 1976 the U.S. Geological Survey, in cooperation with the U.S. Army Corps of Engineers, collected native water and core material from 14 sites along the Atchafalya River in Louisiana (from the head of Whiskey Bay Pilot Channel to American Pass) and 5 sites in Atchafalya Bay for evaluation of possible environmental effects of a proposed channel-enlargement project. Core material from all river sites and one bay site was collected to a depth of 50 feet (15 meters). At the remaining bay sites, samples were collected to a depth of less than 6 inches (15 centimeters) using a pipe dredge. Core material and native water were analyzed (separately and as elutriate samples prepared from mixtures) for selected metals, nutrients, organic compounds, and physical characteristics. No interpretation of the data is given. (Woodard-USGS)
W78-04245

GROUND-WATER RESOURCES OF THE RIVIERA BEACH AREA, PALM BEACH COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04247

SALINE-WATER INTRUSION IN THE FLORIDAN AQUIFER IN THE FERNANDINA BEACH AREA, NASSAU COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04248

GROUND-WATER BASIC DATA FOR MORTON COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04252

GROUND-WATER RESOURCES OF GRIGGS AND STEELE COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04253

GROUND-WATER RESOURCES OF CAVALIER AND PEMBINA COUNTIES, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04254

WATER-QUALITY EFFECTS ON BAKER LAKE OF RECENT VOLCANIC ACTIVITY AT MOUNT BAKER, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-04260

SUBMARINE SEEPAGE OF NATURAL GAS IN NORTON SOUND, ALASKA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab., and Geological Survey, Seattle, WA. Geology Div.
For primary bibliographic entry see Field 5B.
W78-04262

GEOLOGY AND WATER RESOURCES OF THE NORTHERN PART OF THE JUDITH BASIN, MONTANA,
Geological Survey, Billings, MT. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04263

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 1. COLORADO RIVER BASIN, SOUTHERN GREAT BASIN FROM MEXICAN BORDER TO MONO LAKE BASIN, AND PACIFIC SLOPE BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04266

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 4. NORTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM HONEY LAKE BASIN TO OREGON STATE LINE.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04267

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 3. SOUTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM WALKER RIVER TO TRUCKEE RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C
W78-04268

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 2. PACIFIC SLOPE BASINS FROM ARROYO GRANDE TO OREGON STATE LINE EXCEPT CENTRAL VALLEY.
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4A
W78-04269

DETECTION OF TRINITROTOLUENE IN WATER BY FLUORESCENT ION-EXCHANGE RESINS,
Naval Weapons Center, China Lake, CA.
C. A. Heller, R. R. McBride, and M. A. Ronning
Analytical Chemistry, Vol. 49, No. 14, p 2251-2253, December, 1977. 2 fig, 2 tab, 6 ref.

Descriptors: *Analytical techniques, *Ion exchange, *Water analysis, *Chemical wastes, *Pollutant identification, Industrial wastes, Effluents, Adsorption, Fluorescence, Resins, *Explosives, Effluents, Monitoring, Waste water treatment, *Trinitrotoluene.

A process for the detection of TNT (2,4,6-trinitrotoluene) in effluent water from ammunition plants is described. The process is based on the absorption of TNT on a quarternary ammonium ion-exchange resin which darkens in the presence of TNT. TNT can be detected at levels of 70 ppb and the presence of any colored species can be verified with the system. The analytical apparatus includes a liquid flow system and an optical system for illuminating and viewing the ion-exchange beads in the liquid system. An ultraviolet light source is used to irradiate the resin; fluorescence is measured by a photomultiplier, radiometer, and recorder. Interferences to the procedure include the presence of any colored anion, organic 'dye', or dark particulate matter. The method is suggested for use in a semicontinuous monitoring system. (Schulz-FIRL)
W78-04271

COMPOSITION OF EFFLUENTS FROM THE BLEACHING OF SPRUCE SULPHATE PULP (ZLOZENIE ODPADOVYCH VOD Z BIELENIA SMREKOVEJ SULFATOVEJ BUNICINY),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
T. Halmova, and L. Balhar.
Papir a Celuloza, Vol. 32, No. 5, p 12-15, 1977. 3 fig, 4 tab, 12 ref.

Descriptors: *Bleaching wastes, *Pulp and paper industry, *Biochemical oxygen demand, *Chemical oxygen demand, Pollutant identification, Chlorination, Effluents, Waste water treatment.

Laboratory experiments were conducted to examine bleaching of spruce sulphate pulps with different Kappa numbers with respect to variations in effluent characteristics. Concentrations of 5-day BOD, COD, and oxidizability were the parameters used in comparing the effluents. The analyses indicated that the Kappa number of the unbleached pulp and the amount of chlorine added during the chlorination contribute heavily to variations in effluent characteristics. Laboratory bleaching experiments are suggested for the prediction of pollutant loads from each of the various stages of the bleaching process, independently of the effects of washing between the single bleaching stages. (Schulz-FIRL)
W78-04280

EFFECT OF EFFLUENT COMPOSITION VARIABLES ON FLOCCULATION OF SUSPENDED SOLIDS IN LIME-SULFIDE UNHAIRING EFFLUENTS,
Agricultural Research Service, Philadelphia, PA. Eastern Regional Research Center.
For primary bibliographic entry see Field 5D.
W78-04285

ON THE WATER EXAMINATIONS OF THE RIVERS AT THE PIEDMONT DISTRICT OF MT. TOKACHI IN AND AROUND KAMIFURANO CHO, (IN JAPANESE),
Obihiro Zootechnical Univ. (Japan). Dept. of Veterinary and Public Health.
For primary bibliographic entry see Field 5B.
W78-04313

METHOD AND APPARATUS FOR CONTINUOUSLY MONITORING THE PRESENCE OF OIL IN WATER,
Texaco Inc., New York.
R. M. Dille, M. H. Van Stavern, D. L. Shull, and D. Gripshover.
U.S. Patent No. 4,045,671, 5 p, 1 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 961, No 5, p 2318, August 30, 1977.

Descriptors: *Patents, *Pollutant identification, *Oil pollution, Water pollution sources, Monitoring, Measurement, *Infrared absorption measurement.

A sensitive arrangement for determining the presence of oil, at low parts per million, in water employs infrared absorbtion measurement. First the water is mixed with about 10% by volume of trichlorotrifluoroethane, an oil solvent that may be separated from the water after taking any oil into solution. The solvent is one which does not have any significant infrared absorbency at a predetermined wave length, which does have absorbency by hydrocarbons. After separation of th oil solvent, it is continuously passed through an absorption cell in an infrared spectrometer, to monitor the presence of oil in the water. (Sinha-OEIS)
W78-04322

FLOATING BAG FOR POLLUTION STUDY,
Case Existological Labs., Ltd., Victoria (British Columbia). (Assignee).
J. N. Case.
U.S. Patent No. 4,046,178, 5 p, 2 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 962, No 1, p 129, September 6, 1977.

Descriptors: *Pollutant identification, *Patents, *Water pollution, *On-site investigations, Sampling, Floating, Water levels, Floating bags, Differential head.

A method for capturing a column of water in a flexible, floating bag is provided, where the water to be stored is the same as the body of water in which the bags are deployed. The bag is formed from a material that is relatively resistant to stretching. When it is deployed, for example in the ocean, there is maintained within the bag a water level slightly higher than the level of the water in the surrounding marine environment. The result is that the bag becomes turgid and resists distortion such as that caused by cross currents. In order to fill the bags with water from the surrounding marine environment, a collapsed bag provided with floats around its mouth is taken down, for example by a diver, to the point at which the mouth is below (40 feet or so) the surface of the water. The bag is then released. Due to the floats in the mouth, the bag instantly rises to the surface, expanding as it does so and becoming filled with water. When the bag reaches the surface, it will be substantially filled with water. It can then be attached to a suitable float and the differential head created by the pumping of a marginal amount of extra water to raise the level of the water within the bag to a level slightly above the level of the surrounding environment. (Sinha-OEIS)
W78-04323

MIXING LENGTH FOR REPRESENTATIVE WATER QUALITY SAMPLING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
T. G. Sanders, D. D. Adrian, and J. M. Joyce.
Journal Water Pollution Control Federation, Vol 49, No 9, p 2467-2478, December 1977. 3 fig, 4 tab, 24 ref. OWRT A-041-MASS(5).

Descriptors: *Diffusion, *Water quality, *Sampling, Channels, Monitoring, Turbulence, Hydrology, Mixing, Tracers, Equations, Instrumentation, *Pollutant identification, *Mixing length(Sampling).

A theoretical approach to determine zones of relatively complete mixing in a straight, uniform channel for representative water quality sampling was presented. The mixing length equation was based upon classical image theory and mean estimates of the lateral and vertical turbulent diffusion coeffiecents. The coefficients were estimated simultaneously in a procedure minimizing the squared deviations between field tracer concentrations and the concentrations predicted from the recently derived analytical solution to the three-dimensional, unsteady-state, advection and dispersion partial differential equation. The mixing lengths and the turbulent diffusion coefficients of the test stream compared favorably with results of other researchers. An easily assembled, inexpensive sampling device was tested and used to collect tracer samples at several depths simultaneously without disturbing the tracer mixing. (Lee-ISWS)
W78-04334

SURFACE WATER QUALITY IN CANADA - AN OVERVIEW.
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5G.
W78-04349

NITRILOTRIACETIC ACID (NTA) IN THE CANADIAN ENVIRONMENT,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5B.
W78-04350

WATER QUALITY SURVEYS ON THE NIAGARA RIVER - 1974,
Department of the Environment, Burlington (Ontario). Water Quality Div.
C. H. Chan.
Report Series No. 48, 1977. 9 p, 3 fig, 7 tab.

Descriptors: *Water quality, *Surveys, *Nutrients, *Pesticides, *Chemical properties, Heavy metals, Water pollution, Temperature, Statistics, Canada, *Niagara River, *Niagara-on-the-Lake.

Five water quality surveys were carried out from July to December of 1974 at Niagara-on-the-Lake to examine the cross-sectional, downstream and seasonal variation of the water chemistry of the mouth of the Niagara River. Sixteen surface water samples were collected for three consecutive days on each survey. The water samples were analyzed for nutrients, dissolved major ions, heavy metals and organic contaminants. Variance analysis of the results indicates that there is no lateral or cross-sectional variation in the water chemistry and that the variability in the water quality of the Niagara River is both parameter and season dependent. (WATDOC)
W78-04358

WATER QUALITY OF URBAN STORM WATER RUNOFF IN THE BOROUGH OF EAST YORK,
For primary bibliographic entry see Field 5B.
W78-04359

ANALYTICAL MONITORING FOR EFFLUENT POLLUTION,
British Ceramic Research Association, Stoke-on-Trent (England).
P. H. Brassington.
Transactions and Journal of the British Ceramic Society, Vol. 76, No. 5, p 13-14, 1977. 2 tab, 1 ref.

Descriptors: *Analytical techniques, *Monitoring, *Sampling, *Pollutant identification, Effluents, Hydrogen ion concentration, Suspended solids, Metals, Chemical oxygen demand, Biochemical oxygen demand, Industrial wastes.

Various methods of waste water sampling and pollutant identification available to the pottery industry are reviewed. Sampling of industrial waste waters should be conducted so as to provide information on the daily variation in effluent composition, as well as on the particular sources of waste water contaminants. The pH of the sample should be measured as soon as possible after collection. Suspended solids are normally measured by filtration of the effluent through a fine grade filter paper. Atomic absorption spectrophotometry is used to measure lead, cadmium, zinc, chromium, copper, nickel, and tin. The high clay content of pottery manufacturing waste water often makes it necessary to subject the effluents to acid digestion prior to metal analysis. Procedures for BOD and COD analyses are outlined. Typical limits for effluent discharge in the Stoke-on-Trent area in England are listed. (Schulz-FIRL)
W78-04376

ENVIRONMENTAL TRACE ANALYSIS OF ORGANICS IN WASTE WATER BY GLASS CAPILLARY COLUMN CHROMATOGRAPHY AND ANCILLARY TECHNIQUES,
Colorado Univ., Boulder. Dept. of Chemistry.
R. E. Sievers, R. M. Barkley, G. A. Eiceman, R. H. Shapiro, and H. F. Walton.
Journal of Chromatography, Vol. 142, p 745-754, 1977. 3 fig, 25 ref.

Descriptors: *Pollutant identification, *Gas chromatography, *Mass spectrometry, *Ozone, *Chlorination, *Organic compounds, Colorado, Treatment facilities, Industrial wastes, Waste water treatment, Waste water disposal.

Products formed during ozone treatment of secondary waste water were analyzed with gas chromatography and mass spectrometry techniques. The ozonization of waste water was tested as an alternative to disinfection by chlorination which has been shown to produce carcinogenic compounds that may enter potable water sources. Waste water samples were obtained from the Upper Thompson Sanitation District treatment facility in Estes Park, Colorado, where ozonization was being used. Chromatograms of the waste water after ozonization revealed the presence of n-hexanal, n-octane, n-heptanal, n-octanal, and n-nonanal. A chromatogram taken before ozonolysis indicated significant concentrations of chlorinatd hydrocarbons. After ozonization, quantities of chloroform and tetrachloroethylene were unchanged from levels recorded before ozone treatment. Halogenated hydrocarbon concentrations in ozone-treated effluent were found to be lower than levels in chlorinated waste water. Unknown hydrocarbons with carbon numbers ranging 9-11 remained relatively unchanged after ozonization. Caffeine was found to be a significant component of secondary treated effluent; caffeine derivatives were observed after ozonization under laboratory conditions. (Lisk-FIRL)
W78-04387

NEW HYGIENIC FLOWMETER.
For primary bibliographic entry see Field 7B.
W78-04392

TWO-STAGE ACTIVATED SLUDGE BETTER THAN SINGLE FOR TOXICITY REDUCTION.
For primary bibliographic entry see Field 5D.
W78-04406

FUNDAMENTAL PRINCIPLES OF SLUDGE ANALYSIS (GRUNDLAGEN DER ANALYTIK VON SCHLAEMMEN),
G. Jaekel.
Vom Wasser, Vol. 48, p 199-212, 1977. 6 tab.

Descriptors: *Analytical techniques, *Pollutant identification, *Industrial wastes, *Clarification, Sludge treatment, Water analysis, Waste water treatment.

The need for a uniform series of analytical techniques for industrial waste water sludges has been recognized with the creation of the 'German unified processes for the examination of water and sewage'. Various methods exist for the determination of physical and chemical properties of waste water sludges, including microorganisms content, dewaterability, pH, viscosity, specific resistance to filtration, and chemical constituents. Analytical techniques for industrial wastes are outlined, with special reference to sludge leachates. (Schulz-FIRL)
W78-04410

THE COORDINATED MEDITERRANEAN POLLUTION MONITORING AND RESEARCH PROGRAM,
United Nations Environment Program, Geneva (Switzerland).
For primary bibliographic entry see Field 5G.
W78-04412

QUALITY ASSURANCE PROGRAM FOR TRACE HYDROCARBON ANALYSIS,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
S. N. Chesler, H. S. Hertz, W. E. May, and S. A. Wise.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p 1-14, March 1977. 3 tab. 01-6-022-11469.

Descriptors: *Pollutant identification, *Analytical techniques, *Baseline studies, *Water pollution, Alaska, Resources development, Sediments, *Outer Continental Shelf, Quality assurance, Hydrocarbons.

This program was undertaken to assess the analytical integrity of hydrocarbon analyses performed by NOAA laboratories and NOAA contractors. Since chemical data reported to NOAA originates from several different laboratories, it is imperative that these data be uniform in quality so that there is a basis for comparison of the data. Of the Alaskan sediment samples analyzed by the liquid chromatograph (LC) method, only Katalla River sediment showed presence of polynuclear aromatic hydrocarbons (PAH's). Since there is a low level, natural oil seep on the Katalla River, the presence of PAH's in the river sediment is to be expected. The other sediment collection stations must be considered to be frr from any detectable PAH contamination. The methodology for the analysis of hydrocarbon content in biological tissue samples has been completed and verified. The method will be used to determine the hydrocarbon baseline in Mytilus samples backlogged at NBS. The sediment intercalibration exercise results indicated that wide (factor of 50) variations can occur when different laboratories analyze the same low-level hydrocarbon samples. Detailed evaluation of the results indicates that the numbers are not in the same population, and therefore no statistical evaluation of the data (Other than reporting ranges) can be made. These observations confirm the need for a strong program in quality assurance. (Sinha - OEIS)
W78-04457

INTERLABORATORY COMPARISON OF ANALYSES FOR TRACE LEVEL PETROLEUM HYDROCARBONS IN MARINE SEDIMENTS,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
L. R. Hilpert, W. E. May, S. A. Wise, S. N. Chesler, and H. S. Hertz.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p 15-39, March 1977. 6 tab, 16 ref.

Descriptors: *Water pollution, *Pollutant identification, *Analytical techniques, *Baseline studies, Alaska, Sediments, Oil pollution, Resources development, *Outer Continental Shelf, Petroleum hydrocarbons.

Results of analyses for petroleum hydrocarbons at the ppb level in marine sediments have been compared among eight laboratories. Values for concentrations of total extractable hydrocarbons scattered between 9 to 500 microgram/kg and 49 to 6625 microgram/kg for the two sites examined. Scatter of results for hydrocarbons in the gas chromatographic elution range, the most abundant aliphatic and aromatic hydrocarbons, and total polynuclear aromatic hydrocarbons (four rings and larger) were similar. Results for percent water and pristane/phytane ratio were somewhat more consistent. Sample inhomogeneity and analysis uncertainty contributed to an observed intralaboratory precision of plus or minus 25 percent for nine replicate analyses of one sediment sample. The data are discussed with regard to the reliability and comparability of current methods for environmental baseline measurements. (Sinha-OEIS)
W78-04458

RESEARCH AND EVALUATION OF TRACE ELEMENT METHODOLOGY FOR THE ANALYSIS OF SEA WATER,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
I. L. Barnes, H. M. Kingston, T. C. Rains, and J. R. Moody.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p 38-88, March 1977. 5 tab, 30 ref, 2 append.

Descriptors: *Pollutant identification, *Water pollution, *Baseline studies, *Analytical techniques, Methodology, Trace elements, Sea water, Fresh water, Neutron activation analysis, X-ray fluorescence, Alaska, *Outer Continental Shelf, Atomic absorption spectrometry, Activation analysis.

It was determined that a number of plastic materials may be suitable for the collection and storage of samples of sea water. The analysis for a variety of elements may be done accurately on as little as 100 ml of water even in the extremely clean waters of Alaska using graphic furnace atomic absorption spectrometry, if extreme care is taken to prevent contamination during the preconcentration procedure. A new preconcentration procedure was developed which should substantially help in these analyses in that only minimal handling of the sample is required, only reagents for which ultra purification procedures are available are required and the procedure appears adaptable to field or shipboard use. The procedure removes elements (i.e. Na, K, Ca, and Mg) that are interferences in many analytical methods and thus makes possible the use of a variety of techniques such as atomic absorption (flame or flameless), neutron activation and x-ray fluorescence. (Sinha-OEIS)
W78-04459

DISTRIBUTION OF LIGHT HYDROCARBONS, C1-C4, IN THE NORTHEAST GULF OF ALASKA, LOWER COOK INLET, SOUTHEASTERN BERING SHELF, NORTON SOUND AND SOUTHEASTERN CHUKCHI SEA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W78-04461

NATURAL DISTRIBUTION OF TRACE HEAVY METALS AND ENVIRONMENTAL BACKGROUND IN ALASKAN SHELF AND ESTUARINE AREAS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W78-04463

HYDROCARBONS: NATURAL DISTRIBUTION AND DYNAMICS ON THE ALASKAN OUTER CONTINENTAL SHELF,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W78-04464

TRACE METAL CONTENT OF BOTTOM SEDIMENT IN NORTHERN BERING SEA,
Geological Survey, Menlo Park, CA.
H. Nelson.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p. 728-735, March 1977. 3 fig, 3 tab.

Descriptors: *Baseline studies, *Water pollution sources, Water pollution, *Data collections, Heavy metals, *Bottom sediments, Resources development, Alaska, Trace elements, *Outer Continental Shelf, Bering Sea, Trace metals.

All analyses have been completed and all data resides on data files in computer storage. All old and new bulk data sets are being integrated into one master set with latitude and longitude locations and environmental information. On the basis of statistical results, elements will be plotted onto maps contoured into the third dimension by computer graphics. An example of a computer listing of elements Fisher K statistics that have been completed on part of the bulk set is included as well as an example of a completed reoport on mercury for the Kuskokwim region. (Sinha - OEIS)
W78-04465

CHARACTERIZATION OF ORGANIC MATTER IN SEDIMENTS FROM GULF OF ALASKA, BERING AND BEAUFORT SEAS,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 5B.
W78-04467

FULVIC ACIDS, HUMIC ACIDS, AND KEROGENS FROM SEDIMENTS OF THE GULF OF ALASKA AND EASTERN BERING SEA,
California Univ., Los Angeles. Dept of Earth and Space Sciences.
K. E. Peters, and I. R. Kaplan.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p. 839-857, March 1977. 4 fig, 2 tab, 15 ref.

Descriptors: *Pollutant identification, *Baseline studies, *Organic matter, Water pollution, Sedi-

ments, Fulvic acid, Humic acid, Diagenesis, Resources development, Alaska, *Water pollution sources, *Outer Continental Shelf, Hydrocarbons, Kerogen, Gulf of Alaska, Bering Sea.

Surface samples of sediment from Gulf of Alaska and the eastern Bering Sea were analyzed by the Leco carbon technique for carbon as fulvic acid, humic acid, and kerogen. Preliminary data indicate a crude correlation between fulvic acid/humic acid ratios and proximity to shore which may be attributed to: (1) differing degrees of diagenesis, and/or (2) mixing of marine and terrestrial humic substances. Carbon isotope data support the contention that the relative proportions of marine and terrestrial organic matter influence the FA/HA ratio. (Sinha - OEIS)
W78-04468

RIVER BASIN WATER QUALITY SAMPLING,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
D. A. Verdi, C. C. Clarkson, and D. D. Adrian.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 029, Price codes: A06 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRRC Publication No 82, Termination Report, September 1976. 110 p, 21 fig, 12 tab, 12 ref, 6 append. OWRT A-083-MASS(1).

Descriptors: *Pollutant identification, Massachusetts, *Sampling, Rivers, On-site data collections, *Basic data collections, Biochemical oxygen demand, Water quality, Suspended load, *Merrimack River(Mass).

A sound water quality data base provides an important input to officials responsible for the development of river basin management plans. Developing a sound water quality data base requires the collection and analysis of many water quality samples over a long period of time. The research reported focuses on two aspects of river basin water quality sampling. The first aspect is a study of various means by which representative coverage of the river basin can be obtained. Representative coverage of the river basin involves allocating sampling stations to different reaches of the river. Several criteria are explored empirically for their practicality in allocating sampling stations to various reaches of the Connecticut River system. The criteria include uniform area coverage and weighting in terms of BOD loads. The second aspect of river basin sampling reported is a study of suspended sediment loads in the Merrimack River. The suspended sediment data are modeled by time series methods. (Lefferts-Mass)
W78-04491

MOBILITY OF HEAVY METAL HUMATES IN SOILS AND SURFACE WATERS,
Missouri Univ., Rolla. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 5B.
W78-04494

TOXIC METALS IN SURFACE WATERS FROM COAL ASH,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Envrontemental Studies.
D. S. Cherry, and R. K. Guthrie.
Water Resources Bulletin, Vol. 13, No. 6, p 1227-1236, December 1977. 3 fig, 2 tab, 22 ref. ERDA AT(38-1-824), S-1750, S-1818.

Descriptors: *Pollutants, *Trace elements, Leachate, *Water pollution sources, *Water pollution, Analytical techniques, Public health, Chemical analysis, Water analysis, Water chemistry, Fossil fuels, Water quality, Heavy metals, Runoff, Leaching, Cadmium, Mercury, *Coal ash, Solid waste disposal sites, Benthic sediment, Coal ash pollution.

The concentrations of 10 toxic elements (titanium (Ti), manganese (Mn), copper (Cu), chromium (Cr), zinc (Zn), arsenic (As), selenium (Se), cobalt (Co), cadmium (Cd), and mercury (Hg)) were measured in the water, benthic sediment, plants, invertebrates, and vertebrates of an ash basin and its drainage system at a coal-fired power plant of the Savannah River Project, Aiken, South Carolina, over a period of two years. During 12 months of this period, the basin was filled, and little settling of ash occurred. In the remaining 12 months, dredging had been completed, adequate settling occurred, and most of the effluent turbidity was removed. All elements were more concentrated in sediment and biota than in water, and 5 (Mn, Cu, As, Zn, and Se) were biomagnified by at least one biotic component as compared to concentration in benthic sediment. Plants had high accumulations of Ti, Mn, As, and Hg; invertebrates had high accumulations of Co, Hg, Cu, Cr, Cd, and As; and vertebrates greatly biomagnified Se and Zn. The streamlined biotic community of the system accomplished major removal of Mn, Zn, As, Se, and Cd from the effluent. The magnitude of bioaccumulation of Ti, Mn, Zn, As, Se, Cd, and Hg was increased during the period of adequate settling the Basin. (Henley - ISWS)
W78-04502

PROBLEMS WITH THE USE OF ULTRA-VIOLET ABSORPTION FOR MEASURING CARBON COMPOUNDS IN A RIVER SYSTEM,
Durham Univ. (England). Dept. of Botany.
C. R. C. Sheppard.
Water Research, Vol. 11, No. 11, p 979-982, 1977. 4 fig, 11 ref.

Descriptors: *Carbon, *Humic acids, *Organic compounds, *Absorption, *Water properties, Analytical techniques, Organic acids, Humus, Peat, Water pollution sources, Water quality, Water pollution, Instrumentation, Waste identification, Optical properties, Organic matter, Chemical properties, Organic wastes, *Ultra-violet absorption, Sewage components.

The method of ultra-violet (uv) absorption for measuring dissolved organic compounds was used to trace the fate of 2 groups of compounds in a river. The first was a group originating from the peatland catchment whose uv absorption was stable for at least one week. The second was a group which appeared only by a major town, which was attributed to sewage compounds, and whose absorption was short lived (less than 24 h). Interferences were found with the method in marine and estuarine system. The interferences appear to make the method of limited value. In interference is such that absorption is severely depressed in saline waters within the range 220-260 nm. The substance causing the interference can be concentrated using a nylon column, but the substance loses its effect with time. (Henley-ISWS)
W78-04513

UNUSUAL RESPONSE OF A CUPRIC ION ELECTRODE IN PRAIRIE LAKE WATERS,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
Journal of the Fisheries Research Board of Canada, Vol. 35, No. 1, p 141-143, January 1978. 1 fig, 7 ref.

Descriptors: *Copper, *Ions, *Electrodes, *Water analysis, *Copper compounds, Algicides, Copper sulfate, Analytical techniques, Fish, Aquatic life, Fish toxins, Hardness(Water), Chemical analysis, Algae, Water pollution sources, Algae control, Fisheries, Ecology, *Prairie lake waters, *Specific ion electrode, Electrode response.

The Orion cupric ion electrode exhibited the theoretical (Nernstian) response of 29-30 mV per concentration decade in deionized water solutions, but in certain moderately alkaline amd moderately saline natural waters of the Canadian prairies (pH 7.8-8.6, specific conductance 950-6550 microsiemens/cm), the response to added cupric ion of over 100 micrograms Cu/L was twice as great. The electrode, nevertheless, was usable in natural waters provided that calibration was made with water from the same source. (Henley-ISWS)
W78-04527

THE DETERMINATION OF VANADIUM IN AQUEOUS SOLUTIONS, AIR AND BIOLOGICAL MATERIAL: 1. THE DETERMINATION OF VANADIUM IN AQUEOUS SOLUTIONS, (IN GERMAN),
Farbenfabriken Bayer A. G., Leverkusen (West Germany). Physiologisches Chemie Analytisches Lab.
W. Pilz, S. Komischke, and G. Prior.
Int J Environ Anal Chem. 1(1), p 47-61, 1971.

Descriptors: Aqueous solutions, Salicylhydroxamic-acid, Salicyl, *Vanadium, *Pollutant identification.

The method originally described by Bhaduri and Ray for the determination of vanadate with salicylydroxamic acid was modified by the present authors as early as 1958. At that time it was impossible to achieve linearity between extinction and concentration, and this relationship was described with a logarithmic function. A new study of this problem resulted in the establishment of linearity between extinction and extinction and concentration (straight calibration curve). In addition, the extraction equilibrium for the dye extracted from an aqueous phase was investigated. Examination of the Lambert and Lambert-Beer laws, the stability of the dye toward ageing, relative error, dependence of extinction on the concentration of reagent, and interference of foreign ions were discussed. Experimental procedures, analytical data and a simple method for the synthesis of analytically pure salicylhydroxamic acid were presented.--Copyright 1973, Biological Abstracts, Inc.
W78-04540

MODEL DDO/MARK V DIGITAL DISSOLVED OXYGEN ANALYZER.
National Oceanographic Instrumentation Center, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 021, Price codes: A02 in paper copy, A01 in microfiche. Instrument Fact Sheet 76012, June 1976. 6 p, 5 fig.

Descriptors: Evaluation, *Instrumentation, *Dissolved oxygen analyzers, Temperature, Water properties, *Pollutant identification, Martek Instruments Model DDO/Mark V Digital Dissolved Oxygen Analyzer.

A description, manufacturer's performance specification, results of performance and environmental evaluation tests, and comments on the Model DDO/Mark V Digital Dissolved Oxygen Analyzer are presented. The analyzer, manufactured by Martex Instruments, Inc., is designed for simultaneous in situ measurement of dissolved oxygen and temperature. Dissolved oxygen is sensed by a gold-silver polarographic membrane type probe designed to be automatically temperature compensated. Temperature is sensed by a thermolinear array utilizing a PN-junction semiconductor device. The sensor outputs are developed as analog signals which are then digitized by automatic-zeroing, commandable dual-slope circuitry which converts at rates of 5 to 7 times/second with appropriate integration for each conversion cycle. Readout is on a 4-digit panel meter switchable for each parameter; the display can be read continuously, made to flash at a fixed rate to conserve power, or disabled entirely while operating in a recording mode. A front panel jack permits analog strip chart recording of all parameters simultaneously, and a BCD signal can be obtained from the

digital panel meter for printer readout for the switch-selected parameter. The analyzer can be operated from nickel-cadmium rechargeable batteries, alternating current mains, or external batteries. Analyzer tests showed calibration errors and nonrepeatability data. Cleaning and recharging of the sensor were necessary during the evaluation period, and the readout display unit had to be replaced due to temperature sensitivity. (Wares-IPA)
W78-04547

BECKMAN FIELDLAB DISSOLVED OXYGEN SYSTEM.
National Oceanographic Instrumentation Center, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 029, Price codes: A02 in paper copy, A01 in microfiche. Instrument Fact Sheet 76011, June 1976. 10 p, 7 fig, 1 ref.

Descriptors: Evaluation, *Instrumentation, *Dissolved oxygen analyzers, Temperature, Water properties, *Pollutant identification, Beckman Instruments Fieldlab Dissolved Oxygen System.

A description, manufacturer's performance specifications, results of performance and environmental evaluation tests, and comments on the Beckman Instruments Fieldlab Dissolved Oxygen System are presented. The system is a portable unit designed to measure dissolved oxygen and temperature in situ in fresh water and salt water. Dissolved oxygen is sensed with a platinum-silver polarographic membrane type probe. Three sensors are available: a glass unit for sterilized laboratory work and two rugged units for in situ or laboratory applications (one including rubber diaphragm for pressure compensation). Temperature is sensed by an optional separate thermistor type probe which is used to manually set a temperature compensation dial on the face of the readout unit. Dissolved oxygen and temperature data are displayed on an analog panel meter and through an analog recorder output jack for dissolved oxygen alone. The unit can be powered by either a rechargeable nickel-cadmium battery pack or by direct current mains. Accessories and fittings are available to facilitate the system's use for laboratory, flow-through, or pipeline applications. Tests of the system showed calibration errors and nonrepeatability data which were attributed to selection of sensitive experimental procedures. The manual temperature compensation operation was inconvenient and is likely to lead to error in readings. (Wares-IPA)
W78-04548

DISSOLVED OXYGEN ANALYZER MODEL 330.
National Oceanographic Instrumentation Center, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 030, Price codes: A02 in paper copy, A01 in microfiche. Instrument Fact Sheet 76010, June 1976. 6 p, 3 fig, 1 ref.

Descriptors: Evaluation, *Instrumentation, *Dissolved oxygen analyzers, Temperature, Water properties, *Pollutant identification, Rexnord Instrument Products Dissolved Oxygen Analyzer Model 330.

The description, manufacturer's performance specifications, results of performance and environmental tests, and comments on the Rexnord Instrument Products Dissolved Oxygen Analyzer Model 330 are presented. The system measures dissolved oxygen and temperature in situ in fresh water and salt water. The system evaluated was comprised of the analyzer, a Model 61 field probe, and a Model 18 stirrer assembly (optional). Dissolved oxygen is sensed with a platinum-lead polarographic membrane type probe that is designed to be automatically temperature compensated. Temperature is sensed by a thermistor. Data are provided in the form of a visual display on an analog panel meter and through an analog recorder output jack. The Model 330 is powered by carbon-zinc batteries, and an optional feature permits operation from standard alternating current mains. The stirrer is powered by batteries. Tests of the analyzer showed calibration errors and nonrepeatability data. The probe unit was replaced during the evaluation due to failure to operate properly at low temperatures, and some corrosion of metal parts was noted after salt water exposure. (Wares-IPA)
W78-04549

PUBLIC HEALTH ASPECTS OF LAND UTILIZATION OF WASTEWATER EFFLUENTS AND SLUDGES,
Johns Hopkins Univ., Baltimore, MD.
For primary bibliographic entry see Field 5E.
W78-04604

A SIMPLE SOIL PERCOLATION TEST DEVICE FOR FIELD ENVIRONMENTALISTS,
Summit County Dept. of Environmental Health, Frisco, CO.
W. H. Smith, and P. E. Stark.
Environmental Health, Vol 40, No 3, p 138-139, November-December, 1977. 6 fig, 3 ref.

Descriptors: *Soil moisture meters, *Percolation, *Environmental engineering, *Water quality, *Sewage disposal, Analytical techniques, Environmental sanitation, Soil water movement, Moisture content, Instrumentation, Cesspools, Waste water treatment.

A simple float meter has been designed to provide accurate, reliable and systematic soil percolation data for sewage disposal site evaluations. The device consists of a styrofoam float, aluminum float rod, PVC float housing tube, and plastic end cap. It allows technicians to run several tests simultaneously. The float meter yields uniform, precise and reproducible test results. The float is placed in a hole at the test site and marked with tape. After the hole is filled with water and the initial level marked, level markings are registered for three consecutive time intervals once the water level decrease becomes consistent. The device can be constructed for about $10. More than one float meter can be used to conduct several simultaneous tests. (Lisk-FIRL)
W78-04619

METHODS FOR MEASURING THE DEGREE OF STABILITY OF AEROBIC STABILIZED SLUDGES,
Norsk Inst. for Vannforskning, Blindern.
A. S. Eikum, and B. Paulsrud.
Water Research, Vol. 11, No. 9, 1977. 7 fig, 6 tab, 18 ref.

Descriptors: *Sludge treatment, *Aerobic treatment, *Odor, *Stabilization, *Nitrification, Oxygen, Biochemical oxygen demand, Chemical oxygen demand, Waste water treatment, Hydrogen ion concentration, Pollutant identification.

Various parameters which can be used to assess the degree of stability of aerobically processed raw sludges were identified and then used to devise a definition of fully stabilized sludge. Sludges were termed fully stabilized after 14 days of storage at 20C, providing the Odor Intensity Index did not exceed 11 at any time. Aerobically stabilized having a 'soil' odor was not considered objectionable. Insufficient sludge aeration and detention periods contributed to an increase in the odor intensity. As long as temperature effects were considered, oxygen uptake rates were also deemed suitable measurements of stability. Nitrate concentrations on aerobic stabilized sludge were also suggested as a measure of stabilization. Both oxygen uptake and nitrification were judged to be reliable parameters of stability for primary sludge, mixed-primary chemical sludge, and septic tank sludge. BOD and COD reductions, pH changes, volatile suspended solids contents, and lead acetate tests were not considered adequate parameters for measuring sludge stability. (Lisk-FIRL)
W78-04620

THE EFFECT OF TOXIC LOADS ON EFFLUENT PURIFICATION SYSTEMS,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5D.
W78-04623

METHOD DEVELOPMENT AND MONITORING OF POLYNUCLEAR AROMATIC HYDROCARBONS IN SELECTED U.S. WATERS,
Syracuse Research Corp., NY.
J. Saxena, D. K. Basu, and J. Kozuchowski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 635, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/1-77-052, November 1977. 83 p, 21 fig, 23 tab, 55 ref, append. ICC614, R803977.

Descriptors: *Monitoring, *Organic compounds, Water quality, *Pollutant identification, Water supply, Water treatment, *Potable water, Sampling, *Analytical techniques, Chromatography, Public health, Methodology, *Polynuclear aromatic hydrocarbons, Polyurethane foam plugs, Raw water.

A method for concentration of trace quantities of six representatives of the polynuclear aromatic hydrocarbon (PAH) family (fluoranthene, benzo(k)flouranthene, benzo(j)flouranthene, benzo(a)pyrene, benzo(ghi)perylene, and indeno(1,1,3-cd)pyrene) has been developed and successfully applied to PAH monitoring in finished drinking waters and their raw water sources in 10 selected water supplies in the eastern United States. PAH is collected by passing water through polyurethane foam plugs. Water is heated to 62 plus or minus 2 degrees Centigrade prior to passage, and flow rate is maintained at approximately 250 ml/minute to obtain quantitative recoveries. The collection is followed by elution of foam plugs with organic solvent, purification by partitioning with solvents and column chromatography on Florisil, and analysis by two dimensional thin layer chromatography-fluorometry and gas liquid chromatography-flame ionization detection. Employing this method and a sample volume of 60 liters, PAH was detected in all the 10 water supplies sampled. Although the sum of the six representative PAH values in drinking waters was small (0.9 to 15 ppt), the values found for raw waters were as high as 600 ppt. It was not determined whether PAH was removed during treatment or transformed to another product and thus escaped detection. The health significance that the presence of these levels of PAH, in finished and raw waters, may have to man is not known. (Wares-IPA)
W78-04656

MOVEMENT OF MERCURY-203 IN PLANTS,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5B.
W78-04658

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON NITROSAMINES.
Environmental Protection Agency, Research Triangle Park, NC. Office of Research and Development.
For primary bibliographic entry see Field 5C.
W78-04659

FUSION METHOD FOR THE MEASUREMENT OF PLUTONIUM IN SOIL: SINGLE-LABORATORY EVALUATION OF INTERLABORATORY COLLABORATIVE TEST,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
P. B. Hahn, E. W. Bretthauer, P. B. Altringer, and N. F. Mathews.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 965, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/7-77-078, July 1977. 76 p, 1 fig, 16 tab, 22 ref, append. EHE 625C (ABJ).

Descriptors: *Measurement, *Soil contamination, Quality control, Evaluation, Methodology, *Pollutant identification, Soil analysis, Laboratory tests, *Plutonium, Quantitative analysis, Fusion, Fusion method.

The results of a single laboratory evaluation and an interlaboratory collaborative test of a method for measuring plutonium in soil are presented. The method (described in the appendix) employs potassium fluoride and potassium pyrosulfate fusions to compose a 10-gram sample, barium sulfate precipitations, solvent extraction and electrodeposition to isolate the plutonium, and alpha spectrometry to measure the plutonium. The single laboratory evaluation demonstrated that the overall within-laboratory precision of the method can approach the precision of nuclear counting statistics alone. The interlaboratory collaborative test showed the coefficient variation representing differences between laboratories to be approximately 10% for concentration levels exceeding one disintegration per minute per gram. Also discussed are several problem areas associated with environmental actinide analyses, including difficulties that may be anticipated in requiring monitoring laboratories to adopt a specific complex method of this type. Suggestions for improving agreement between laboratories include establishing criteria for analytical results rather than requiring specific methodology. (Wares-IPA)
W78-04660

RELATIONSHIPS AMONG POLLUTION INDICATOR BACTERIA ISOLATED FROM RAW WATER AND DISTRIBUTION SYSTEMS BY THE PRESENCE-ABSENCE (P-A) TEST,
Ontario Ministry of the Environment, Rexdale.
J. A. Clark, and L. T. Vlassoff.
Health Lab Sci. 10(3), p 163-172, 1973.

Descriptors: *Bacteria, Distribution, Fecal coliforms, Filters, Fluorescent, Indicators, Isolated, Pseudomonads, Tests, Water samples, *Bioindicators, *Membrane filters, *Pollutant identification, *Potable water, Water supply.

Comparative analyses of raw and drinking water samples were made using membrane filter (MF) and presence-absence (P-A) precedures. Analysis of raw water samples were more suited to MF procedures, whereas analysis of drinking water samples was more effectively performed by the P-A procedure. Pollution levels in the samples influenced the types, frequencies and combinations of pollution indicator bacteria detected by the P-A test. Bacteria indicative of fecal pollution were the first to disappear following water treatment, although coliform bacteria were the principal organisms isolated from insufficiently treated water. Water considered potable from a sanitary aspect may still have an appreciable incidence of other bacteria present such as fluorescent pseudomonads.--Copyright 1974, Biological Abstracts, Inc.
W78-04664

INVESTIGATIONS OF THE IMPACT OF MERCURY ON ENCLOSED WATER COLUMNS USING A ZOOPLANKTON SIMULATION MODEL,
British Columbia Univ., Vancouver. Inst. of Oceanography.
N. C. Sonntag, and W. Greve.
Journal the Fisheries Research Board of Canada, Vol. 34, 1977, p 2295-2307, 12 fig, 4 tab, 21 ref.

Descriptors: *Pollutant identification, Environmental effects, *Water pollution sources, *Model studies, Plankton, Populations, *Zooplankton, *Mercury, Simulation analysis.

The population dynamics of three Controlled Experimental Ecosystems (CEEs) bags were monitored for 70 days. On day 8 one bag was polluted with 1 microg/l mercury and one bag with 5 microg/l mercury while the third bag was used as a control. A computer simulation model of a phytoplankton-zooplankton-salmon system was used to study causes of different Pseudocalanus minutus s.l. population dynamics in the bags. Use of the model demonstrated that it was not necessary to hypothesize a long-term effect of mercury on Pseudocalanus to explain the low population observed in the CEE to which 5 microg/l mercury was added but that it is possible that the direct impact of the mercury perturbation was to affect the physiology of Pseudocalanus causing a decrease in grazing pressure over the first 30 days. Indirect impact was the emergence of other dominant phytoplankton species, giving a negative feedback impact on Pseudocalanus by not providing food suitable for its nauplii. (Chilton-ORNL)
W78-04665

AQUEOUS RELEASE OF HEAVY METALS FROM TWO SEWAGE SLUDGES,
Agricultural Research Service, Morgantown, WV. Plant Sciences Div.
For primary bibliographic entry see Field 5B.
W78-04677

THERMOCOUPLE READOUT INSTRUMENT,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 7B.
W78-04678

EVALUATION OF 'CAM-1', A WARNING DEVICE FOR ORGANOPHOSPHATE HAZARDOUS MATERIAL SPILLS,
Midwest Research Inst., Kansas City, MO.
L. H. Goodson, and W. B. Jacobs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 647, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-77-219, MRI 3820-B Final Rept. Task I, November 1977. 43 p, 5 fig, 7 tab, 8 ref, 2 append. 1BB610, Proj. No.00202, EPA 68-03-0299.

Descriptors: *Pollutant identification, *Warning systems, *Monitoring, *Water pollution, Evaluation, Toxicity, Pesticide residues, Electrochemistry, Organic compounds, Enzymes, Insect control, *Organophosphates, *Cholinesterase Antagonist Monitor(CAM-1).

The Cholinesterase Antagonist Monitor (CAM-1) uses immobilized cholinesterase on a porous polyurethane pad in an electro-chemical cell to sense the presence of low concentrations of cholinesterase inhibitors in water on a real time basis. The sensitivity of CAM-1 to organophosphates and carbamates is a function of the affinity of cholinesterase for them; thus its respone is greater for those compounds which are more toxic, i.e., the detectable concentrations are inversely proportional to the lethal dosages of these pesticides. Studies were conducted to show the sensitivity of the monitor to 22 organophosphates and 7 carbamate pesticides. Correlation of the sensitivity to chemical structure of the organophosphates shows that introduction of one or two sulfur atoms into the pesticide molecules reduces the sensitivity of the instrument for it. CAM-1 was suitable for monitoring of water for the presence of nonreversible invitro cholinesterase inhibiors. Applications are suggested for assessing the quality of water supplies and of plant effluents that may be contaminated by spills or chronic discharges of cholinesterase inhibitors. The appendices described CAM-1 and the mechanism of its electrochemical detection process. (Wares-IPA)
W78-04679

AERIAL AIR POLLUTION SENSING TECHNIQUES,
Environmental Protection Agency, Las Vegas, NV. Monitoring Operations Lab.
R. B. Evans.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Sect. I, p. 32-38. 1 tab.

Descriptors: *Air pollution, *Monitoring, California, Ozone, Smog, Nitrogen compounds, Aircraft, Methodology, Pollutants, Data collections, Pollutant identification, *Los Angeles Reactive Pollutant Program(LARPP), Atmospheric inversions.

The National Environmental Research Center at Las Vegas (NERC-Las Vegas) has developed techniques for aerial monitoring of air pollution for the Los Angeles Reactive Pollutant Program (LARPP). LARPP's purpose is to compile a data base for developing and validating mathematical air pollution photochemistry models. The program is concerned with photochemical reactions within a parcel of air as it moves downward. Both airborne and ground sampling platforms are used to isolate and follow air parcels in order to measure pollutant concentrations (NO, NO2, CO, O3, nonmethane hydrocarbons, and particulates.) Aircraft are also measuring temperature, dew point, and fluorescent particle concentrations, while ground stations are monitoring ultraviolet radiation. Air parcels to be sampled are identified with clusters at altitudes from 200 ft to the base of the inversion. Helicopters were chosen over dirigibles for greater maneuverability and load capacity. The rental rate for the Bell 212 helicopters currently in use is $20,000/mo plus $200/hr, including fuel and pilot. Data inputs are recorded directly into a digital data acquisition system is standard BCD code on magnetic tape. (Lynch-Wisconsin).
W78-04680

REMOTE DETECTION OF WATER POLLUTION WITH MOCS: AN IMAGINING MULTISPECTRAL SCANNER,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
G. W. Grew.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section II, p. 17-39, 14 fig, 1 tab, 4 ref.

Descriptors: *Remote sensing, *Pollutant identification, Water pollution, Instrumentation, Algae, Sediments, California, New York, North Carolina, Aircraft, Monitoring, Oceanography, Path of pollutants, *MOCS, *Multichannel Ocean Color Sensor, *Spectroradiometers, Multispectral scanners, Clear Lake(CA), New York Bight(NY), Cape Hattaras(NC).

Multichannel Ocean Color Sensor (MOCS), a multispectral scanner, is being used by the NASA Langley Research Center in developing a system for remote sensing of pollutant distribution in oceans and inland waters. Spacecraft and aircraft will be used to produce periodic maps of such pollutants as algae and sediment. Color spectral signatures emitted from a water mass can vary continuously, as with sediment. Sometimes, however, indicative patterns can be established readily when one pollutant is present. An algal bloom, for instance, can be easily identified as it is highly concentrated at the water surface and has a unique

spectral signature. When mixtures of pollutants occur, identification is more difficult. The MOCS, weighing only 23 lbs, is a visible-imaging spectroradiometer which scans electronically. It measures the intensity in 20 spectral bands at each of 150 spatial sites of the ocean across the field of view. Output of MOCS is fed to an A/D converter and stored on magnetic tape. An algal bloom in Clear Lake, CA, was mapped from data gathered on a flight at 37,400 ft (28 June 1972). Not only was the distribution of the algae mapped, but the type (Aphanizomenon) could be identified using the remote sensor. Flights over New York Bight and off Cape Hattaras (NC) provided data on the spectral signatures of acid wastes and the transition between two water masses. (Lynch-Wisconsin).
W78-04681

THE USE OF NEAR-INFRARED REFLECTED SUNLIGHT FOR BIODEGRADABLE POLLUTION MONITORING,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
W. E. Bressette, and D. E. Lear, Jr.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section II, p 69-89. 8 fig, 3 tab, 10 ref.

Descriptors: *Remote sensing, *Chlorophyll, *Infrared radiation, *Aerial photography, *Algae, Phytoplankton, Water pollution, Potomac River, *Monitoring, Nutrients, Pollutant identification, *Near-infrared photography(NIR).

Near-infrared (NIR) photographs of the Potomac River Salt Wedge Area were taken on October 2, 1972 from an altitude of 3 km to detect algal phytoplankton containing chlorophyll-a. Objectives of the program were to determine if the spatial and temporal changes of the chlorophyll could be measured remotely, and to determine if such measurements could index the stress of biodegradable pollutants on the ecosystem. Photographic film was used in the project, although an electronic readout sensor could be used in the future. Massive blooms of blue-green algae (Anacystis cyanea) occur as a result of sanitation plant nutrient deposition at the salt-freshwater interface. Photographic results were correlated with ground truth data. It was found that overdeveloping transparencies and prints from overexposed negatives through an NIR filter greatly enhances the contrast between the blooms and the water background. Bottom features as deep as 2 m can be photographed using an 89B Wratten NIR filter. The threshold for algal blooms with an NIR camera system is between chlorophyll-a concentrations of 34 and 51 micrograms/l. Detection of upwelling light in the NIR coupled with detection near 523 nm has a potential for measuring suspended sediment when chlorophlyy-a concentrations are below 34 micrograms/l. (Lynch-Wisconsin)
W78-04682

ST. LOUIS REGIONAL AIR MONITORING SYSTEM,
National Environmental Research Center, Las Vegas, NV.
J. A. Reagan.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section III, 1-16. 3 fig, 2 ref.

Descriptors: *Air pollution, *Monitoring, Missouri, Simulation analysis, Atmospheric physics, Fallout, Pollutant identification, *St. Louis(MO), Regional Air Monitoring System(RAMS), Regional Air Pollution Study(RAPS).

The Regional Air Pollution Study (RAPS) of St. Louis, MO, was created to develop mathematical simulation models of atmospheric processes affecting the transport and concentration of air pollutants. As a related research tool (but not as an enforcement monitoring network), the Regional Air Monitoring System (RAMS) was devised. RAMS will consist of 25 stations to monitor the following parameters: sulfur dioxide, hydrogen sulfide, total sulfur, carbon monoxide, total hydrocarbons, methane, nitrogen dioxide, nitric oxide, ozone, visibility, wind speed, wind direction, temperature, relative humidity, pressure, solar radiation, and particulate loading. The system is designed to obtain 90% data capture. Stations will be arranged in four concentric circles at 4, 9, 20, and 40 km from a central station near the Gateway Arch. The four outer stations will monitor background levels. Each station will be a 10 x 16-ft shelter mounted on concrete piers, with a 10 or 30-m tower on the north side. Stations are linked to a data center via telephone. The central facility includes a PDP-11/40 computer with 32 K core, three tape drives, three 1.2 megaword dishes, console, line printer, card reader, graphics printer/plotter, and CRT. A PDP-11/05 front-end processor handles station telecommunications. (Lynch-Wisconsin)
W78-04683

LONG PATH OPTICAL MEASUREMENT OF ATMOSPHERIC POLLUTANTS,
Health Effects Research Lab., Research Triangle Park, NC. Chemistry and Physics Lab.
A. E. O'Keeffe.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section III, p 17-21.

Descriptors: *Remote sensing, *Air pollution, Monitoring, Pollutant identification, Instrumentation, Research and development, *Lasers, *Gas lasers, Carbon dioxide lasers, Long path optical.

Air Quality Measurements Branch of the Chemistry and Physics Laboratory, National Environmental Research Center, Research Triangle Park, North Carolina, currently has three contracts for long path optical measurement. The underlying principle is that monochromatic light having a wavelength corresponding to a principal absorbance maximum of the pollutant is projected outwardly from a source to a retro-reflector, which returns the beam to its origin. There sensitive detectors read the intensities of the transmitted and received beams, and electronic logic devices compare the two intensity values and display a signal representing the light attenuation of the selected wavelengths as the beam traversed the path source-reflector-detector. In essence, the pollutant concentration is measured, although generally extraneous effects must be subtracted to measure only the pollutant. Wavelength-independent interferences can be eliminated by reading the difference in attenuation between two wavelengths, one being at a peak and the other at a valley, in the absorbance spectrum of the pollutant. This works well for turbulence, but less well for other absorbing gases. The contract with General Electric is for application of gas lasers (particularly the CO2 laser) to long path instrumentation. A contract with Lincoln Laboratories is similar, but uses a tiny crystal diode laser as the light source. The third contract, with Tulane University, involves applying more sophisticated tuning techniques to the CO2 laser. (Lynch-Wisconsin)
W78-04684

A REVIEW OF AVAILABLE TECHNIQUES FOR COUPLING CONTINUOUS GASEOUS POLLUTANT MONITORS TO EMISSION SOURCES,
Health Effects Research Lab., Research Triangle Park, NC. Chemistry and Physics Lab.
J. B. Homolya.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section III, p 22-49. 10 fig, 7 ref.

Descriptors: *Air pollution, *Gases, *Monitoring, Pollutant identification, Instrumentation, On-site data collections, Extractive monitoring, Ambient air monitoring sensors.

Nearly all present-day ambient air monitoring sensors have the required sensitivity, freedom from interferences, and adequate response time where application for source-level pollution monitoring presents no problem on the detectors themselves. But monitoring stationary sources of gaseous emissions, consideration must be given to the complete monitoring system. Stack emissions usually contain corrosive gases at elevated temperatures, and may have a high dew point temperature or include particulate matter of varying composition and size. The monitoring system must be capable of continuously extracting a sample from these types of sources, transporting it to the detector, and conditioning it, if necessary, for an accurate analysis. These processes must be consistent with the analytical method involved. There are several approaches to monitoring a gaseous source emission stream; the extractive ones involve sample conditioning techniques, including filtered probes, heated sample lines, water vapor removal systems, or a variety of dilution devices coupled to ambient air monitors. With dilution devices, it is possible for both ambient air and source monitoring to be accomplished by the same instrument. A recent investigation has demonstrated the viability of in-situ monitoring for SO2 which, in effect, eliminates all sample conditioning. In-stack monitoring avoids any extraction of sample by utilizing the sample stream itself as an analysis chamber. (Lynch-Wisconsin)
W78-04685

INSITU SENSOR SYSTEMS FOR WATER QUALITY MEASUREMENT,
Michigan Univ., Ann Arbor. School of Public Health.
K. H. Mancy.
In: Proceedings of Conference of Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, Published December 1973, Section IV, p 1-26. 20 ref, 2 append.

Descriptors: *On-site data collections, *Monitoring, *Water quality, Remote sensing, Water pollution, Instrumentation, Pollutant identification, *Sensors, *Electrochemical sensors, Conductometric sensors, Potentiometric sensors, Voltammetric sensors, Ion-selective electrodes, Ion-specific electrodes.

Direct placement of sensors in the environment offers an ideal approach for water quality monitoring, but such sensor systems are available for only a few parameters. In addition, water flow, temperature, and chemical and biological interferences may affect sensor response. Sensor reliability depends on sensitivity, response time, selectivity, long-term stability, accuracy, and precision. In-situ electrochemical sensor systems currently available include conductometric, potentiometric, and voltammetric electrode systems. Potentiometric systems (specific ion or selective ion electrodes) include glass electrodes for pH measurement, inert metal electrodes (platinum or gold) for measuring oxidation-reduction potentials, and potentiometric membrane electrodes. Oxidation-reduction potential measurements can give meaningful results only under anaerobic conditions and in certain industrial waste effluents. Recently developed specific-ion electrodes can help monitor a variety of anions and cations. Solid-state specific-ion electrodes are more applicable for water quality monitoring than liquid ion exchange electrodes. Voltammetric membrane

electrodes are at present the only in-situ sensors capable of dissolved oxygen analysis; their unique feature is the separation of the electrode from the test solution by the membrane. (Lynch-Wisconsin)
W78-04686

A REGIONAL WATER QUALITY MONITORING SYSTEM,
Minneapolis Metropolitan Sewer Board of the Twin Cities Area, Md.
R. H. Susag.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, Published December 1973, Section IV, p 38-57. 7 fig.

Descriptors: *Water quality, *Water quality control, *Monitoring, Minnesota, Sewage treatment, Water pollution, Water pollution control, Waste water treatment, Mississippi River, Automatic control, *Minneapolis(MN), *St Paul(MN), *Metropolitan Sewer Board(Minneapolis-St Paul MN), Twin Cities(MN).

The Metropolitan Sewer Board of the Twin Cities Area (MSB) is a seven-county regional agency created in 1969 by the Minnesota state legislature to preserve water quality, protect public health, and treat and dispose of sewage. MSB operates 24 wastewater treatment plants (consolidated from 33 when board began operation in 1970) for 90 communities comprising 85% of the population of the Minneapolis-St. Paul metropolitan area. A sampling program on the Mississippi River begun in 1926 is still in operation, with the addition of several monitors. Temperature, pH, turbidity, DO, BOD, coliform organisms, conductivity, chloride, and oxidation-reduction potential are monitored. Since 1965 this surveillance has also become an enforcement tool. The Minnesota Pollution Control Agency requires operation of all primary and secondary treatment plant units at maximum capability; tertiary treatment units are allowed variable operation, depending on water quality standards compliance. Considerations for siting of automatic water quality monitors include accessibility, availability of utilities, security, and representativeness of sample. The Board has entered into a cooperative program with the U.S. Geological Survey to develop a water quantity-quality monitoring network. The USGS maintains four gauging stations on the three major rivers in the area, and water quality monitors are being placed at three of the four sites, as well as at six other locations. (Lynch-Wisconsin)
W78-04687

WATER QUALITY MONITORING IN SOME EASTERN EUROPEAN COUNTRIES,
Vanderbilt Univ., Nashville, TN. Dept. of Environmental and Water Resources Engineering.
P. A. Krenkel, and V. Novotny.
In: Proceedings of Conference of Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, Published December 1973, Section IV, p 58-84. 28 fig, 4 ref.

Descriptors: *Water quality, *Monitoring, *Automatic control, Europe, River basins, Instrumentation, Pollutant identification, *Poland, *Odra River(Poland), Czechoslovakia, Hungary, Vistula River(Poland).

The United States has been the world leader in automatic water quality monitoring, with 205 stations in operation or under construction. Other countries have regarded the U.S.'s ORSANCO system as a model in developing their own systems. The World Health Organization (WHO) provides support through its United Nations Development Program (Special Fund endeavors); eastern European countries receiving support include Poland, Czechoslovakia, Romania, and Hungary. Poland, with six years of support, has built seven automatic monitoring stations, with 53 more in planning. Stations are currently located in the Odra and Wisla (Vistula) River basins. They are equipped with Honeywell W-20 monitors, capable of measuring temperatures from -5 to 40C, conductivity from 100-1000 mhos, DO from 0-15 ppm, pH from 1-14, oxidation-reduction potential in the + or - 500 mv range, turbidity from 0-500 ppm, chlorides from 1-1000 ppm, water level, and solar radiation. Water is delivered via a screw-type pump. Maintaining intake velocity at the same rate as river velocity proved to be the major problem. Periodical inquiry and teletype recording was the registering option selected. In Czechoslovakia three monitoring stations were installed in 1966, and five stations in Hungary are projected with WHO support. (Lynch-Wisconsin)
W78-04688

AN AIRBORNE LASER FLUOROSENSOR FOR THE DETECTION OF OIL ON WATER,
National Aeronautics and Space Administration, Wallops Island, VA. Wallops Station.
H. H. Kim, and G. D. Hickman.
In: Proceedings of Conference of Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, Published December 1973, Section IV, p 85-95. 4 fig, 6 ref.

Descriptors: *Oil spills, *Remote sensing, Pollutant identification, Water pollution, Aircraft, Fluorescence, Virginia, Delaware River, Instrumentation, *Lasers, *Fluorosensors.

An airborne laser fluorosensor system to detect and map surface oil (from either spills or natural seepage) in large bodies of water is described. The system consists of a pulsed nitrogen laser, an f/l 28 cm diameter Cassegranian telescope, and a high-gain photomultiplier tube (RCA 8575) filtered by a UV blocking filter (0.01 and 0.3% transmission at 337 and 390 nm). The laser produces a nominal 1 m joule pulse of 10 nsec duration at 337 nm contained in a rectangular beam having a half-angle divergence of about 30 by 2 mradians. The repetition rate of 100 pulses/sec affords good spatial resolution when operated from an aircraft flying at 300 km/hr. Test flights off Norfolk, VA (May 1973) and on the Delaware River (August 1973) indicated that sensitivity of the instrument exceeds that of conventional passive remote sensors currently available. In the tests laser-induced fluorescence of the oil in the 450-500 nm spectral region was monitored. Each return pulse was fed into a range-gated multimode analog-to-digital (ADC) conversion unit which recorded the peak fluorescence amplitude. Images from aerial photography showed the presence of oil when a reading of 50 or greater was reached on the ADC output, showing much greater sensitivity of the laser fluorosensor in detecting oil traces. (Lynch-Wisconsin)
W78-04689

REMOTE SENSING DATA, A BASIS FOR MONITORING SYSTEMS DESIGN,
Geological Survey, Iowa City, IA.
J. V. Taranik, and S. J. Tuthill.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, Published December 1973, Section V, p 17-31. 3 fig, 12 ref.

Descriptors: *Remote sensing, *Mississippi River, *Thermal pollution, Monitoring, Iowa, Illinois, Mapping, Floods, Flood plains, Nuclear powerplants, Powerplants, Water temperature, Pollutant identification, Thermal mapping, Nishnabotna River(IA).

To assess possible thermal pollution danger from a proposed diffuser pipe in the Mississippi River near Cordova, IL in connection with a nuclear power plant, the Iowa Geological Survey conducted a thermal mapping mission on 4 June 1971 from Keokuk (IA) to Clinton (IL) using a multispectral camera and uncalibrated infrared scanner mounted in a Twin Beechcraft. Thermal data was recorded directly on film by means of the 4.5-5.5 micron portion of the infrared spectrum. Corrobarating temperature data was collected at 13 ground stations. Thermal outfalls on the images were traced to their sources. Data showed that in June rivers flowing into the Mississippi were several degrees warmer than the main channel, and thermal outfalls from the Muscatine and Riverside electric power plants were over 10F hotter than the channel. Plumes extended over 1/4 mi downstream. Slough areas were particularly hot. The major result of the mission was the discovery that current-distribution patterns could be mapped very accuractely using thermal data. Slow-moving water appears warmer because the sun-heated surface is not mixed with underlying colder water. Such low-altitude flight over the Mississippi between Keobuk and the Iowa-Minnesota border was made to photograph all ice-free areas, in order to identify warm effluents. An aerial photographic flood-mapping mission was flown in September 1972 on the Nishnabotna flood plain. (Lynch-Wisconsin)
W78-04690

TECHNIQUES AND PROCEDURES FOR QUANTITATIVE WATER SURFACE TEMPERATURE SURVEYS USING AIRBORNE SENSORS,
National Aeronautics and Space Administration, Bay Saint Louis, MS. Earth Resources Lab.
L. E. Tilton, III, and K. R. Daughtrey.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section V, p. 32-58. 5 fig, 7 ref.

Descriptors: *Remote sensing, *Water temperature, *Thermal radiation, Aircraft, Methodology, Instrumentation, Data processing, Monitoring, Pollutant identification, Radiometers, Thermal scanners, Sensors.

NASA Johnson Space Center's Earth Resources Laboratory at the Mississippi Test Facility conducted remote sensing experiments using a Texas instruments RS-18 thermal scanning radiometer mounted in a light aircraft. A synopsis of thermal remote sensing techniques based on these tests is given. Major equipment needed includes: thermal scanning radiometer, calibration sources, scanner platfiorm (air craft or satellite) and data recording system, tapedeck and oscillograph, tape-to-film converter, photo processing facility, analog-to-digital converter (SDS930 computer), data processor (UNIVAC 1108 computer), SC4020 plotter for display proparation. Cloud cover and land/water differentiation should be considered in the choice of flight times, as clouds below the aircraft screen out thermal radiation, and at certain times of the day and night surface radiometric temperatures of land and water approach each other and may be indistinguishable in the imagery. Information is given on data acquisition procedures, including flight plan, system calibration, navigation, camera and thermal scanner operation, flight logs, voice annotation of tapes, and surface measurements. Data processing involves quick-look verification, qualitative analog data production, and quantitative digital data production. Finally, accuracy assessment, personnel, scheduling, and cost are discussed. (Lynch-Wisconsin)
W78-04691

REMOTE SENSOR IMAGERY ANALYSIS FOR ENVIRONMENTAL IMPACT ASSESSMENT,
Army Engineer Topographic Labs., Fort Belvoir, VA. Geographic Sciences Lab.
C. P. Weatherspoon, J. N. Rinker, R. E. Frost, and T. E. Eastler.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada

on October 10-11, 1973. Published December 1973, Section V, p 59-72. 2 fig.

Descriptors: *Environmental effects, *Methodology, *Aerial photography, Remote sensing, *Pollutant identification, Path of pollutants, Research priorities.

A conceptual framework is examined in which remote sensing data collected and analyzed by an interdisciplinary research team is focused on problems of concern to the Environmental Protection Agency. Most remote sensing interpretation procedures can be classified either as direct detection of discrete objects, or analysis of various environmental components. The latter are necessary for long-term planning. In most cases standard panchromatic aerial photography--much of it already available--provides the information required for basic environmental analysis. Regardless of the imagery type used, the study should start with an analysis of the smallest scale available (e.g., ERTS images). Next individual photographs at a scale of 1:15,000 to 1:20,000 are pieced into a mosaic. Finally a detailed study should be made of each set of stero pairs. Auxiliary data should be used where appropriate. An outline guide for analysis of natural features using aerial phots is given. The data gathered by remote sensing can be applied to such problems as pollution source location and characterization, impact assessment, controls and monitoring, projection of trends and potential problem areas, preventive measures, and research needs. (Lynch-Wisconsin)
W78-04692

AERIAL SPILL PREVENTION SURVEILLANCE DURING SUBOPTIMUM WEATHER,
Earth Satellite Corp., Washington, DC.
P. M. Maughan, R. I. Welch, and A. D. Marmelstein.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section V, p. 73-86. 3 fig, 1 ref. EPA 68-01-1091.

Descriptors: *Oil spills, *Aerial photography, *Films, Monitoring, Weather, Pollutants identification, Water pollution control, Hazardous material spills.

Recommendations are given for use of aerial photography for prevention of detection of spills of oil or other hazardous materials under relatively poor weather conditions (unclear skies, or where horizontal visibility is less than 15 mi). Photography was tested under various combinations of cloud cover (scattered clouds to overcast) vs cloud base (1,000 to > 20,000 fit), and haze (< 2 to 4 mi visibility) vs sun angle (20 to 60 degrees above the horizon). Only positive color film (specifically Kodak SO-397 aerial color film) exposed through a Wratten iA filter provided adequate image quality under all conditions tested. This film can, in fact, be used under any daylight conditions in which an aerial photographic missin can be flown in safety. Color infrared and black-and-white panchromatic films are not recommended for these weather conditions. It should be noted that as aircraft altitude decreases due to low cloud ceilning, image motion increases unless airspeed is decreased as well. A single-engine, high-wing monoplane is preferred for suboptimal weather conditions. A scale of 1:5,000 provides adequate detail with a high-quality camera system. (Lynch-Wisconsin)
W78-04693

ENVIRONMENTAL APPLICATION OF THE EARTH RESOURCES TECHNOLOGY SATELLITE,
General Electric Co., Beltsville, MD. Space Div.
D. T. Schultz, and C. C. Schnetzler.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section VII, p. 11-26. 10 fig, 7 ref.

Descriptors: *Remote sensing, *Satellites, *Aerial photography, *Monitoring, Mapping, Water pollution, Planning, New Jersey, Chesapeake Bay, Potomac River, *Earth Resources Technology Satellite(ERTS), Multispectral scanners, Nanticoke River Marsh(Chesapeake Bay), Chicago, Gary(IN), New York Bight, Air pollution.

The first Earth Resources Technology Satellite (ERTS-1), launched July 23, 1972 by NASA, carries a multispectral scanner (MSS). A second imaging system, the return beam vidicon (RBV), malfunctioned soon after launch and was deactivated. ERTS-1 orbits at an altitude of 920 km, and reoccupies the same orbital path every 18 days. The MSS records a scene simultaneously on four bands (in micrometers): 0.5-0.6 (green), 0.6-0.7 (red), 0.7-0.8 (near infrared), and 0.8-1.1 (near infrared). A 185-km-square image is produced, which is converted to digital data and telemetered to an earth-based receiving station. The final data products are digital tapes, black and white images of individual bands, and false color composites of several bands. ERTS imagery is about 70-80 m. About 330 projects currently use ERTS data, of which about 27 are directly related to environmental problems. Air pollution, fresh water and ocean water pollution, disrupted land surfaces, and regional and local environmental management planning are some of the environmental uses made of the data. ERTS images were used to produce an ecozone map of New Jersey, as well as a vegetation classification map of the Nanticoke River Marsh on Chesapeake Bay. Weather effects of airborne particulate plumes from Chicago and Gary (IN) were studied. Other projects on the Potomac River and New York Bight are also discussed. (Lynch-Wisconsin)
W78-04694

AIRCRAFT AND SATELLITE MONITORING OF LAKE SUPERIOR POLLUTION SOURCES,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
J. P. Scherz, and J. F. Van Domelen.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section VIII, p. 1-27. 12 fig, 15 ref. NG1 50-002-127.

Descriptors: *Remote sensing, *Aerial photography, *Water pollution sources, *Turbidity, Satellites, *Lake Superior, Minnesota, Eutrophication, Water quality, Aircraft, Monitoring, Suspended solids, Mapping, Secchi disk, *Earth Resources Technology Satellite(ERTS).

The use of aerial photography could have prevented the poor siting of an $8 million water intake on Lake Superior in turbid, unpotable water. ERTS and aircraft imagery clearly showed the location of the rubid water, and also showed clear water areas which would have made good sites. The Lake Superior work is an example of how aerial photography can be a valuable tool for water quality research. Surface reflections and bottom effects, which are useful only for detection of oil spills and mapping bottom vegetation, must be screened out for water quality monitoring, and ground truth data are needed to verify and calibrate aerial photographs. The most significant difference between images from aircraft and from satelites is the amount of atmosphere between the ground and the camera of scanner. Careful analysis of imagery and water samples make quantitative measurements of turbidity possible, as well as the correlation of turbidity with suspended solids and other water quality parameters. The secchi disk can be used to determine whether bottom effects pose a problem in a given situation. (Lynch-Wisconsin)
W78-04695

A SEARCH FOR ENVIRONMENTAL PROBLEMS OF THE FUTURE,
Battelle Columbus Labs., OH.
J. E. Flinn, A. A. Levin, and J. R. Hibbs.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section VIII, p 67-97. 6 tab, 26 ref. EPA 68-01-1837.

Descriptors: *Environmental effects, *Forecasting, *Projections, Future planning(Projected), Pollutant identification, Industrial production, Air pollution, Energy, Trace elements, Toxins, Wastes, Radiation, Potable water, Irrigation, Social aspects, Particulates.

To assist in long-term environmental planning, ten serious problems which are likely to exist in the near future were identified and ranked through several analytical steps. Initially, three categories of human activities were screened: (1) industrial, (2) environmental, (3) societal change and trends. A list of problems with associated pollutant 'stressors' was generated, and repeated occurrence of stressors, such as heavy metals, was noted. Problem statements were combined and then grouped into these nine general areas: pollution control residues, industrial production-consumption residues, energy supply, toxic and hazardous substances, air pollution, water pollution, ecological effects, radiation and sound, and social aspects. Nine factors were used to select and rank the ten major problems: toxicity, persistence, pervasiveness, volume of substance, number of people affected, ecological complexity, technological complexity, social/political complexity, and research needs. The ten problems were, in order: (1) impact of new energy contaminants, (2) geophysical modifications of the earth, (3) metal trace element initiatives, (4) hazardous and toxic chemicals, (5) automotive emissions, (6) waste disposal, (7) radiation, (8) fine particulates, (9) drinking water contamination, (10) irrigation (impoundment) practices. Each problem is discussed separately, and projections for the future are made. (Lynch-Wisconsin)
W78-04696

SENSOR UTILIZATION IN NEW ENGLAND,
Environmental Protection Agency, Boston, MA. Region I.
H. McCammon.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section IX, p 1-5.

Descriptors: *New England, *Remote sensing, *Monitoring, Effluents, Thermal pollution, Eutrophication, Planning, Runoff, Agriculture, Industrial wastes, Powerplants, Oil spills, Land use, Pollutant identification.

Use of remote sensing could provide a beneficial overview of New England's varied environmental problems, such as thermal plumes from power plants, air emissions and effluents from isolated ural industrial pockets, runoff and heat island build-up from congested urban-industrial areas, mining and ocean dumping operations, eutrophication in lakes and estuaries, and rural community development. Infrared detection with resolution to 1C isotherms should be used on overflights of the 49 major power plants to document the extent of thermal plumes. Sludge blankets formed in rivers and lakes adjacent to pulp and paper mills, as well as oil spills from petroleum terminals and storage areas, could be detected and quantified using remote sensing, and monitoring of particulate emissions and metal wastes could be improved. Aerial surveys could improve knowledge of nonpoint pollution sources, changes in effluents as secondary sewage treatment plants convert to tertiary, the effect of urban storm water runoff on

river channels, the nature and depth of rural soil cover in relation to ability to assimilate septic tank drainage, and the impact of highway construction on watersheds. In land use planning and coastal zone management, aerial monitoring would be invaluable for evaluating soil provile, geology, topography, vegetative cover, water resources, and salt water intrusion into ground water aquifers. (Lynch-Wisconsin)
W78-04697

ENVIRONMENTAL MONITORING NEEDS IN REGION V,
Environmental Protection Agency, Chicago, IL. Region V.
C. Risley, Jr.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973. Section IX, p 18-20.

Descriptors: *Great Lakes Region, *Monitoring, *Water pollution, *Water quality, *Water quality control, Nutrients, Lakes, Waste disposal, Effluents, Fish, Great Lakes, Pollutant identification.

Environmental quality of the Great Lakes area is the major concern of EPA's Region V. A status review shows that water quality in Lake Superior is, in general, high; impairment is limited to localized areas of waste discharge, although the Reserve Mining Co. discharge at Silver Bay, MN, has had widespread impact. Lake Michigan water quality is very good in open waters and the Straits of Mackinac, but in the southern part biomagnification of DDT and PCBs ash halted the sale of salmon, trout, and other species. Waste discharge problems occur in Calumet, Milwaukee, and Green Bay. The worse impairment in the Lake Huron area is in the southeast corner of Georgian Bay and in Saginaw Bay; the Saginaw River is a major source of PCBs. In Lake Erie anoxic conditions in the hypolimnion of the central basin recurred in 1972, and low oxygen levels were reported in the western and eastern basins. Recovery in the lake in not expected until several years after nutrient and pollutant loadings are reduced. Nutrients and dissolved solids enter Lake Ontario primarily from the Niagara River, which connects lakes Erie and Ontario. Impairment is mainly confined to near-shore waters. In the Great Lakes problems of floating oil and scum, discoloration, solids, phenols, heavy metals, and bacteria are frequent. On 15 April 1972 the U.S. and Canada entered into the Great Lakes Water Quality Agreement. A summary of monitoring efforts is given. (Lynch-Wisconsin)
W78-04698

COMMENTS ON ENVIRONMENTAL MONITORING IN REGION VII AND SOME MONITORING PLANS AND NEEDS PREPARED FOR SECOND CONFERENCE ON ENVIRONMENTAL SENSORS,
Environmental Protection Agency, Kansas City, MO. Region VII.
A. Alexander.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973. Published December 1973, Section IX, p 23-35.

Descriptors: *Central U.S., *Monitoring, *Remote sensing, Agriculture, Iowa, Kansas, Missouri, Nebraska, Aerial photography, Thermal pollution, Feed lots, Air pollution, Runoff, Water pollution.

The major industry in EPA's Region VII (Iowa, Kansas, Missouri, and Nebraska) is agriculture. Although the Region has its share of severe pollution incidents, such as industrial spills and feedlot runoff, there are no severe chronic pollution problems. The four states conduct routine and special air and water quality monitoring as part of their control programs. Aerial 35 mm photography of feedlot operations has been used to determine lot size, drainage characteristics, livestock load, and wastewater retention pond conditions as related to conformity to NPDES standards. Flying time of about 150 days is required to cover 7,500 feedlots in the four states; aerial surveillance can save an estimated 50-75% in cost and manpower over ground methods. However, aerial photography from 5,000 and 8,000 ft of feedlots in Nebraska was not found to be useful for ascertaining pollution potential. Thermal and color infrared imagery was used in an unsuccessful attempt to locate natural brine seeps in the Republican and Kansas River Basins; failure was attributed to the weakness and small size of the brine seeps. Efforts to detect algae and weeds in the Big Piney River and several reservoirs in Missouri using infrared photography were partially successful. Thermal scans were used successfully to detect plumes of cooling water from power plants, and unsuccessfully to locate wastewater outfalls in the Kansas City area. (Lynch-Wisconsin)
W78-04699

5B. Sources Of Pollution

LEACHATE PRODUCTION AT SANITARY LANDFILL SITES,
Ayres (Owen) and Associates, Inc., Eau Claire, WI.
P. Dass, G. R. Tamke, and C. M. Stoffel.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 103, No. EE6, Proceedings Paper 13406, p 981-988, December 1977. 1 fig, 4 tab, 9 ref, 1 append.

Descriptors: *Leaching, *Landfills, *Waste disposal, Water pollution, Water pollution sources, Runoff, Precipitation(Atmospheric), Groundwater movement, Percolation, Soil water, Groundwater, *Leachates, Pollutants, Solid wastes, Analytical techniques, Data processing, Path of pollutants, Leachate production.

It is becoming increasingly important to minimize the quantity of leachate produced at a sanitary landfill site to reduce contamination of groundwater and surface water. The water balance approach was used to estimate the amount of leachate produced at a sanitary landfill site. The method was applied to predict leachate at an actual landfill site. Runoff coefficients used to calculate monthly runoff from the monthly precipitation in the water balance method were evaluated based upon past precipitation data. The runoff coefficients customarily used in the design of storm sewers are for 5 yr to 10 yr frequency storms. Use of such runoff coefficients in the water balance method presented here would produce much higher values for runoff and thereby would underestimate the quantity of leachate. (Sims-ISWS)
W78-04201

EFFECTS OF URBAN LAKES ON QUANTITY AND QUALITY OF BASEFLOW,
Wisconsin Univ.-Milwaukee. Dept. of Geological Sciences.
D. S. Cherkauer.
Water Resources Bulletin, Vol. 13, No. 6, p 1119-1130, December 1977. 5 fig, 1 tab, 5 ref.

Descriptors: *Base flow, *Lakes, *Urbanization, *Water quality, Watersheds(Basins), Streams, On-site investigations, Sampling, Stream gages, Groundwater, Temperature, Water temperature, Hydrogen ion concentration, Specific conductivity, Ions, Chlorine, Sodium, Calcium, Magnesium, Salts, Water pollution, Pollutants, Hydrology, Road salts.

Man-made lakes have significant impacts on the hydrologic conditions in the watershed in which they are built. Reported herein was the examination of the nature of the impact upon baseflow by comparing baseflow conditions at the outlet of the lakes with those elsewhere in the watershed. Situated in the upper reaches of a small watershed, the lakes studied have only a minor effect upon the magnitude of baseflow discharge, increasing it slightly from October to January and decreasing it from May to September. Baseflow quality is affected substantially. Natural dissolved ions, as represented by magnesium, generally are decreased in concentration and total load by the lakes. Road salt related ions are increased substantially in both concentration and total load in the baseflow. Surface runoff stored in the lakes is extremely enriched in salt in the winter, and the storage capacity of the lakes is sufficient to maintain winter salt concentrations in the baseflow near the lakes until summer. The storage effect also tends to damp out seasonal fluctuations in baseflow chloride content which are extreme in suburban watersheds. The difference in quality between lake and non-lake baseflows and the linear distance needed for complete mixing were used as measures of the magnitude and distal extent of the lake effect on baseflow quality. (Sims-ISWS)
W78-04206

AGRICULTURAL CHEMICALS IN THE ENVIRONMENT (AGROCHEMIKALIEN IN DER UMWELT),
VEB Gustav Fischer Verlag, Jena (East Germany).
For primary bibliographic entry see Field 5C.
W78-04207

DISPERSION OF PROPOSED THEODORE INDUSTRIAL PARK EFFLUENTS IN MOBILE BAY, HYDRAULIC MODEL INVESTIGATION,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
R. C. Berger, Jr, and M. J. Trawle.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 656, Price codes: A09 in paper copy, A01 in microfiche. Miscellaneous Paper H-77-3, March 1977. 189 p, 177 fig, 1 tab.

Descriptors: *Dispersion, *Effluents, *Bays, *Alabama, *Model studies, Laboratory tests, Dye releases, Dye dispersion, Dyes, Tides, Tidal effects, Tidal waters, Rivers, Industries, Industrial wastes, Water pollution, Water pollution sources, *Path of pollutants, Data collections, Estuaries, *Mobile Bay(Ala), Theodore Industrial Park(Ala), Hydraulic models.

An existing comprehensive physical model that correctly reproduced tides, tidal currents, and density currents throughout the entire Mobile Bay was used to determine the distribution characteristics in Mobile Bay of effluents from four possible discharge locations. No attempt was made to analyze the results of the dye dispersion tests or to draw any conclusions from the results. The dyes used in the model tests were conservative and so did not decay with time. Therefore, appropriate decay rates should be applied to the model test data as a basis for predicting prototypre conditions. (Sims-ISWS)
W78-04229

FORMATION OF POLYCHLORINATED AROMATIC COMPOUNDS DURING AQUEOUS CHLORINATION,
Waterloo Univ. (Ontario). Centre for Graduate Work in Chemistry.
J. G. Smith, R. B. McCall, and P. K. Chan.
Environmental Pollution, Vol. 14, 1977, p 289-296, 3 tab, 23 ref.

Descriptors: *Water pollution, *Pollutants, *Chlorination, *Polychlorinated biphenylls, Water pollution sources, *Aromatic compounds, Chlorine, Chemical reactions, *Napthalene, *Biphenyll.

This study is concerned with the reaction between typical organic pollutants and aqueous solutions of active chlorine, particularly the reaction of naphthalene and biphenyll. It was found that the extent of reaction is dependent upon the pH of the solution and the concentrations of both the aromatic hydrocarbon and the active chlorine. Naphthalene was appreciably more reactive than biphenyll and both chlorinated biphenylls examined were less reactive than biphenyll itself. (Chilton-ORNL)
W78-04236

TRACE METAL CONTAMINATION OF BLUEGILL (LEPOMIS MACROCHIRUS) FROM TWO INDIANA LAKES,
Prudue Univ., Lafayette, IN. Dept. of Bionucleonics.
For primary bibliographic entry see Field 5C.
W78-04243

ANALYSES OF NATIVE WATER, CORE MATERIAL, AND ELUTRIATE SAMPLES COLLECTED FROM THE ATCHAFALAYA RIVER AND ATCHAFALAYA BAY,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-04245

WATER-QUALITY EFFECTS ON BAKER LAKE OF RECENT VOLCANIC ACTIVITY AT MOUNT BAKER, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
G. C. Bortleson, R. T. Wilson, and B. L. Foxworthy.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price $2.00. Professional Paper 1022-B, 1977. 30 p, 8 fig, 1 plate, 4 tab, 29 ref.

Descriptors: *Water pollution sources, *Lakes, *Volcanoes, *Path of pollutants, *Washington, Reservoirs, Inflow, Water chemistry, Water quality, Thermal stratification, Chemical stratification, Evaluation, *Baker Lake(Wash), *Mount Baker, Puget Sound region.

Increased thermal activity on Mount Baker, Wash., which began in 1975, focused attention on the possibility of volcanic eruptions or other hazardous events. However, the greatest undesirable natural results found after one year of the increased activity are local pollution of the air and of some water resources, including Baker Lake. Baker Lake is a hydropower reservoir fed in part by Boulder Creek, which drains the Sherman Crater part of Mount Baker. Boulder Creek carries into the lake sizeable loads of acid and dissolved minerals derived mainly from sulfurous gases and fumarole dust from Sherman Crater. A layer of acidic Boulder Creek water was found in Baker Lake extending at least 0.3 miles, but the lake probably could assimilate indefinitely the acid loads measured during 1975. Arsenic, selenium, and mercury found in Boulder Creek water would not reach the limits recommended by the U. S. Environmental Protection Agency for the public water supplies unless their concentrations increased severalfold. However, even if the acid load from Boulder Creek does not greatly increase, occasional light fish mortalities may result near the mouth of the creek; greater acid and mineral loads could be more harmful. (Woodard-USGS)
W78-04260

GEOCHEMICAL EFFECTS OF RECHARGING THE MAGOTHY AQUIFER, BAY PARK, NEW YORK, WITH TERTIARY-TREATED SEWAGE,
Geological Survey, Mineola, NY. Water Resources Div.
S. E. Ragone.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price $1.40. Professional Paper 751-D, 1977. 22 p, 14 fig, 9 tab, 26 ref.

Descriptors: *Artificial recharge, *Aquifers, *Tertiary treatment, *Sewage, *Chemical reactions, Geochemistry, *New York, Water chemistry, Oxidation-reduction potential, Sorption, Ion exchange, Groundwater recharge, Data collections, Evaluation, *Bay Park(NY), *Magothy aquifer(NY).

Thirteen recharge tests using tertiary-treated sewage (reclaimed water) and six tests using city (drinking) water were completed between 1968 and 1973 as part of an experimental recharge program at Bay Park, New York. In the longest test, reclaimed water was injected during 84.5 days over a 199-day period. Although iron concentration of reclaimed water and native water in the recharge zone is less than 0.5 mg/liter, the iron concentration in samples taken 20, 100, and 200 feet from the recharge well approached 3 mg/liter at times. Within a 20-ft radius of the recharge well, dissolved oxygen in the reclaimed water oxidized pyrite and caused iron to be released to solution. Because the amount of iron in water increases with distance from the recharge well even though dissolved oxygen is no longer present in water reaching the 20-ft radius, the exact dissolution mechanism is not understood. Some cation exchange occurs. Ammonium and potassium cations exchange with the proton in clay, resulting in a decrease in pH of over 1 pH unit at times. Phosphorus and organic compounds can react chemically and biologically to degrade water quality. Reclaimed water contains an average of 0.17, 0.07, and 9 mg/liter of phosphate, MBAS (methylene blue active substances), and COD (chemical oxygen demand), respectively. During recharge, phosphate concentrations remain at native-water levels at the 20-, 100-, and 200-foot observation wells, which indicates retention by the aquifer; MBAS and COD are partly retained at the 100- and 200-foot wells, presumably by adsorption reactions. (Woodard-USGS)
W78-04261

SUBMARINE SEEPAGE OF NATURAL GAS IN NORTON SOUND, ALASKA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab., and Geological Survey, Seattle, WA. Geology Div.
J. D. Cline, and M. L. Holmes.
Science, Vol 198, No 4322, p 1149-1153, December 16, 1977. 2 fig, 1 tab, 40 ref.

Descriptors: *Water analysis, *Sounds, *Alaska, *Natural gas, *Seepage, Bottom sampling, Chemical analysis, Organic compounds, Geology, Sediments, Data collections, Water pollution sources, Evaluation, *Norton Sound(Alaska), Hydrocarbons, Methane/ethane ratio.

Unusual concentrations of dissolved two- to four-carbon alkanes were observed in the waters in Norton Sound in a localized area approximately 40 kilometers south of Nome, Alaska, in 1976. The hydrocarbons were identified in the near-bottom waters downcurrent for more than 100 kilometers from a sea-floor point source. Preliminary dynamic modeling estimates of the initial gas phase composition predict methane/ethane and ethane/propane ratios of 24 and 1.7, respectively, assuming the hydrocarbons were introduced by bubbles. The low ethane/propane ratio is indicative of gas from a liquid petroleum source rather than from nonassociated or biogenic natural gas. Preliminary data on the structural geology of Norton Basin lend support to the interpretation based on the hydrocarbon plume. Unconformably truncated strata dip basinward from the seep locus; acoustic anomalies and numerous steeply dipping faults in the immediate vicinity of the seep are corroborating evidence that shallow gas- or petroleum-charged sediments and strate coincide with avenues for migration of mobile hydrocarbons to the sea floor. These factors, taken in concert with the sedimentological regime, the recent revision (increase) of basin depth estimates, and the highly localized hydrocarbons source, strongly suggest a thermogenic rather than a recent biogenic origin for these gaseous compounds. (Woodard-USGS)
W78-04262

A LOOK AT GROUND WATER RESEARCH.
For primary bibliographic entry see Field 2F
W78-04290

GLOBAL DISTRIBUTION OF CARCINOGENIC POLLUTANTS IN WATER,
National Cancer Inst., Bethesda, MD.
H. F. Kraybill.
Annals of the New York Academy of Sciences, Vol. 298, p 80-89, September, 1977. 1 fig, 6 tab, 35 ref.

Descriptors: *Carcinogens, *Pollutants, Water supply, Potable water, Chlorination, Ozonation, Pesticides, Cancer, Organic compounds.

Modern analytic techniques now permit the detection of contaminants at very small concentrations in solution, including those contaminants which are suspect carcinogens. While animal experiments involving large doses of these substances over short time periods are revealing, difficulties arise in extrapolating these results to humans, who encounter low-level doses over extended time periods. In appraising the potential hazards of toxic agents, it is generally recognized that there may be a 'no effect' or apparent threshold on dose-response relationships; for carcinogens, however, the existence of such a threshold has not been established. The worldwide occurrence of carcinogenic contaminants, the cumulative effects of carcinogens in the food chains, the formation of carcinogens as a direct result of water treatment practices, the interaction of water-borne contaminants with each other and with other environmental agents, and many similar potential problems all form a complex web which can only be unraveled by further research. (Eberle-NWWA)
W78-04304

ON THE WATER EXAMINATIONS OF THE RIVERS AT THE PIEDMONT DISTRICT OF MT. TOKACHI IN AND AROUND KAMIFURANO CHO, (IN JAPANESE),
Obihiro Zootechnical Univ. (Japan). Dept. of Veterinary and Public Health.
T. Nishi, K. Sugimoto, M. Takahashi, T. Sakai, and M. Yonekawa.
Res Bull Obihiro Zootech Univ Ser I. 8(3), p 319-343, 1974.

Descriptors: *Japan(Kamifurano cho), Piedmont, Rivers, Water quality, Hydrogen ion concentration, Water chemistry, Path of pollutant, Water pollution sources.

The abnormal water of rivers which flow at the foot of Tokachi-dake, an active volcano having a record of many eruptions, was observed. Sixteen observation points were set up: 6 on the Furano River; 8 tributary rivers of Furano River; and 2 places at the upper and lower junctions of the Furano and Sorachi Rivers. Samples of the river water (12) were taken from May 1969-March 1970 and examinations of the water covering 29 items were made. The upper stream of Furano River which rises from the new crater of Tokachi-dake shows high acidity, low pH value and large quantities of sulfalic acid ion, dissolved solids, total hardness and Ca- and Mg ions. In the 83rd or 4th branch rivers which flow into the Furano River, the highest acidity and other parameters next to the upper stream of the Furano River was Nukkakushi-Furanui River which rises from the old crater of Mt. Kami-Horokametoku. The next were the Korukoni-Ushibetsu-, Shibukeushi- and

Ehorokanbetsu Rivers. The abnormal water of these rivers are related to the eruptions of volcanoes. In the 3rd branch, the water of the 4 rivers Pirika-, Furano-, Kajika-, Ebanama-Ehorokanbetsu- and Beberui River did not appear abnormal. When comparing the water of the lower stream at the junction where the Furano River flows into the Sorachi River the river is influenced by the special characteristics of the Furano River. In the study of these river, the progress of pollution and the inclusion of heavy metals was not included.--Copyright 1975, Biological Abstracts, Inc.
W78-04313

DISTRIBUTION AND ECOLOGY OF SUBMERGED MACROPHYTES IN STREAMS OF THE ERDINGER MOOR (MUENCHEN PLAIN), (IN GERMAN),
Universitaet Hohenheim (Landwirtschaftliche Hochschule) (West Germany). Inst. of Plant Ecology.
G. Kutscher, and A. Kohler.
Ber Bayer Bot Ges Erforsch Heim Flora 47, p 175-228, 1976.

Descriptors: *Submerged aquatic plants, Macrophytes(Submerged), Chara-hispida, Chara-vulgaris, Juncus-alpino-articulatus, Juncus-subnodulosus, Nitella-opaca, Potamogeton-coloratus, Sparganium, *Water quality.

The distribution and ecology of the submerged macrophytes depends on the water quality of the streams. Potamogeton coloratus, is completely absent, although this area should offer a favorable substrate for this plant. Especially common are the Characeae, such as Juncus subnodulosus and J. alpino-articulatus with Sparganium minimum, Chara hispida, C. vulgaris and Nitella opaca.--Copyright 1978, Biological Abstracts, Inc.
W78-04314

MIXING LENGTH FOR REPRESENTATIVE WATER QUALITY SAMPLING,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-04334

RELATIONSHIPS BETWEEN WATER CHEMISTRY AND PRIMARY PRODUCTS IN STREAMS, A LIMNOLOGIC PROBLEM, (IN GERMAN),
Zurich Univ. (Switzerland). Inst. fuer Pflanzenbiologie.
For primary bibliographic entry see Field 5C.
W78-04339

EFFECTS OF STORM FREQUENCY ON POLLUTION FROM URBAN RUNOFF,
Rutger - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr, J. V. Hunter, and S. L. Yu.
Journal Water Pollution Control Federation, November 1977, p 2243-2248. 9 fig, 1 tab, 5 ref. OWRT C-5341(No 4239)(9).

Descriptors: Water pollution, *Water pollution sources, *Storm runoff, *Antcedent precipitation, Biochemical oxygen demand, Nutrients, Phosphates, Runoff, *Modeling(Runoff pollution).

A test is reported of the common assumption that pollution loading in a storm varies with the length of time elapsed since the preceeding rainfall. This assumption is incorporated in the Stormwater Management Model (SWMM) of EPA. The data available covered a number of storms in the Saddle River, N.J., and pollutant loadings were compared for total suspended sediments, BOD, phosphates and heavy metals. With few exceptions, pollution loadings did not appear to vary with time elapsed since previous rainfall. Further testing of this assumption and development of more realistic models for storm runoff pollution is indicated.
W78-04342

ENVIRONMENTAL CONTAMINANTS INVENTORY STUDY NO. 4, THE PRODUCTION, USE AND DISTRIBUTION OF PHTHALIC ACID ESTERS IN CANADA,
Canada Centre for Inland Waters, Burlington (Ontario).
T. D. Leah.
Report Series No. 47, 1977. 67 p, 2 fig, 15 tab, 104 ref, 3 maps.

Descriptors: *Wastes, *Water pollution, *Soil contaminants, *Biota, *Toxicity, Industrial production, Public health, Hazards, Disposal, Investigations, Data collections, *Canada, *Phthalic acid esters, Distribution.

This study is the fourth in the Environmental Contaminants Inventory Series. The first Chapter contains an introduction to and summary of the material detailed throughout the report. The second and third chapters review the literature on ortho-phthalic acid esters (PAEs) in the environment and their effects on human health. By combining information on exposure and toxicity, an attempt is made to assess the present hazard to human health and the environment posed by observed levels of PAEs in the environment. In the fourth chapter, the production and use of PAEs in Canada is analyzed for the year 1973. The fifth chapter covers the releases of PAEs to the environment from production and processing, and from the use and disposal of articles that contain PAEs. Estimates indicate that in 1973 releases from production and processing activities comprised approximately 20 percent of the total, whereas use and disposal activities accounted for the remaining 80 percent. These releases have been presented in terms of major drainage basins to give the data more regional significance. The sixth chapter reviews the chemistry and properties of PAEs, the major processes used in producing and fabricating flexibilized (plasticized) poly (vinyl chloride) and the use of related chemicals such as phthalic anhydride and terephthalic acid. The final chapter summarizes the conclusions and recommendations based on the findings of this study. Throughout the report, the data are clarified through the use of a material flow charts, tables, and maps. (WATDOC)
W78-04348

SURFACE WATER QUALITY IN CANADA - AN OVERVIEW.
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5G.
W78-04349

NITRILOTRIACETIC ACID (NTA) IN THE CANADIAN ENVIRONMENT,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
D. H. Matheson.
Scientific Series No. 74, 1977. 46 p, 10 fig, 17 tab, 21 ref, 4 append.

Descriptors: *Nitrilotriacetic acid, *Phosphates, *Detergents, *Groundwater, *Sampling, Waste water treatment, Chlorination, Effluents, Degradation(Decomposition), Lakes, River, *Canada, *Lake Ontario, *Hamilton Harbour, Western Lake Ontario, Montreal Metropolitan Area.

Nitrilotriacetic acid (NTA) has been used in Canada since 1970 as a replacement for phosphate in detergents. An extensive monitoring program for NTA residuals in water supplies has been carried out by the Water Quality Branch, Inland Waters Directorate, Department of Fisheries and the Environment, with the close cooperation of the Procter & Gamble Company of Canada, Limited. The program includes a survey of public water supplies across Canada and intensive studies of 13 municipalities and certain unique local situations. To date the findings of this program are: (1) Rapid disappearance of NTA in wastewater treatment plants and in receiving waters has prevented a build up of the concentration of the chemical in the environment despite its expanding use. (2) Very few cases occurred in which the NTA content of drinking water derived from surface sources exceeded 10 ppb. These happened where the raw water was polluted with wastewaters containing NTA and reused before degradation and dilution had reduced the concentration. (3) Shallow groundwaters may be contaminated by NTA by way of faulty septic tanks or disposal pits, but they should be condemned for more urgent sanitary reasons. Municipal groundwater supplies showed little evidence of NTA contamination. (WATDOC)
W78-04350

HEATED DISCHARGE CONTROL AND MANAGEMENT ALTERNATIVES SMALL WATER BODIES AND RIVERS.
MacLaren (James F.) Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5D.
W78-04353

WATER QUALITY SURVEYS ON THE NIAGARA RIVER - 1974,
Department of the Environment, Burlington (Ontario). Water Quality Div.
For primary bibliographic entry see Field 5A.
W78-04358

WATER QUALITY OF URBAN STORM WATER RUNOFF IN THE BOROUGH OF EAST YORK,
W. G. Mills.
Canada-Ontario Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, Research Report No. 66, 1977. 90 p, 4 fig, 5 tab, 19 ref, 2 append. 74-1-40.

Descriptors: *Water quality, *Storm runoff, *Storm water, *Urban runoff, Parametric hydrology, Surface runoff, Suspended solids, Lead, Phenolic pesticides, Chlorine, Phosphorus, Ammonia, Nitrates, Nitrites, Conductivity, Drainage area, Storm drains, *Canada, Biochemical oxygen demand, Chemical oxygen demand, *Borough of East York(Ont), Kjeldahl nitrogen.

Two study areas were established in the Borough of East York, with one area, Broadview, being abandoned after a short time due to instrumentation problems. The other area, Barrington, was monitored for a period of almost three years. Water quality results are given for eighteen events ar Barrington and three at Broadview. Parameters recorded throughout the study included suspended solids, BOD, lead, phenolic compounds, chlorides, COD, total and dissolved phosphorus, ammonia, Kjeldahl nitrogen, nitrite, nitrate and conductivity. Parameters recorded occasionally included pH, TOC, sodium, potassium, iron, hardness, alkalinity, dissiolved and total solids, sulphates, heavy metals, petroleum hydrocarbons and herbicides. Barrington is an old residential system built in the late 1960s. All tests were run on separated storm water from the new storm sewer system. The drainage area was 22.4 hectares, of which 17.4 hectares contributed runoff to the sewer system, since the roof drainage was connected to the older combined sewer system. Results are provided in tabular form, and include the peak concentrations of all parameters in all events monitored, peak mass loadings for all events (mass loading being the rate at which the parameter is being carried by the runoff), the mass of material carried by runoff in each event, and the flow-weighted mean concentration for each event. Results are also provided in graphical form, including 291 graphs (all of which are available on request). Each graph shows the rainfall, concen-

tration and mass loading for each parameter in each event. (WATDOC)
W78-04359

THE EUTROPHIC POTENTIAL OF WAHIAWA RESERVOIR SEDIMENTS,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5C.
W78-04366

METHANE IN LAKE ERIE: ANALYSIS OF MECHANISMS OF PRODUCTION AND OF AMOUNTS PRODUCED,
Ohio State Univ., Columbus. Dept. of Microbiology.
J. I. Frea, T. E. Ward, and G. E. Mallard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 981, Price codes: A08 in paper copy, A01 in microfiche. Ohio Water Resources Center, Ohio State University, Completion Report No. 488, March 1977. 153 p, 40 fig, 28 tab. OWRT A-040-OHIO(1).

Descriptors: *Methane, *Methane bacteria, Gases, Carbon cycle, Cycling nutrients, Anaerobic digestion, Biodegradation, Aquatic bacteria, Sediments, Anaerobic bacteria, Gas chromatography, *Lake Erie, Microbial degradation, Water pollution sources, *Path of pollutants, Distribution, Lake sediments, *Methane production rates, *Methanobacterium, *Methanospirillum, *Methanosarcina, Fluorescent antibody.

Microbial methanogenesis in the sediment and water column of the Western and Central Basins of Lake Erie was studied. Year to year methane production varies, but relative methanogenesis by geographical location is constant with near shore and harbors having highest production. The Western Basin generally supports more methane production than the Central Basin. Four species of methanogenic bacteria, Methanobacterium ruminantium, Methanobacterium strain M.Q.H., Methanospirillum hungatii, and Methanosarcina barkerii, were shown by the direct fluorescent antibody technique to be distributed in specific locations in the Lake and its harbors. Laboratory study of these same methanogenic species showed that they produce an average of 1.2 umoles of methane per hour per 10 to the 8th power cells. Methane accumulation does not inhibit methane production; hydrogen depletion terminates production.
W78-04373

OIL POLLUTION IN THE MEDITERRANEAN SEA,
Mediterranean Regional Oil Combating Center, Manoel Island (Malta).
For primary bibliographic entry see Field 5G.
W78-04403

VARIATIONS IN THE LEVELS OF MINERAL AND ORGANIC MATERIALS CARRIED BY A CANALIZED RIVER, THE LOT, (IN FR. iCH),
Toulouse-3 Univ. (France). Lab. d'Hydrobiologie.
For primary bibliographic entry see Field 5C.
W78-04441

THE DISTRIBUTION, COMPOSITION AND TRANSPORT OF SUSPENDED PARTICULATE MATTER IN THE NORTHEASTERN GULF OF ALASKA, SOUTHEASTERN BERING SHELF AND LOWER COOK INLET,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
R. A. Feely, and J. D. Cline.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p 89-179, March 1977. 35 fig, 10 tab, 35 ref.

Descriptors: *Water pollution sources, *Baseline studies, *Sediment transport, Ocean currents, Bottom sediments, Alaska, Resources development, Distribution, Path of pollutants, *Outer Continental Shelf, Suspended matter, Particulate matter, Bering Sea, Gulf of Alaska.

The most significant conclusions of the suspended matter program in the southeastern Bering Shelf are listed: The surface suspended matter distributions appear to follow the general pattern of circulation in Bristol Bay. Terrestrial suspended matter from the northern rivers is generally carried to the west and southwest by counterclockwise currents. Large plumes of suspended matter can be seen extending to the southwest. In the region north of Unimak Pass large suspended matter plumes have been observed in the early summer which appear to be the result of increased productivity during the summer months. Sharp increases in suspended matter concentrations near the bottom indicate that resuspension of bottom sediments is occurring. In the Gulf of Alaska the distribution of suspended matter at the surface appear to follow the general pattern of water circulation. Significant variations can be related to seasonal variations in the discharge of terrestrially derived suspended matter, seasonal variations in primary productivity, and occasional offshore transport of suspended matter by wind-generated eddies. A bottom nepheloid layer is present throughout most of the Gulf. Studies of the chemical composition of the suspended matter show significant spatial and seasonal variations. (Sinha-OEIS)
W78-04460

DISTRIBUTION OF LIGHT HYDROCARBONS, C1-C4, IN THE NORTHEAST GULF OF ALASKA, LOWER COOK INLET, SOUTHEASTERN BERING SHELF, NORTON SOUND AND SOUTHEASTERN CHUKCHI SEA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
J. Cline.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p 180-268, March 1977. 39 fig, 6 tab, 27 ref.

Descriptors: *Water pollution sources, *Baseline studies, *Oil spills, *Seepage, Resources development, Alaska, Fossil fuels, Methane, Distribution, Path of pollutants, *Outer Continental Shelf, *Bering Sea, *Gulf of Alaska, Chukchi Sea, Hydrocarbons, Aliphatic hydrocarbons, Petroleum hydrocarbons.

The development of petroleum resources in the Gulf of Alaska may result in the release of toxic hydrocarbons to the marine environment with possible deleterious effects on the pelagic, benthic, and intertidal biota. It is of environmental significance that baseline levels of both naturally occurring and petroleum-derived hydrocarbons be established prior to the development of fossil fuel resources in the area. Low molecular weight hydrocarbons (LMWH) studies were carried out in the northeast Gulf of Alaska and the southeastern Bering Sea to determine the distributions and natural sources of methane, ethane, ethylene, propane, propylene, isobutane and n-butane. Known offshore seeps were investigated to ascertain the composition of natural gas seeps and to evaluate the merits of naturally injected LMWH as tracers of petroleum input. Baseline surveys have been completed in the northeast Gulf of Alaska, southeastern Bering Sea, Norton Sound, and southeastern Chukchi Sea. The data obtained to date is probably sufficient to delineate the background levels of the low molecular weight aliphatic hydrocarbons to be expected in a future monitoring activity. (Sinha-OEIS)
W78-04461

SUBMARINE SEEPAGE OF NATURAL GAS IN NORTON SOUND, ALASKA,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
J. D. Cline, and M. L. Holmes
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p 269-289, March 1977. 2 fig, 1 tab, 38 ref.

Descriptors: *Baseline studies, *Water pollution sources, Resources development, Alaska, Natural gas, Seepage, *Outer Continental Shelf, Norton Sound, Alaska, Alkanes, Hydrocarbons.

During a 1976 survey of petroleum hydrocarbon distributions in the waters of Norton Sound, relatively large concentrations of dissolved C2-C4 alkanes were observed in a localized area approximately 40 km south of Nome, Alaska. The hydrocarbons, apparently originating from a point source in the sea floor, could be identified in the near-bottom waters down-current for more than 100 km. Concentrations of ethane, propane, iso- and n-butanes near the locus of the seep were above ambient levels by a factor of 10 or more. Preliminary estimates of the composition of the initial gas phase composition predict methane:ethane and ethane:propane ratios of 24 and 1.7, respectively, assuming the hydrocarbons were introduced via bubbles. Taken at face value, the low C2:C3 ratio is indicative of gas from a liquid petroleum source rather than from nonassociated or biogenic natural gas. Preliminary data on the structural geology of Norton Basin support this interpretation based on the observed chemical and physical characteristics of the plume. (Sinha-OEIS)
W78-04462

NATURAL DISTRIBUTION OF TRACE HEAVY METALS AND ENVIRONMENTAL BACKGROUND IN ALASKAN SHELF AND ESTUARINE AREAS,
Alaska Univ., College. Inst. of Marine Science.
D. C. Burrell.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p. 290-506, March 1977. 31 fig, 70 tab, 203 ref. No. 03-5-022-56.

Descriptors: *Pollutant identification, *Baseline studies, *Water pollution, Resources development, Alaska, Oil pollution, Heavy metals, Toxicity, Distribution, Path of pollutants, *Outer Continental Shelf, Berging Sea, Beaufort Sea, Gulf of Alaska, Mytilus, Fucus.

The scope of this project included lower Cook Inlet, Norton Sound and the southern part of the Chukchi Sea in addition to the three shelf areas (Gulf of Alaska, S. Bering and Beaufort Seas). Baseline collection and analysis of water column samples is now considered to be complete. For the soluble contents analysed to date, viz. Cd, Cu, Pb, Ni, Hg and V, concentrations in filtered seawater from all shelf regions of Alaska are generally lower than commonly accepted oceanic means. As expected for such open ocean areas, distributions are quite uniform. Surficial sediment samples, collected in a uniform, contamination-free fashion in all these areas, show a number of heavy metals have been determined both as concentrations in extractable fractions from the sediment surface and as 'whole rock' totals. In all cases the heavy metal contents are a function of the sediment grain size fractionation and the lithology. The concentrations of particulate heavy metals in the water are related to the particulate sediment load with enhanced concentrations adjacent to the sediment interface and in coastal waters. The clay mineralogy of all the fine grained fractions have also been determined. A fairly representative spread of two intertidal benthic species have been analysed.

Data show heavy metal contents as low of lower than other regions. It is noted that the Alaskan shelf regions could well serve as a type example of pristine coastal environments. (Sinha - OEIS)
W78-04463

HYDROCARBONS: NATURAL DISTRIBUTION AND DYNAMICS ON THE ALASKAN OUTER CONTINENTAL SHELF,
Alaska Univ., College. Inst. of Marine Science.
D. G. Shaw.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p. 507-727, March 19 77. 8 tab, 16 ref, 2 apend. Chiefly data tables and charts. 03-5-022-56.

Descriptors: *Water pollution sources, *Baseline studies, *Pollutant identification, Analytical techniques, Alaska, Resources development, Sediment, Biota, Zooplankton, Seston, *Outer Continental Shelf, *Hydrocarbons, Aromatic hydrocarbons.

Results of hydrocarbon analyses of biota, water, sediment and seston are reported and discussed. In general these analyses show that the Alaskan OCS environments are free of petroleum at the present time. Petrogenic hydrocarbons were detected in intertidal sediments of the Beaufort Sea. It is not yet known to what extent, if at all, anthropogenic sources contribute to these hydrocarbons. Efforts to understand and quantify processes by which hydrocarbons in the water column are transported to the benthic environment are described. The two such processes investigated are the association of hydrocarbons and suspended sediments and the scavenging and sedimenting of hydrocarbon droplets by zooplankton. It appears that at least for the conditions of south central Alaska the formet process is not highly effecient. Results about the latter process are not yet available. Brief descriptions of recently begun site specific studies are presented. (Sinha - OEIS)
W78-04464

TRACE METAL CONTENT OF BOTTOM SEDIMENT IN NORTHERN BERING SEA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 5A.
W78-04465

MERCURY DISPERSAL FROM LODE SOURCES IN THE KUSKOKWIM RIVER DRAINAGE, ALASKA,
Geological Survey, Menlo Park, CA.
H. Nelson, B. R. Larsen, E. A. Jenne, and D. H. Sorg.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p. 736-750, March 1977. 2 fig, 1 tab, 17 ref.

Descriptors: *Water pollution sources, *Baseline studies, *Bottom sediments, *Mercury, Alaska, Resources development, Metals, Fresh water, Sea water, *Outer Continental Shelf, Suspended sediment, Cinnabar.

The Kuskokwim River is not industrially polluted, but has anomalous mercury content from cinnabar particles in bottom sediments near natural mineralized sources. To ascertain if physical dilution is the dominant dispersal process in natural rivers, dispersal distance (distance required for Hg content to return to background values) was examined in filtered water, suspended sediment, bulk sediment, and size fractions of heavy mineral concentrates downstream from mineralized areas over 840 km of the Kiskokwim River system. The highest individual Hg anomalies in suspended sediment and filtered water occur near the largest mineralizred sources of tributary streams; however, values decline rapidly downstream. The Hg anomalies in source areas for both water and suspended sediment usually are significantly lower than the bed sediment anomalies, and water values are much lower than any sediment values at a given source. This dispersal pattern of anomalies probably results because most of the mercury appears to be entering the river system as particulate cinnabar in bottom sediment and the diluting effect of water discharge always is greater than sediment discharge in any river, and similarly the bottom sediment load of this river is estimated to be only about 10% of the annual suspended sediment load. (Sinha - OEIS)
W78-04466

CHARACTERIZATION OF ORGANIC MATTER IN SEDIMENTS FROM GULF OF ALASKA, BERING AND BEAUFORT SEAS,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
I. R. Kaplan, W. E. Reed, M. W. Sandstrom, and M. I. Venkatesan.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 13. Contaminant Baselines, p. 751-838, March 1977. 46 fig, 11 tab, 15 ref. 03-6-022-35250.

Descriptors: *Water pollution sources, *Pollutant identification, *Baseline studies, *Oil pollution, *Bottom sediments, Environmental effects, Sediments, *Organic matter, Resources development, Alaska, *Outer Continental Shelf, Hydrocarbons, Petroleum hydrocarbons, Gulf of Alaska, Bering Sea, Beaufort Sea.

The paraffin fraction of the high molecular weight hydrocarbons have been identified from sediment samples from the Eastern Gulf of Alaska and the Eastern Bering Sea. In general it has been shown that: The concentrations of total hydrocarbons in surface sediments from both areas, with the exception of one sample near Pribilof Canyon, is low compared to recent marine sediments from other environments; the hydrocarbons in the sediments appear to be derived from a mixture of terrigenous and marine sources. In the Bering Sea, a terrigenous source predominates, while in the Gulf of Alaska, contribution from mainr and terrigenous sources is approximately equal. A series of n-alkanes and unresolved hydrocarbons in the n-C21 to n-23 molecular weight range occurs in some samples from the Bering Sea and many of the sediments of the Gulf of Alaska. The source of these hydrocarbons may be either from petroleum or from unidentified marine organisms. Sediments near the head of Pribilof Canyon appear to contain petroleum derived hydrocarbons. This is in contrast to most other samples of the Bering Sea which have no indications of petroleum addition. Several of the Gulf of Alaska sediments analyzed seem to indicate some petroleum contribution. (Sinha - OEIS)
W78-04467

FULVIC ACIDS, HUMIC ACIDS, AND KEROGENS FROM SEDIMENTS OF THE GULF OF ALASKA AND EASTERN BERING SEA,
California Univ., Los Angeles. Dept of Earth and Space Sciences.
For primary bibliographic entry see Field 5A.
W78-04468

CHARACTERISTICS OF THE SOLUTION ALGORITHMS FOR THE QUAL II RIVER MODEL,
Utah State Univ., Logan.
W. J. Grenney, M. C. Teuscher, and L. S. Dixon.
Journal Water Pollution Control Federation, Vol. 50, No. 1, p 151-157, January 1978. 4 fig, 12 ref.

Descriptors: *Model studies, *Simulation analysis, *Water quality, *Algorithms, *Numerical error analysis, Computers, Flow, Jordan River(Utah), Constraints, Equations, Systems analysis, Input-output routines.

The QUAL II river water quality model has been widely used in the past 3 or 4 years for water quality planning. However, application of the model to the Jordan River in Utah has indicated several limitations, the most serious being the instability at large diversions (flow discontinuities). Modifications made to eliminate this problem and to improve the model's applicability are discussed herein. Numerical analysis of the conditions encountered with the Jordan River has indicated that in order to retain reasonable accuracy, the solution algorithm be limited to inverting matrices containing less than 250 equations. This constraint was applied to both dynamic and steady-state conditions. It is concluded that in order to use the QUAL II effectively, the modifications made to the input/output routines and to the solution algorithm are a necessity. (Bell-Cornell)
W78-04479

ENVIRONMENTAL TRANSPORT MODELING OF POLLUTANTS IN WATER AND SOIL,
Oak Ridge National Lab., TN; and Union Carbide Corp., Oak Ridge, TN. Nuclear Div.
M. R. Patterson, C. L. Begovich, and D. R. Jackson.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-7605121, Price codes: A02 in paper copy, A01 in microfiche. (1976). 14 p, 6 fig, 8 ref.

Descriptors: *Pollutant transport, *Water pollution, *Soils, Heavy metals, Particulates, Suspended sediment, Hydrologic cycle, Bulk flow, Time scale, *Environmental effects, Soil erosion, *Simulation analysis, Mathematical models, Systems analysis.

A suite of models is discussed which can be applied to calculation of first order effects in transport of several types of pollutants in water and soil. The materials considered include solids in the form of particulates and soluble forms of the heavy metals. The time scale that is currently being emphasized is discussed, along with the physical size of the area covered by these calculations. The role of the hydrologic cycle is introduced along with the importance of bulk flow and particulate transport, as suspended sediment. The build-up of lead, cadmium, zinc, and copper in the soil near a lead smelter over a six-year period is presented. (Bell-Cornell)
W78-04481

MOBILITY OF HEAVY METAL HUMATES IN SOILS AND SURFACE WATERS,
Missouri Univ., Rolla. Dept. of Geology and Geophysics.
E. Bolter, and T. R. Butz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 050, Price codes: A04 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, September 1977. 51 p, 14 fig, 5 tab, 4 ref. OWRT B-114-MO(1). 14-34-0001-6094.

Descriptors: *Heavy metals, Humic acid, Water pollution sources, *Humic acid-heavy metal complexation, *Copper, *Lead, *Zinc, *Cadmium, Solubility, Runoff, Soils, Pollutant identification, Path of pollutants.

The dissolution of heavy metal compounds by humic acids and the formation of humic acid-metal complexes for copper, lead, zinc and cadmium was investigated. The solubility of heavy metal compounds increased sharply with humic acid compared to water with the same pH. The tendency to form humic acid complexes increased in the sequence cadmium, zinc, lead and copper. The tendency to form complexes increased with increasing humic acid concentration and higher pH,

but decreased with increasing electrolyte content of the solution. Runoff samples from a heavily polluted smelter area were in agreement with the laboratory data. Several methods of determining complexation were compared.
W78-04494

PREDICTING POLLUTANT DISPERSION IN RIVERS,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
H. Liu, and J. E. Dieter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 048, Price codes: A02 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, January 1, 1978. 13 p, 4 fig, 16 ref. OWRT A-094-MO(2). 14-34-0001-7053 and 7054.

Descriptors: *Path of pollutants, *Forecasting, Dispersion, Longitudinal dispersion, Open channel, *Pollution(Prediction), Rivers, Streams, Water pollution sources, *Dispersion coefficient.

The purpose was to evaluate and refine a new method proposed by Liu (See W77-05803) to predict the dispersion coefficient of natural streams. It was found that the dimensionless dispersion coefficient Beta, where Beta = U*R3DL/Q2, is directly proportional to the Darcy-Weisbach frictional factor f. This establishes an analogy between one-dimensional dispersion and friction which deserves further investigation. The study also showed the effect of channel cross-sectional geometry on the dimensionless dispersion coefficient Beta.
W78-04495

PHOSPHORUS ACCUMULATION-DISCHARGE CYCLES IN MARSHES,
Wisconsin Univ.-Oshkosh. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-04501

TOXIC METALS IN SURFACE WATERS FROM COAL ASH,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Envrontemental Studies.
For primary bibliographic entry see Field 5A.
W78-04502

MATHEMATICAL MODELING OF LAND RUNOFF CONTAMINATED BY PHOSPHORUS,
Marquette Univ., Milwaukee, WI.
V. Novotny, H. Tran, G. V. Simsiman, and G. Chesters.
Journal Water Pollution Control Federation, Vol. 50, No. 1, p 101-112, January 1978. 12 fig, 21 ref.

Descriptors: *Path of pollutants, *Runoff, *Model studies, *Mathematical models, Pollutants, Water pollution, Sediments, Suspended solids, *Phosphorus, Water quality, Chemicals, Agricultural chemicals, Watersheds(Basins), Hydrology, *Water quality models.

A dynamic model capable of simulating pollutants movement and adsorption in soils was developed. Soil adsorption was treated as a non-conservative kinematic process with adsorption equilibrium described by the Langmuir isotherm. The soil adsorption model then was incorporated into a larger dynamic hydrologic-sediment transport model termed LANDRUN and applied to simulation of phosphorus contamination of runoff from urban and non-urban areas. The model was tested by comparing observed and simulated phosphorus loadings from pilot watersheds. The measured data for sediment and phosphorus were in good agreement with simulated loadings. (Sims-ISWS)
W78-04507

SIMULATION OF DESIGN-STORMS WITH PROBABLE DISTRIBUTIONS IN TIME AND SPACE FOR STORM DRAINAGE SYSTEMS,
Technische Univ., Hanover (West Germany). Inst. fuer Wasserwirtschaft, Hydrologie und Landwirtschaftlichen Wasserbau.
For primary bibliographic entry see Field 2B.
W78-04511

THE SIGNIFICANCE OF STORMWATER RUNOFF IN AN URBANIZING WATERSHED,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
C. W. Randall, J. A. Garland, T. J. Grizzard, and R. C. Hoehn.
Progress in Water Technology, Vol 9, No 3, p 547-562, 1977. 8 fig, 7 tab, 5 ref.

Descriptors: *Urban runoff, *Nutrients, *Organic loading, *Waste water treatment, *Virginia, *Watershed management, Water supply, Pollution abatement, Data collections, Sampling, Reservoirs, *Occoquan Reservoir(VA), *Advanced waste water treatment, Secondary effluents.

The Occoquan Creek watershed is located in the northern part of Virginia and occupies an area of 600 mi, consisting of portions of Fairfax, Fauquier, Loudon, and Prince William Counties. The Occoquan Reservoir is a major and critical water supply source for urban development in the Greater Washington, D.C., area. A total of 11 treatment plants are being replaced by advanced wastewater treatment plants. The data from a preliminary investigation showed that organic and nutrient contributions from urban runoff constitute a sizeable fraction of total load and that this source of pollution must be considered in formulating any future policies for the watershed. So far, the construction of elaborate wastewater treatment plants has been emphasized for pollution abatement. This practice needs to be reevaluated, and consideration should be given to control of runoff. (Singh-ISWS)
W78-04512

QUALITY ASPECTS OF AGRICULTURAL RUNOFF AND DRAINAGE,
American Society of Civil Engineers, New York. Task Committee on Agricultural Runoff and Drainage of the Water Quality.
S. Kilman, L. B. Baldwin, M. H. Frere, A. T. Hjelmfelt, Jr, and G. S. McGregor.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 103, No IR4, Proceedings Paper 13439, p 475-479, December 1977. 4 tab, 67 ref.

Descriptors: *Agriculture, *Drainage, *Runoff, *Water quality, Eutrophication, Federal government, Sedimentation, Pesticides, Water management(Applied), Water pollution, Pollutants, Nutrients, Fertilizers, Nitrogen, Phosphorus, Reviews, Federal laws, Pollutant loads.

The ASCE Task Committee on Agricultural Runoff and Drainage summarized the literature and research findings concerning sources of pollutants, nature of downstream impacts, and relationships between pollutant loads and certain physical variables. Agricultural discharges from nonirrigated lands are significant contributors of nitrogen, phosphorus, and pesticides to downstream receiving waters. State-of-the-art knowledge indicates that management practices directed toward control of erosion, control of runoff, and management of fertilizer and pesticide application can reduce total pollutant load carried off-site from agricultural lands. The development of on-site discharge water quality control measures, as contemplated under PL 92-500, must be predicated on detailed surveys of a more specific nature due to the high degree of variability in the factors influencing waterborne pollutant transport. (Visocky-ISWS)
W78-04523

UNUSUAL RESPONSE OF A CUPRIC ION ELECTRODE IN PRAIRIE LAKE WATERS,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W78-04527

THE EFFECTS ON THE VEGETATION OF THE ADDITIONS OF INORGANIC NUTRIENTS TO SALT MARSH SOILS AT STIFFKEY, NORFOLK,
University of East Anglia, Norwich (England). School of Biological Sciences
For primary bibliographic entry see Field 2L.
W78-04541

GROWTH RESPONSES OF COASTAL HALOPHYTES TO INORGANIC NITROGEN,
University of East Anglia, Norwich (England). School of Biological Sciences
For primary bibliographic entry see Field 2L.
W78-04542

PHOSPHORUS ACCUMULATION--DISCHARGE CYCLES IN MARSHES,
Wisconsin Univ.-Oshkosh. Dept. of Biology.
F. L. Spangler, C. W. Fetter, Jr., and W. E. Sloey.
Water Resources Bulletin, Vol 13, No 6, p 1191-1201, December, 1977. 3 fig, 2 tab, 10 ref.

Descriptors: *Bulrush, *Marshes, *Marsh management, *Phosphorus, *Sewage effluents, *Aquatic productivity, Rooted aquatic plants, Wetlands, Freshwater marshes, Aquatic environment, Marsh plants, Phosphorus compounds, Sediments, Pollutants, *Path of pollutants, Wastes, Water pollution, *Water pollution control, Waste water(Pollution), Sewage, Environmental sanitation, Waste water disposal, Productivity, *Wisconsin, Brillion(Wis), Artificial marshes, Phosphorus removal.

Artificial and natural marshes were studied to determine changes in quality of polluted water passing through them. Phosphorus removal ranged from zero to 64%, removals in the 35% range were common. Much of the phosphorus went into sediments and unharvestable plant parts. Harvesting vegetation removed 6% of the phosphorus put into the system. Accumulation of phosphorus during the growing season was about 20 g/sq m, much of which was flushed out after the onset of freezing weather. The amount of phosphorus flushed out can be prevented from entering a lake or stream by handling marsh discharge in one of three ways: irrigate on land, lagoon to recycle later, treat conventionally if facilities are available. (Steiner-Mass)
W78-04545

HEAVY METALS IN SEWAGE SLUDGE MAY MAKE IT UNSAFE FERTILIZER.
For primary bibliographic entry see Field 5E.
W78-04579

HYDROECOLOGICAL INVESTIGATIONS IN THE WATERS OF THE BUKK AND ZEMPLENI MOUNTAINS: I, (IN HUNGARIAN),
Lajos Kossuth Univ., Debrecen (Hungary). Zoological Inst.
J. Szabo, G. Devai, I. Devai, K. Horvath, and I. Bancsi.
Acta Biol Debrecina. 7/8, p 223-243, 1969/70.

Descriptors: *Dissolved oxygen, *Ecological distribution, *Hungary, Mountains, Decomposition, Indicators, Springs, Streams, Bioindicators.

Comprehensive investigations in Hungary of the factors influencing the dissolved O2 content is spring and creek water show the dissolved O2 level in spring-water is primarily determined by the extent of the water-air contact and by the tem-

perature. The O2 saturation of water-rich karst springs with high dissolved O2 level is fairly constant throughout the year. The dissolved O2 content of creek water is fairly uniform, and its variations are largely a function of the water yield. Living organisms constitute a major factor regarding the dissolved O2 content in spring and even in quick-running creek water. Decreased O2 saturation during summer as compared with colder periods indicates intensified decomposition processes while O2 saturation values in summer equal to or slightly higher than those in winter indicate the predominance of photosynthesizing organisms.--Copyright 1973, Biological Abstracts, Inc.
W78-04595

A MODEL FOR THE SIMULATION OF RAIN-WATER RUNOFF IN SEWERS (EIN MODELL ZUR SIMULATION DES REGENABFLUSSES IN KANALISATIONSNETZEN),
Balzari Blaser Schudel, Ingenieure und Planer, Bern (Switzerland).
P. Kaufmann.
Gas-Wasser-Abwasser, Vol. 57, No. 3, p 287-292, 1977. 14 fig, 1 tab.

Descriptors: *Computer models, *Pipes, *Storm runoff, *Analytical techniques, *Model studies, Mathematical models, Sewers, Sewerage, Waste water treatment.

An electronic program has been developed for the hydraulic analysis of drain pipes. ELCAN precisely simulates flow conditions in a sewer system, taking into consideration backwash, retention, and pipe or trunk pressure in the network. This type of calculation for sewer networks allows optimum use of existing pipelines, while minimizing unwarranted investments so that sewer construction will answer actual needs. A series of tests used in evaluating the model and its sensitivity is presented along with some examples of possible practical applications. (Blits-FIRL)
W78-04627

THE MODELING OF ACTIVATED CARBON ADSORBERS IN THE PRESENCE OF BIO-OXIDATION,
McMaster Univ., Hamilton (Ontario).
For primary bibliographic entry see Field 5D.
W78-04628

A PHYSICAL AND MATHEMATICAL MODEL OF MASS TRANSFER AND REACTION KINETICS OF OZONATION,
Anderson-Nichols and Co., Boston, MA.
For primary bibliographic entry see Field 5D.
W78-04629

EFFECTS OF EXTERNAL MASS TRANSFER AND INTRAPARTICLE DIFFUSION ON ADSORPTION RATES IN SLURRY REACTORS,
Williams and Works, Grand Rapids, MI.
For primary bibliographic entry see Field 5D.
W78-04631

EVALUATION OF THE POLLUTION AND DROUGHT HYPOTHESES IN RELATION TO LICHENS AND BRYOPHYTES IN URBAN ENVIRONMENTS,
Ottawa Univ. (Ontario). Dept. of Biology.
F. Leblanc, and D. N. Rao.
Bryologist. 76(1), p 1-19, 1973.

Descriptors: *Bryophytes, *Drought, Environments(Urban), *Lichens, *Water pollution, Domestic water, *Cities.

The evidence on the pollution and drought hypotheses, which seek to explain the rarity of lichens and bryophytes in urban environments, have been critically examined. It is concluded that the premises and logic of the drought hypothesis are not acceptable. In the present paper the importance of experimentation and of phytosociological quantification in ecological hypotheses are stressed.--Copyright 1973, Biological Abstracts, Inc.
W78-04635

ALTERATION OF CRUDE OIL BY WATERS AND BACTERIA: EVIDENCE FROM GEOCHEMICAL AND ISOTOPE STUDIES,
Imperial Oil Ltd., Calgary (Alberta).
N. J. L. Bailey, H. R. Krouse, C. R. Evans, and M. A. Rogers.
Am Assoc Pet Geol Bull. 57(7), p 1276-1290, 1973.

Descriptors: *Bacteria, Canada, *Crude oil alteration, *Geochemical studies, *Isotope studies, *Oxidation, Reservoirs, Washing, *Biodegradation, Water pollution.

Oils from the Mississippian Mission Canyon 5 (MC5) carbonates of Saskatchewan (Canada), on the northern flank of the Williston basin, were changed from sweet, medium- to high-gravity crudes, to sour nonproducible tars where the MC5 subcrop trend is intersected by a zone of fresh meteoric formation water. These waters are recognized by lower salinities and oxygen isotopic compositions which resemble water from present-day precipitation. The alteration of petroleum by fresh water may involve 3 processes: inorganic oxidation, water washing, and biodegradation. Inorganic oxidation (oy O2) is restricted largely to nearsurface reservoirs and is not documented by the present study of crudes from depths of 35000-6000 ft. Water washing occurred where formation waters undersaturated with hydrocarbons dissolved the more soluble lighter hydrocarbons in the reservoired oils. This left more sulfurous, heavier crudes with lower solution gas-oil ratios. Bacterial degradation occurred within the area of freshwater invasion, presumably through the introduction of microorganisms, O2, and nutrients. Normal paraffins and smaller naphthenes were preferentially degraded and nonhydrocarbon NSO compounds and asphaltenes produced with resulting low-wax, heavier, more sulfurous crudes. Isotope data provide additional evidence of bacterial activity in the subsurface. In the study area, water washing and biodegradation reduced crude oil gravities by more than 20 degrees API and increased the S content from less than 1% to more than 3%.--Copyright 1974, Biological Abstracts, Inc.
W78-04649

TRANSPORT OF HEAVY METALS IN A SLUDGE-TREATED FORESTED AREA,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
R. C. Sidle, and L. T. Kardos.
Journal of Environmental Quality, Vol 6, No 4, p 431-437, October-December, 1977. 10 tab, 16 ref.

Descriptors: *Pollutant identification, *Percolating water, *Heavy metals, *Soil amendments, *Soil contamination, Soil analysis, Sewage sludge, Sludge disposal, Cadmium, Zinc, Copper, Chromium, Lead, Cobalt, Nickel.

The transport of selected heavy metals in a forested sludge disposal area was evaluated with respect to the distribution of metals in the extractable and total fractions of the soil and in the soil water percolate. Anaerobically digested sludge was applied to plots in a hardwood forest at rates of 12.71 and 26.96 metric tons of sludge solids/ha. Cu, Zu, and Cd loadings at the higher application rate were 24.50, 28.49, and 0.253 kg/ha., respectively. Percolate quantities of Cu, Zn, and Cd leaving the 120 cm soil depth at the high treatment rate were 0.3, 3.2, and 6.6% of the applied levels, respectively. The relative order of mobility in the soil was determined as Cd>Zn>Cu. Measurements of the 0.1N HCL extractable and total soil fractions of Cu, Zn, and Cd in samples collected before and after sludge application indicated that the relative order of extractibility was Cu>Zn>Cd. Analyses of Cr, Pb, Co, and Ni in 0.1N HCL soil extracts revealed an increase in the Cr and Ni concentration at the 0-7.5 cm depth as a result of sludge application. (Snyder-FIRL)
W78-04653

METHOD DEVELOPMENT AND MONITORING OF POLYNUCLEAR AROMATIC HYDROCARBONS IN SELECTED U.S. WATERS,
Syracuse Research Corp., NY.
For primary bibliographic entry see Field 5A.
W78-04656

MOVEMENT OF MERCURY-203 IN PLANTS,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
D. D. Gay, and G. P. Butler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 472, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-600/3-77-122, October 1977. 13 p, 2 fig, 2 tab, 47 ref. IAA602.

Descriptors: *Plant physiology, *Biochemistry, *Mercury-203, Trace elements, Legumes, Absorption, Biological uptake, Metabolism, Storage, Pollutants, Radioisotopes, *Plant chemistry, Methyl mercury, Phenyl mercury, Transformation, Pisum sativum.

This study was designed to assess plant uptake, translocation, and storage of three forms of mercury via root uptake from contaminated soil. Radioactive mercury-203, in the forms of mercuric acetate, methylmercuric chloride, and phenylmercuric acetate, were used. Two distinct varieties of the garden pea Pisum sativum were used, a dwarf variety, Little Marvel, and a normal variety, Alaska. The seeds were planted in soils contaminated with the mercury compounds. After maturation, stems, leaves, and pods were harvested and analyzed by gamma spectroscopy. Utilizing a least squares three-way analysis of covariance coupled with a Studentized Range Test, significant differences were noted among the levels of the three mercury compounds in the plants, between mercury levels in the two pea varieties, and among mercury levels in the different pea tissues examined. Phenylmercury levels differed consistently from levels of ionic mercury and methylmercury, suggesting a separate pathway for it in peas with regard to metabolism and storage. (Wares-IPA)
W78-04658

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON NITROSAMINES.
Environmental Protection Agency, Research Triangle Park, NC. Office of Research and Development.
For primary bibliographic entry see Field 5C.
W78-04659

FUSION METHOD FOR THE MEASUREMENT OF PLUTONIUM IN SOIL: SINGLE-LABORATORY EVALUATION OF INTERLABORATORY COLLABORATIVE TEST,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W78-04660

EVIDENCE FOR PARTIAL DEGRADATION OF TOXAPHENE IN THE AQUATIC ENVIRONMENT,
Texas Univ. at Dallas, Richardson. Center for Environmental Studies.
G. F. Lee, R. A. Hughes, and G. D. Veith.
Water, Air, and Soil Pollution, Vol. 8, No. 4, October 1977, p 479-484, 1 fig, 9 ref.

Descriptors: Environmental effects, *Water pollution sources, Toxicity, *Pesticides, Fish control agents, Aquatic environment, Sediments, *Degradation(Decomposition), *Pesticide residues, Detoxification, *Toxaphene.

Toxaphene which was present in lake sediments from a previous rough fish control program was extracted and used in a fish bioassay study. Bioassays showed that the toxicity of the toxaphene was reduced compared to the toxicity of the original formulation which had been added to the lake 10 months before. It was concluded that commercial toxaphene formulation is somewhat detoxified in the aquatic environment. (Chilton-ORNL)
W78-04674

THE INTERACTION OF DDT WITH SUSPENDED PARTICLES IN SEA WATER,
Institut Rudjer Boskovic, Rovinj (Yugoslavia). Center for Marine Research.
N. Picer, M. Picer, and P. Strohal.
Water, Air, and Soil Pollution, Vol 8, 1977, p 429-440, 10 fig, 1 tab, 19 ref.

Descriptors: *Water pollution sources, *Path of pollutants, Pesticides, *DDT, *Sea water, Suspension, Adsorption, Pesticide residues.

Radiotracer techniques were used to study the equilibrium distribution of DDT between the liquid and solid phases in sea water. The adsorption of DDT on suspended solids as a function of concentration is presented as adsorption isotherms. It was concluded that DDT in these experiments did not exist in seawater as a real seawater solution but as a kind of colloid aggregate and that for evaluation of the real fate of DDT in the marine environment, adsorption and desorption experiments would have to be performed at concentration of 10 to 50 ppt (lower than in these experiments).)Chilton-ONRL)
W78-04676

AQUEOUS RELEASE OF HEAVY METALS FROM TWO SEWAGE SLUDGES,
Agricultural Research Service, Morgantown, WV. Plant Sciences Div.
R. C. Sidle, and L. T. Kardos.
Water, Air, and Soil Pollution, Vol. 8, 1977, p 453-459, 3 tab, 12 ref.

Descriptors: Environmental effects, Pollution, *Groundwater, Sewage, *Sewage sludge, *Heavy metals, Copper, Zinc, Cadmium, Soil water, Pollutant identification.

Two anerobically digested sewage sludges, one of relatively low and one of relatively low and one of relatively high heavy metal content, were extracted several times with water. It was found that relatively small amounts (1 - 7%) of the total Cu, Zn, and Cd in the two sludges would be readily available for transport in soil water immediately following the application of these sludges to the land. The percentage of non-cationic species of each of these metals in the aqueous extract, which represents the most mobile component in soils, was different in the two sludges, ranging from <1% for Zn and Cd in one sludge to 56.2% for Cd in the other. It was suggested that fractionation into cationic and noncationic forms of the metals in aqueous sludge estracts may be a useful index of the groundwater pollution hazard of the sludge. (Chilton-ORNL)
W78-04677

THE USE OF NEAR-INFRARED REFLECTED SUNLIGHT FOR BIODEGRADABLE POLLUTION MONITORING,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-04682

WATER QUALITY MONITORING IN SOME EASTERN EUROPEAN COUNTRIES,
Vanderbilt Univ., Nashville, TN. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 5A.
W78-04688

REMOTE SENSING DATA, A BASIS FOR MONITORING SYSTEMS DESIGN,
Geological Survey, Iowa City, IA.
For primary bibliographic entry see Field 5A.
W78-04690

AIRCRAFT AND SATELLITE MONITORING OF LAKE SUPERIOR POLLUTION SOURCES,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W78-04695

COMMENTS ON ENVIRONMENTAL MONITORING IN REGION VII AND SOME MONITORING PLANS AND NEEDS PREPARED FOR SECOND CONFERENCE ON ENVIRONMENTAL SENSORS,
Environmental Protection Agency, Kansas City, MO. Region VII.
For primary bibliographic entry see Field 5A.
W78-04699

5C. Effects Of Pollution

RESERVOIR METALIMNION OXYGEN DEMANDS,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-04202

AGRICULTURAL CHEMICALS IN THE ENVIRONMENT (AGROCHEMIKALIEN IN DER UMWELT),
VEB Gustav Fischer Verlag, Jena (East Germany).
E. Henisch, H. Paucke, H.-D. Nagel, and D. Hansen.
1976, 306 p.

Descriptors: *Agricultural chemicals, *Chemical wastes, Environment, *Pesticides, Soil treatment, *Fertilizers, Air pollution, Toxicity, Pesticide residues, Soils.

The levels of agricultural chemicals (pesticides, chemicals applied to soil) and their derivatives in soil, water and air and their effect on aquatic life and birds are discussed. Chapters on mineral and organic fertilizer for plants, biological control of plant pests, toxicology of pesticides and contamination of fodder are included.--Copyright 1978, Biological Abstracts, Inc.
W78-04207

THE CYCLICITY OF THE PROCESS OF CHANGES IN THE BIOMASS OF LAKE BAIKAL ZOOPLANKTON OVER MANY YEARS, (IN RUSSIAN),
Irkutskii Gosudarstvennyi Univ. (USSR). Scientific Research Inst. of Biology.
O. M. Kozhova, and N. G. Melnik.
Gidrobiol Zh 13(1), p 36-39, 1977.

Descriptors: *Zooplankton, *Biomass, *Lake Baikal(USSR), Lakes, Cycling nutrients, Water pollution, Cladocera, Copepoda, Rotatoria.

Visual analysis of chronological graphs indicates a cyclic character in the variations of zooplankton biomass over several years in Lake Baikal, USSR. Copepoda, Cladocera and Rotatoria are examined in detail. Copepoda has a 14 yr. Biomass cycle whereas Rotatoria and Cladocera both have 15 yr duration cycles.--Copyright 1978, Biological Abstracts, Inc.
W78-04212

THE EFFECT OF DETERGENT 'SOLO' AND CRUDE OIL ON THE ACTIVITIES OF CATHEPSIN D AND ACID PHOSPHATASE IN HEMOLYMPH OF CRANGON CRANGON L.,
Medical Academy, Gdansk (Poland). Dept. of Biology.
G. Drewa, Z. Zbytniewski, and F. Pautsch.
Polskie Archiwum Hydrobiologii, Vol. 24, No. 2, 1977, p 279-284, 4 fig, 16 ref

Descriptors: Environmental effects, *Water pollution effects, Biochemistry, *Shrimps, Pollutants, *Detergents, Oil, *Oil pollution, Cathepsin D, Acid phosphatase, Hemolymph, Crangon crangon L.

Investigation showed that the hemolymph cathepsin D activity in shrimps exposed in detergent concentrations of 10, 50 and 100 mg/l increased but that the activity dropped below the control values of shrimps exposed in water with an addition of crude oil. Acid phosphatase activity decreased at all concentrations of the detergent and crude oil after 12 and 24 hrs, but rose slightly after 48 hours without attaining control levels. These disturbances in activities of cathepsin D and acid phosphatase are attributed to changes in the permeability of the lysomal membranes. (Chilton-ORNL)
W78-04237

NITROGEN CHANGES IN STARVED EEL (ANGUILLA ANGUILLA L.),
Polish Academy of Sciences, Warsaw. Lab. of Ecological Bioenergetics.
Z. Fischer.
Polskie Archiwum Hydrobiologii, Vol. 24, No. 2, 1977, p 289-298, 4 fig, 3 tab, 23 ref.

Descriptors: Environmental effects, *Eels, *Metabolism, Weight, *Nitrogen, *Starvation, Protein metabolism, Lipid metabolism.

Nitrogen excretion, respiration and loss of weight of eels subjected to long-lasting starvation (460 days) was examined. In the course of the starvation period a limitation of mobility to the minimum and transition into resting metabolism were observed. Losses of weight during the first year of starvation were equalized and amounted to less than 0.2% of the body weight per day. In the course of the extension of the starvation period up to 460 days the daily losses of weight increased up to about 0.3%. Protein metabolism constituted 30% of total metabolism and the remainder of the energy was taken by the organism by the breaking down of lipids. (Chilton-ORNL)
W78-04238

SEASONAL DISTRIBUTION AND ABUNDANCE OF FISHES IN THE LITTORAL ZONE OF A MICHIGAN LAKE,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station; and Michigan State Univ., Hickory Corners. Dept. of Zoology.
For primary bibliographic entry see Field 2H.
W78-04240

TRACE METAL CONTAMINATION OF BLUEGILL (LEPOMIS MACROCHIRUS) FROM TWO INDIANA LAKES,
Prudue Univ., Lafayette, IN. Dept. of Bionucleonics.
G. J. Atchison, B. R. Murphy, W. E. Bishop, A. W. McIntosh, and R. A. Mayes.
Transactions of the American Fisheries Society, Vol 106, No 6, 1977, p 637-640, 1 fig, 2 tab, 17 ref.

Descriptors: Environmental effects, *Water pollution, *Heavy metals, Fish, *Indiana, *Lakes, Cadmium, Zinc, Lead, Industrial wastes, *Trace elements, *Bluegill.

The two lakes, Little Center Lake and Palestine Lake, from which bluegill were collected are both contaminated by industrial discharges. Bluegill were also collected from several uncontaminated sites to determine background levels of the metals. Metal concentrations (per dry weight) in the bluegill ranged from high levels of 15 microg Cd/g, 42 microg Pb/g, and 480 microg Zn/g to low levels of nondetectable amounts of Cd and Pb and 86 microg Zn/g. Mean concentrations of Cd and Zn were highest in bluegill from Palestine Lake and mean concentrations of Pb were highest in bluegill from Little Center Lake. All mean concentrations were higher than in background. (Chilton-ORNL)
W78-04243

HEALTH IMPLICATIONS OF WATER CONTAMINANTS IN MAN,
National Cancer Inst., Bethesda, MD.
R. W. Miller.
Annals of the New York Academy of Sciences, Vol. 298, p 557-560, September, 1977. 17 ref.

Descriptors: *Carcinogens, *Pollutants, Water supply, Potable water, Methylmercury, Organic compounds, Diseases, Cancer.

Considering the vase array of serious effects of water pollution that have been observed in humans, one could question the necessity of invoking the specter of cancer in order to achieve clean water. The possibility that various drinking water contaminants may be carcinogenic is undeniable, yet, there is no evidence that ingestion of low levels of these chemicals actually causes cancer. The multiplicity of variables involved in the analysis of both polluted drinking water and mixture of diseases known as 'cancer' in humans pose formidable difficulties to researchers. Ideally, prevention can ultimately be achieved through studies that reveal the mechanisms of carcinogens. Once these are known, preventive measures will likely become available. In the meantime, it is hoped that laboratory screening procedures which are highly correlated with known carcinogens can be used to indicate other chemicals which pose real dangers. (Eberle-NWWA)
W78-04302

THE INTERNATIONAL COOPERATION IN STUDYING THE HEALTH ASPECTS OF ORGANIC CONTAMINANTS IN INDIRECTLY REUSED WASTE WATER,
International Reference Center for Community Water Supply, Leidschendam (Netherlands).
For primary bibliographic entry see Field 5D.
W78-04305

RELATIONSHIPS BETWEEN WATER CHEMISTRY AND PRIMARY PRODUCTS IN STREAMS, A LIMNOLOGIC PROBLEM, (IN GERMAN),
Zurich Univ. (Switzerland). Inst. fuer Pflanzenbiologie.
E. A. Thomas, and F. Schanz.
Vierteljahrsschr Naturforsch Ges Zuer 121(4), p 309-318, 1976.

Descriptors: Algae, Macrophytes, Management, Phosphate, Sewage, *Water chemistry, Limnology, *Primary productivity.

The primary products (phytomass) in small streams are estimated. These data are correlated with the water chemistry and limnologic activities of small streams. Whether the introduction of the elimination of phosphates in water treatment plants (3rd treatment stage) would possibly reduce the excessive growth of algae and weed (macrophytes) in small sewage loaded streams is also discussed. The varying phytomass levels of comparable small streams have been defined in a chematic figure. The method can also be used as basis for forming an estimate of the algal mass of shallow lake shore waters.--Copyright 1978, Biological Abstracts, Inc.
W78-04339

ENVIRONMENTAL CONTAMINANTS INVENTORY STUDY NO. 4, THE PRODUCTION, USE AND DISTRIBUTION OF PHTHALIC ACID ESTERS IN CANADA,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-04348

HEATED DISCHARGE CONTROL AND MANAGEMENT ALTERNATIVES SMALL WATER BODIES AND RIVERS.
MacLaren (James F.) Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5D.
W78-04353

THE EUTROPHIC POTENTIAL OF WAHIAWA RESERVOIR SEDIMENTS,
Hawaii Univ., Honolulu. Water Resources Research Center.
L. W. K. Lum, and R. H. F. Young.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 698, Price codes: A07 in paper copy, A01 in microfiche. Technical Report No. 103, August 1976. 121 p, 47 fig, 41 tab, 50 ref, append. OWRT A-066-HI(1), 14-34-0001-6012.

Descriptors: *Eutrophication, *Sediments, *Sewage effluents, Nitrogen, Phosphorus, *Hawaii, Lakes, Reservoirs, Water pollution sources, Water pollution effects, *Wahiawa Reservoir, Lake Wilson, Wahiawa Sewage Treatment Plant, Oahu(Hawaii).

Secondarily-treated sewage effluent discharges into the Wahiawa Reservoir have been implicated as the primary cause of the eutrophic conditions present in the reservoir. The relative importance of in situ nutrient sources, such as N fixation and the sediment, have not, however, been determined. Assessment of the eutrophication potential of the sediment and its relative importance and impact on the selection of a management alternative was the objective of this study using laboratory sediment-water contact systems. Sediment was incubated with four different types of water simulating aerobic and anaerobic conditions in the hypolimnion of the Wahiawa Reservoir. Samples were withdrawn periodically and analyzed for nutrients, chemical oxygen demand (COD), and other constituents. After parameters reached a steady-state, the algal growth potential (AGP) of the waters was determined. Under aerobic conditions, the sediment tended to have an oligotrophic effect on the water. Phosphorus was adsorbed by the sediment, N release from the sediment was inhibited by the development of a surface-oxidized layer, and the COD of the water was decreased. This effect was verified by the poor AGP of the water, which was P deficient. Sediments were able to cause or maintain eutrophic conditions in the test reactors under anaerobic conditions due to release principally of N as NH3. However, the nutrient contribution was of minor importance, only 18% of the N and less than 1% of the P loading to the reservoir relative to other sources. Corrective measures with respect to nutrients released from the sediment are not required, but stabilization of the O2 demand from substances released from the sediment (about 10 mg/l COD) may be required to improve dissolved O2 levels in the deeper portions of the reservoir. A nutrient model of the reservoir shows that diversion of the Wahiawa Sewage Treatment Plant effluent will result in a 65% reduction of N and a 46% reduction of P in the epilimnion of the reservoir. New steady-state conditions are expected to be attained within 30 days, while new steady-state conditions for the hypolimnion and sediments may require about two years.
W78-04366

METHANE IN LAKE ERIE: ANALYSIS OF MECHANISMS OF PRODUCTION AND OF AMOUNTS PRODUCED,
Ohio State Univ., Columbus. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W78-04373

THE CHEMICAL CONDITIONS OF THE WATER IN LAKE KAVSJON, (IN SWEDISH),
Lund Univ. (Sweden). Limnological Inst.
S. Hamrin.
Fauna Flora (Stockh) 71(6), p 254-260, 1976.

Descriptors: Fish kills, *Lake Kavsjon(Sweden), Shallow lakes, Oxygen content(Water), Lakes.

The water in Lake Kavsjon (Sweden) is often low in 0z, probably because the lake is shallow 9 mean depth 0.7 m, maximum depth 1.2 m). During the ice-free period the water is characterized by high values of pH color, carbonate, K, P and Fe. Fish kills are frequent during the winters due to the low 0z content which appear to be due to the inflow from a stream draining a small humus-rich lake. In cold winters the 0z content drops to 0% with the resultant decimation of fish and other organisms.--Copyright 1978, Biological Abstracts, Inc.
W78-04434

PROCESSING LAKES WITH DAMAGED ECOSYSTEMS (IN GERMAN),
Lund Univ. (Sweden). Limnological Inst.
W. Ripl.
Vierteljahrsschr Naturforsch Ges Zuer 121(4), p 303-308, 1976.

Descriptors: Chemical wastes, Chironomids, Duckweed, Leuciscus-Rutilus, Macrophytes, Nitella, Sediments, Sweden(Varnamo), *Ecosystems, *Lakes.

An example of intervention in a lake ecosystem is described for Lillesee, 7 km west of the southern Swedish City of Varnamo, where the use by the local population has added about 300 kg of phosphates/yr for 15 yr. A macrophyte population covered about 40% of the lake surface, and there was an annual summer addition of 90 tons of organic material. A mechanical system for introducting chemicals into the lake was developed; this was operated about 4-5 h/day, adding 146 g Fe, 180 g of Ca (as Ca(OH)z) and 141 g N as calcium nitrate/m2. After this treatment the duckweed no longer developed. Subsequently the macrophytes were removed, roots and all. The littoral was colonized with Nitella, and there was a rapid increase in the red eye (Leuciscus rutilus) fish population. The treated sediment was quickly populated by chironomids.--Copyright 1978, Biological Abstracts, Inc.
W78-04436

VARIATIONS IN THE LEVELS OF MINERAL AND ORGANIC MATERIALS CARRIED BY A CANALIZED RIVER, THE LOT, (IN FRENCH),
Toulouse-3 Univ. (France). Lab. d'Hydrobiologie.
H. Decamps, J. C. Massio, and J. C. Darcos.
Ann Limnol 12(3), p 215-238, 1976.

Descriptors: Algae, Chlorophyll, Electric powerplants, Human wastes, Industrial wastes, *Mineralization, Model, Multiple, Organic matter, Regression analysis, *Seasonal, *Temperature, *Turbidity, Canalized river, *France.

The operation of dams in the upper reaches of the Lot (France) and its Truyere tributary affects the water quality of the middle and lower reaches of

the river where the Lot is canalized. These effects were analyzed with the help of a mathematical model of discharge and the model was used to determine the origins of different masses of water circulating in the 235 km section of canalized river. Profiles taken down the river at different times of the year were used to determine the major changes in the levels of mineral matter, organic matter, dissolved and particulate matter, all carried in suspension in the water. The most important factors, in order of decreasing importance, are the time of the year (seasonal factor), the turbidity of the water and the mineralization of the water. Seasonal changes are chiefly due to water temperature which was the principal factor responsible for variation in chlorophyll a in a multple regression model. This temperature effect is enhanced by the decreased flows at low water levels due to the use of the river in summer for hydro electric purposes. The turbidity of the water is closely associated with the presence of mineral matter. The most important and long lasting effects in the lower reaches are due to the floods of the Dourdou, a tributary draining the sandstone terrain of the Permo-trias. The algae increases the turbidity chiefly in the form of inert organic material mixed with mineral matter. The water coming from the Truyere has a lower mineral content and is less favorable than the upper Lot for the development of algae. The positive correlation between conductivity and temperature shows the importance of urban and industrial waste materials during the low water levels of the summer.-Copyright 1978, Biological Abstracts, Inc.
W78-04441

THE PHYSIOLOGICAL EFFECTS OF ACUTE AND CHRONIC EXPOSURE TO HYDROCARBONS ON NEAR-SHORE FISHES OF THE BERING SEA,
Scripps Institution of Oceanography, La Jolla, CA. Physiological Research Lab.
A. L. Devries.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 1-22, March 1977. 2 fig, 4 tab, 12 ref. 03-5-022-86.

Descriptors: *Fishes, *Water pollution effects, *Baseline studies, *Aromatic compounds, Biochemistry, Oil pollution, Alaska, *Outer Continental Shelf, *Hydrocarbons, Bering Sea, Petroleum, Near-shore fishes, Chronic exposure, Sublethal effects, Naththalene, Physiological ecology.

The main objective was to establish the effect of selected petroleum hydrocarbons on the physiology of certain cold-water fishes that are year round residents of the Bering Sea. Sculpins from the Bering Sea were shown to take up naphthalene from their environment, however it appeared to have little effect on the biosynthesis of either the plasma protein or of the peptide antifreeze. Morphological studies demonstrated that naphthalene exposure caused deterioration of the liver, however it was not determined whether this was a direct effect of naphthalene metabolism or resulted indirectly from anemia and reduced food intake. The normal rate of protein synthesis in the naphthalene exposed fishes suggests that compensatory mechanisms exist to maintain a constant synthetic rate of liver proteins. (Sinha - OEIS)
W78-04443

LETHAL AND SUBLETHAL EFFECTS ON SELECTED ALASKAN MARINE SPECIES AFTER ACUTE AND LONG-TERM EXPOSURE TO OIL AND OIL COMPONENTS,
National Marine Fisheries Service, Auke Bay, AK. Northwest and Alaska Fisheries Center.
S. D. Rice, S. Korn, and J. F. Karinen.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 23-43, March 1977. 5 ref. R7120822.

Descriptors: *Toxicity, *Water pollution effects, *Alaska, Mortality, Shellfish, Oil pollution, *Outer Continental Shelf, Sublethal effects.

Laboratory and field studies were conducted to determine recovery rates of selected organisms and ecosystems from perturbations resulting from either contamination or other disturbances associated with petroleum development. The research involved physiological and bioassay tests of applied research on species indigenous to the Gulf of Alaska, Bering Sea, and Beaufort Sea. The major emphasis of research has shifted from strictly descriptive acute toxicity determinations to mechanistic studies and sublethal tests that will eventually allow prediction of oil impact on the biota. Studies to determine the acute toxicity of the water-soluble fraction (WSF) of crude oil continue with experiments with species not tested previously. Methodology and apparatus of flow-throgh tests have been designed and three systems are in use. Experiments also continue with larvae of species not tested previously. Emphasis is on intertidal species, such as mussels, barnacles, snails, and sea urchins. (Sinha - OEIS)
W78-04444

THE RELATIVE IMPORTANCE OF EVAPORATION AND BIODEGRADATION, AND THE EFFECT OF LOWER TEMPERATURE ON THE LOSS OF SOME MONONUCLEAR AND DINUCLEAR AROMATIC HYDROCARBONS FROM SEAWATER,
National Marine Fisheries Service, Auke Bay, AK. Northwest and Alaska Fisheries Center.
D. L. Cheatham, R. S. McMahon, S. J. Way, and J. W. Short.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 44-65, March 1977. 13 ref.

Descriptors: *Toxicity, *Water pollution effects, *Baseline studies, *Evaporation, *Biodegradation, Alaska, Oil pollution, Temperature, *Outer Continental Shelf, Cook Inlet(AK), Aromatic hydrocarbons.

A Cook Inlet crude oil water-soluble fraction, incubated at 5 degrees, 8 degrees, and 12 degrees C. was analyzed by gas chromatography during a 96-h period to determine the effect of temperature on evaporation and biodegradation of individual mononuclear and dinuclear aromatic hydrocarbons in seawater. The relative importance of evaporation and biodegradation on the loss of these hydrocarbons was assessed at each temperature using combinations of aeration and poison as experimental conditions. Lower temperature reduced the loss of mononuclear and dinuclear aromatic hydrocarbons from seawater. Evaporation was an especially significant factor in the loss of mononuclear aromatics. Biodegradation had little effect on mononuclear aromatics but had a significant effect on dinuclear aromatics, particularly naphthalene. Natural means exist for eliminating toxic aromatic hydrocarbons from seawater, even at low temperature. However, oil and seawater mixtures could be more toxic for longer periods of time at lower temperatures because aromatic hydrocarbons would persist in seawater longer. (Sinha - OEIS)
W78-04445

EFFECTS OF LOW TEMPERATURE ON THE SURVIVAL OF PINK SALMON AND SHRIMP EXPOSED TO TOLUENE, NAPHTHALENE, AND THE WATER-SOLUBLE FRACTION OF COOK INLET CRUDE OIL,
National Marine Fisheries Service, Auke Bay, AK. Northwest and Alaska Fisheries Center.
S. Korn, D. A. Moles, and S. D. Rice.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 66-84, March 1977. 4 tab, 13 ref.

Descriptors: *Toxicity, *Water pollution effects, *Temperature, *Baseline studies, *Oil pollution, *Alaska, Shrimp, Salmon, Cold regions, Subarctic, Arctic, *Outer Continental Shelf, Crude oil, Toluene, Naphthalene, Pandalus goniurus, Oncorhynchus gorbuscha.

Toxicity tests were conducted at different temperatures to determine the effects of temperature on survival of shrimp and fish exposed to oil and oil component solutions. Exposure concentrations declined with time, and at different rates for each temperature, simulating a point source spill in the environment. Shrimp (Pandalus goniurus and Eualus spp.) and pink salmon (Oncorhynchus gorbuscha) were tested (96-h bioassays) with toluene, naphthalene, and the water-soluble fraction (WSF) of Cook Inlet crude oil at 4 degrees, 8 degrees and 12 degrees C. Median tolerance limits (96-h TLm) were computed by probit statistics. Oil concentrations were measured by ultraviolet spectrophotometry. The effect of different temperatures on the toxicity of toluene, naphthalene, and the WSF of Cook Inlet crude oil solutions depended on species and toxicant. Survival of shrimp exposed to toluene and naphthalene was significantly less at higher temperatures. In contrast, survival of pink salmon exposed to toluene was significantly less at lower temperatures. Other tests did not yield significant temperature effects. (Sinha - OEIS)
W78-04446

EFFECTS OF COOK INLET CRUDE OIL, BENZENE, AND NAPHTHALENE ON HEART RATES OF THE ALASKAN KING CRAB (PARALITHODES CAMTSCHATICA),
National Marine Fisheries Service, Auke Bay, AK. Northwest and Alaska Fisheries Center.
T. A. Mecklenburg, and S. D. Rice.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 85-125, March 1977. 5 fig, 1 tab, 13 ref.

Descriptors: *Water pollution effects, *Baseline studies, *Aromatic compounds, *Pathology, Crabs, Cold regions, Alaska, Oil pollution, *Outer Continental Shelf, Sublethal effects, Crude oil, Benzene, Naphthalene, Paralithodes camtschatica.

Continuous monitoring of heart rates during exposure to toxicants was found to be a sensitive indicator of sublethal responses in the king crab, Paralithodes camtschatica. In exposures to water-soluble fractions of Cook Inlet crude oil, benzene, and naphthalene, the heart rate response was consistently one of depression, followed by return to normal as the crude oil or aromatic concentrations in the seawater declined. In one of the experiments with crude oil, respiration was also monitored; it closely parralleled the changes in heart rate. In another, using periodically repenished crude oil water-soluble fractions, the heart rate remained depressed until the oil concentration was allowed to drop. Benzene produced more severe and longer-lasting heart rate depressions than did naphthalene or crude oil; the response of benzene also occurred much sooner after initial exposure. The long-lasting sublethal effect of benzene was evident even though the benzene degraded more rapidly in the water than either crude oil or naphthalene. All of the experiments substantiated a strong relationship between oil or aromatic fraction degradation and heart rate recovery. (Sinha - OEIS)
W78-04447

SUBLETHAL EFFECTS OF PETROLEUM HYDROCARBONS AND TRACE METALS, INCLUDING BIOTRANSFORMATIONS, AS REFLECTED BY MORPHOLOGICAL, CHEMICAL, PHYSIOLOGICAL PATHOLOGICAL, AND BEHAVIORAL INDICES,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.

D. C. Malins, E. H. Gruger, Jr, H. O. Hodgins, and D. Weber.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 125-298, March 1977. 38 fig, 31 tab, 148 ref. R7120820.

Descriptors: *Water pollution effects, *Baseline studies, *Alaska, *Oil pollution, Trace metals, Salmon, Shrimp, Arctic, Subarctic, *Outer Continental Shelf, *Sublethal effects, Biotransformations, Hydrocarbons, Petroleum hydrocarbons, Oncorhynchus, Pandalus.

Several findings have implications with respect to petroleum effects on aquatic species and consequently to OCS oil and gas development. Most of the studies were designed as laboratory experiments and the degree to which laboratory results can be directly applied to natural events remains a considerable problem. The observed susceptibility of postlarval and adult shrimp to very low levels of naphthalene in seawater strongly suggest that petroleum introduced into the environment of these and related animals would have substantially deleterious effects. Similarly, the observed structural changes in salmonid fish after hydrocarbon exposure, and the uptake and retention of toxic trace metals by salmon and flatfish imply that the presence of petroleum and trace metals at some concentrations in diet, water, or sediment would be harmful to these species. Controlled field studies on salmon homing indicated that low concentrations of hydrocarbons do not affect salmon homing behavior or ability and thus imply that petroleum hydrocarbons in the path of migrating salmon would not completely disrupt their migration. The fact that greater accumulations of hydrocarbons were found in exposed fish at 4 degrees C, as compared to 10 degrees C, suggests that cold water environments may substantially increase the hydrocarbon burden under Arctic conditions in comparison to temperate regions. (Sinha - OEIS)
W78-04448

ECOSYSTEMS DYNAMICS, EASTERN BERING SEA,
National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.
T. Laevastu, and F. Favorite.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 299-341, March 1977. 16 fig. R7120810.

Descriptors: *Water pollution effects, *Models, *Mathematical models, *Ecosystems, Alaska, Bering Sea, Oil pollution, Baseline studies, *Outer Continental Shelf.

The nature, size, complexity and feasibility of a multi-component, dynamic, numerical ecosystem model for the eastern Bering Sea was investigated and a functional model permitting useful and reliable assessment of fluctuations in the eastern Bering Sea biomass was constructed. A summary review of the Dynamical Numerical Marine Ecosystem (DYNUMES) Model is given and some specific components account for environmental effects are presented. The model uses the accumulated knowledge on marine ecology in direct form, and interactions can be quite different from one group of species and/or processes to another. Although logical results are obtained, these are new concepts. The DYNUMES model for the eastern Bering Sea has demonstrated its utility in quantitative simulation of processes in the total marine ecosystem and in assessment of the impacts of man's activity on the marine ecosystem and its components. (Sinha - OEIS)
W78-04449

ECOSYSTEM DYNAMICS BIRDS AND MARINE MAMMALS. PART I: PRELIMINARY RELATIONSHIPS IN THE BERING SEA,
National Marine Fisheries Service, Seattle WA. Northwest and Alaska Fisheries Center.
W. B. McAlister, and M. A. Perez.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 342-371, March 1977. 4 fig, 11 tab, 28 ref.

Descriptors: *Water pollution effects, *Ecosystems, *Mammals, Baseline studies, Oil pollution, Fish Alaska, *Outer Continental Shelf, Bering Sea, Pinnipeds, Trophodynamic relationships.

Studies reported in this paper represent the results of research to integrate and synthesize data into a conceptual submodel of the ecosystem describing trophodynamic relationships in the eastern Bering Sea including interactions among northern fur seals, other marine mammals, marine birds, and several species of fish. The amount of food consumed by fur seal and other pinnipeds has been estimated and compared with the amount of fish caught by commercial fisheries in the same waters. Pinnipeds do consume a quantity of food consisting of both non -commercial and commercial fish stocks, especially pollock, which is nearly as great as that of the commercial fishery; although, the impact of fur seals is apparently not as great as that of other pinnipeds such as the northern sea lion. The impact of pinnipeds on the fishery is a complex interaction, and further analyses of data on the ecosystem and trophodynamic relationships of pinnipeds and finfish are required before the system can be understood. (Sinha - OEIS)
W78-04450

ECOSYSTEM DYNAMICS BIRDS AND MARINE MAMMALS. PART II: ASPECTS OF THE FEEDING ECOLOGY OF BERING SEA AVIFAUNA,
Fish and Wildlife Service, Anchorage, AK.
G. A. Sanger, and P. A. Baird.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 372-417, March 1977. 12 fig, 10 tab, 40 ref. No. 01-6-208-13424-NWAFC.

Descriptors: *Water pollution effects, *Ecology, *Birds, Oil pollution, Baseline studies, *Outer Continental Shelf, Bering Sea, Procellariidae, Laridae, Alcidae.

Dramatic seasonal changes occur in the abundance of birds in the eastern Bering Sea. Peak abundance occurs in early spring with the influx of Sooty and Short-tailed Shearwaters from their breeding grounds in the southern hemisphere, and with the staging of Alaskan breeding species prior to nesting. During the Alaskan birds' breeding season, the distribution of all species except the shearwaters is strongly oriented toward colonies. Little is known about the diets of the birds, but the abundant shearwaters and murres appear to consume large quantities of euphausiids, and schooling pelagic and demersal fishes. Prey items range in size from copepods of 7 mm or less to fish of at least 25 cm. Glaucous-winged Gulls, Black-legged Kittiwakes, and Northern Fulmars probably benefit greatly from offal produced by Walleye Pollock fisheries. The fisheries have possibly created an imbalance in the ecosystem which has benefited plantivorous birds. (Sinha - OEIS)
W78-04451

EFFECTS OF PETROLEUM EXPOSURE ON HATCHING SUCCESS AND INCUBATION BEHAVIOR OF GLAUCOUS-WINGED GULLS,
Johns Hopkins Univ., Baltimore, MD. Dept. of Pathobiology.
S. M. Patten, Jr., and L. R. Patten.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 418-445, March 1977. 13 fig, 11 ref.

Descriptors: *Water pollution effects, *Oil pollution, *Birds, *Gulls, Alaska, Bird eggs, Hatching, *Outer Continental Shelf, Gulf of Alaska, Larus glaucescens.

An analysis of the effects of petroleum exposure on hatching success and chick survival of Alaskan Glaucous-winged Gulls (Larus glaucescens) is provided. The effects of both North Slope Crude Oil and mineral oil on the hatching success and incubation behavior of a key seabird species nesting on the Copper River Delta barrier islands is presented. Oil spill danger in the Copper River Delta barrier islands is high due to proximity to Valdez tanker lanes, offshore oil leases, counterclockwise onshore currents, strong tidal interchange, shallow slope of the islands, and huge concentrations of birds including the largest gull colonies in the northeast Gulf of Alaska. Research has been focused on Egg Island, where a control group and reproductive data are available from previous years. Egg oiling experiments had decided effects: North Slope Crude led to nearly complete mortality of all samples and high mortality with mineral oil applied to gull eggs. Hatching success was 14.6% compared to the normal range of 69-77% in the adjacent control colony. Oil application to egg surfaces causes not only high egg mortality, but the behavior of the adult birds is altered and they do not renest during the season due to extended periods of incubation. (Sinha - OEIS)
W78-04452

EVOLUTION, PATHOBIOLOGY AND BREEDING ECOLOGY OF THE GULF OF ALASKA HERRING GULL GROUP (LARUS ARGENTATUS X LARUS GLAUCESCENS),
Johns Hopkins Univ., Baltimore, MD. Dept. of Pathobiology.
S. M. Patten, Jr., and L. R. Patten.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12. Effects, p 446-595, March 1977. 42 fig, 14 tab, 111 ref.

Descriptors: *Water pollution effects, *Oil pollution, *Gulls, *Ecology, *Diseases, Domestic wastes, Wastes, Alaska, *Outer Continental Shelf, Gulf of Alaska, Larus argentatus, Larus glaucescens.

There are six known large gull colonies along the northeast Gulf of Alaska between Cordova and Juneau, in an area soon to be impacted by the development of oil resources. Information indicates these population have the potential for rapid increase with access to human garbage, sewage and refuse associated with increased oil operations, but their colonies are sensitive to disturbance during the breeding season. Gulls are associated with canneries, fish-packing houses, garbage dumps sewer outfalls and municipal water supplies along the coast of Alaska, and are clearly implicated with human bacterial and parasitic diseases in Alaska. As the availability of human generated refuse increases with the development of oil resources in the Gulf of Alaska, populations of gulls previously more isolated may come into closer contact with one another. The gene flow between gull populations in the Gulf of Alaska may be further increased in coming years as a secondary influence of human activities, which may lead to a new adaptive peak in this commensal bird species, with consequences for municipal health and sanitation. (Sinha - OEIS)
W78-04453

ACUTE EFFECTS - PACIFIC HERRING ROE IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
R. L. Smith, and J. A. Cameron.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports

for the Year Ending March 1977, Vol 12. Effects, p 5961635, March 1977. 23 fig, 3 tab, 14 ref. 03-5--022-56.

Descriptors: *Water pollution effects, *Baseline studies, *Oil pollution, Fish, Herring, Hatching, Alaska, *Outer Continental Shelf, Hydrocarbons, Bering Sea, Gulf of Alaska, Clupea harengus pallasi.

The potential impact of OCS oil development activities on a single species of Alaskan marine fish, the Pacific herring (Clupea harengus pallasi) was evaluated. This project sought to simulate conditions of a crude oil spill to test the effects of low boiling point, water soluble hydrocarbon components of Prudhoe Bay crude on developing herring larvae. Exposure for as little as 48 hrs. led to a significantly higher incidence of gross morphological abnormalities. Exposure for six days resulted in 100% mortality in the fertilized embryos. The following conclusions were reached: the herring reproductive cycle is vulnerable to oil pollution for at least two months, possibly more; very low hydrocarbon levels produced significant effects in terms of hatching success, gross morphological abnormalities, total larval length, and presence of hydrocarbons in hatched larvae and unhatched embryos; and deliterious effects produced by oil contamination reduce the fitness of larvae which, at best, had little chance to survive to adulthood. (Sinha - OEIS)
W78-04454

SUBLETHAL EFFECTS ON SEAGRASS PHOTOSYNTHESIS,
Alaska Univ., College. Inst. of Marine Science.
C. P. McRoy, and S. L. Williams.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12, Effects, p 636-665, March 1977. 15 fig, 1 tab, 19 ref. 03-5-022-56.

Descriptors: *Water pollution effects, *Baseline studies, *Grasses, *Oil pollution, Photosynthesis, Alaska, *Outer Continental Shelf, *Sea grass, *Sublethal effects, Carbon uptake, Hydrocarbons, Zostera, Ruppia, Phyllospadix.

The sublethal effects of petroleum contamination on seagrass photosynthesis was examined. Kinetics of photosynthtic uptake of carbon were the primary basis of examination supplemented by field observations and experiments. It was found that the fundamental kinetic response of seagrass photosynthesis to light, as estimated by 14C uptake, was similar for three Alaskan species: Zostera, Ruppia, and Phyllospadix. Laboratory experiments of seagrass (Zostera) exposed to hydrocarbons exhibited productivity, as estimated by carbon uptake, reduced up to 2.2 times that of unexposed plants. Plants treated with tolulene were visibly affected at the end of a 5.5 hr exposure. The reduction of productivity of plants allowed a recovery period in clean seawater after exposure was not as severe. When exposed to hydrocarbons in natural situations such as in boat harbors or in situ experiments, plants showed no serious effects. In fact seagrasses are able to flourish in chronic low-level exposure. This result stongly discourages the use of laboratory experiments as the sole basis of extrapolation to management considerations. (Sinha - OEIS)
W78-04455

RESEARCH TO DETERMINE THE ACCUMULATION OF ORGANIC CONSTITUENTS, HEAVY METALS FROM PETROLEUM-IMPACTED SEDIMENTS BY MARINE DETRITIVORES OF THE ALASKAN OUTER CONTINENTAL SHELF,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
J. W. Anderson, G. Roesijadi, D. L. Woodruff, and E. A. Crecelius.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 12, Effects, p 770-822, March 1977. 15 tab, 41 ref. 2311102778.

Descriptors: *Water pollution effects, *Baseline studies, *Oil pollution, *Sediments, Alaska, Benthos, Clams, Metals, *Outer Continental Shelf, Trace metals, Feeding habits, Petroleum hydrocarbons, Macoma inquinata, Phascolosoma agassizii.

Experiments were conducted to examine the bioavailability of petroleum hydrocarbons and trace metals from petroleum-impacted marine sediments. The feasibility of using bivalve condition index as an indicator of stress due to petroleum exposure was also tested. Prudhoe Bay Crude was the test oil in all experiments. When simultaneously exposed to oil in sediment for 40 days in the field, detectable levels of hydrocarbons were present in two deposit-feeding species, Phascolosoma agassizii and Macoma inquinata. These results suggest that mode of feeding is a determinate factor in the availability of sediment-sorbed hydrocarbons to benthic animals. Condition index of Macoma inquinata was sensitive to stress, with a significant reduction observed under unfavorable field condtions, as opposed to the laboratory. Condition index was reduced, but not significantly, in clams exposed to oil-contaminated sediment. Compared to sediment concentrations nickel, zinc, and seleium in Macoma inquinata. Other compounds were present at levels similar to or lower than those of sediment. Exposure to oil-contaminated sediment did not appear to affect trace metals content of either species. Individual variation of trace metals content in M. inquinata was relatively low. (Sinha - OEIS)
W78-04456

STRATIGRAPHY AND EVOLUTION OF BOGS IN MIRE TERRITORY OF THE RIGHT-BANK FOREST-STEPPE, (IN UKRANIAN),
Akademiya Nauk URSR, Kiev. Dept. of Geobotany and Palebotany.
For primary bibliographic entry see Field 2H.
W78-04475

AN EVALUATION OF A COMPUTER SIMULATION MODEL OF PLANKTON DYNAMICS IN MONTEREY BAY,
Naval Postgraduate School, Monterey, CA.
D. E. Henrickson.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-032 294, Price codes: A05 in paper copy, A01 in microfiche. Masters Thesis, September 1976. 93 p, 28 fig, 23 ref, 3 append.

Descriptors: *Evaluation, *Computer models, *Simulation analysis, *Plankton dynamics, *Monterey Bay(Cal), Phosphates, Zooplankton, Phytoplankton, Forcing functions, Upwelling, Advection, Predation pressure, Radiation index, Algal sinking, Systems analysis, Equations, California.

A computer simulation model of the phosphate, phytoplankton and zooplankton dynamics in Monterey Bay has been examined and modified. The model is driven by four forcing functions expressed as annual cycles of upwelling velocity, incident solar radiation, mixed layer depth, and mixed layer temperature. An alternate upwelling index has been developed based on the local wind field. A revised radiation index is employed based on the generation of both advective fog and low stratus cloud cover common during upwelling on the California coast. Analysis of the model's response to sinking and advection of phytoplankton has been examined. The importance of seasonal increases in predators has been introduced as a controlling factor in the seasonal growth of zooplankton. The model is able to predict the seasonal trends of phosphate, phytoplankton, and zooplankton throughout the year (Bell-Cornell)
W78-04480

POPULATION OF BENTHIC MACROINVERTEBRATES IN HAM'S LAKE,
Oklahoma State Univ. Stillwater School of Biological Sciences
J. L. Wilhm, D. Barker, E. Clay, and N. McClintock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 037, Price codes: A02 in paper copy, A01 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, December 1977. 20 p, 2 fig, 9 tab, 23 ref. OWRT A-067-OKLA(1), 14-34-0001-7076.

Descriptors: *Artificial destratification, *Dissolved oxygen, Sediments, Sedimentation rate, Sediment particle size, Organic carbon, Hemolymph ions, Osporegulation, *Oklahoma, Invertebrates, Water pollution effects, Benthos, Aquatic populations, Copper, Iron, Manganese, *Ham's Lake(Okla), *Chaoborus punctipennis, Phosphorus.

Ham's Lake, Oklahoma, was destratified during summer 1976 by pumping surface water to the bottom. Number of species, diversity, and density of benthic macroinvertebrates were significantly correlated with the concentration of dissolved oxygen, while none of the biotic variables was correlated with temperature. Percent loss on ignition and CaCO(3) of the sediments generally decreased with increasing sediment depth. During 1977 pumping was not applied. The variables measured will be compared with values obtained in 1978 when the lake will again be destratified. In 1977 the lake had stratified thermally and chemically by 15 April. The depth of sediment deposited averaged 3.6 mm/month of 261 g/m(2) per month. Sediment particle size was less at the 8 m stations than at the 2 m stations. Percent organic carbon in the sediments ranged from 1.0-8.6. A gradual decrease in hemplymph ions (Na+, K+, CL) in Chaoborus punctipennis was observed from May through September and a return to higher concentrations in October. The lake water at the bottom contained low concentrations of these ions until August. A decrease in osmotic pressure was measured in C. punctipennis during the summer reflecting the trends in fluctuation of hemolymph ions. Measurements were also made of the concentration of copper, iron, manganese, and phosphorus of the water and sediments and the distribution and diversity of benthic macroinvertebrates. These data will be reported in a supplement to this report.
W78-04493

WATER QUALITY AT FIVE PROPOSED INDUSTRIAL SITES ON THE ROANOKE AND NEW RIVERS,
Nuclear Regulatory Commission, Washington, DC. Office of Nuclear Reactor Regulation.
J. H. Wilson, and K. L. Dickson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 028, Price codes: A05 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 84, November 1977. 79 p, 11 tab, 10 fig, 23 ref, 2 append. EPA Training Grant WP-166.

Descriptors: *Water quality, Virginia, *Environmental effects, *Sites, Industrial plants, Ecology, Baseline studies, Nitrates, Invertebrates, Benthos, Aquatic populations, *New River(Va), *Roanoke River(Va), Biological assessment, *Baseline ecological surveys, *Environmental impacts.

Aquatic ecological surveys were conducted at five potential industrial development sites in Virginia, four on the New River and one site on the South Fork of the Roanoke River. Eighteen physical-

chemical parameters were analyzed and biological information was collected in order to determine the physical, chemical, and biological water quality. This study was designed to generate baseline information essential in assessing the environmental impacts of future development in the watershed. The results indicate that the New River and the South Fork of the Roanoke River support diverse populations of macrobenthic invertebrates and that physical and chemical water quality is high, except for increased levels of nitrate in the New River. Although both rivers have water quality that is considered good by biological and chemical standards, they are vulnerable. If the assimilative capacity of these two rivers is to be preserved as a valuable resource, they must be used intelligently. Future industrial development should be managed carefully in these watersheds to maintain the high quality of the aquatic environment in the New River and the South Fork of the Roanoke River.
W78-04497

PHOSPHORUS ACCUMULATION-DISCHARGE CYCLES IN MARSHES,
Wisconsin Univ.-Oshkosh. Dept. of Biology.
F. L. Spangler, C. W. Fetter, Jr., and W. E. Sloey.
Water Resources Bulletin, Vol. 13, No. 6, p 1191-1201, December 1977. 3 fig, 2 tab, 10 ref. EPA R803794, S801042.

Descriptors: *Phosphorus, *Bulrushes, *Nutrient removal, *Aquatic plants, *Phosphates, Marshes, Fertilizers, Sediments, Pollutants, Water quality, Waste water treatment, Marsh plants, Water pollution, Aquatic environment, Standing waters, Path of pollutants, Water pollution sources, Nutrients, *Wetland waste treatment.

Artificial and natural marshes were studied to determine changes in quality of polluted water passing through them. Phosphorus removal ranged from 0 to 64%. Removals in the 35% range were common, however. Much of the phosphorus went into sediments and unharvestable plant parts. Harvesting vegetation removed 6% of the phosphorus put into the system. Accumulation of phosphorus during the growing season was about 20 gP/sq m, much of which was flushed out after the onset of freezing weather. The amount of phosphorus flushed out can be prevented from entering a lake or stream by handling the marsh discharge in one of three ways: irrigate on land, lagoon to recycle later, treat conventionally if facilities are available. (Henley-ISWS)
W78-04501

TOXIC METALS IN SURFACE WATERS FROM COAL ASH,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Envrontemental Studies.
For primary bibliographic entry see Field 5A.
W78-04502

THE GREAT LAKES CLEANUP,
International Joint Commission-United States and Canada. Great Lakes Regional Office.
For primary bibliographic entry see Field 5G.
W78-04586

ALGAL CANCER AND ITS CAUSES: I. CARCINOGENIC POTENCIES OF WATER AND SUSPENDED SOLIDS DISCHARGED TO THE RIVER OHMUTA, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
S. Tshio, K. Kawabe, and T. Tomiyama.
Bull Jap Soc Sci Fish. 38(1), p 17-24, 1972.

Descriptors: *Algal cancer, Aromatic compounds, *Carcinogenic potential, Discharge(Water), *Japan(River Ohmuta), *Nitrogenous compounds, Porphyra-tenera, Rivers, *Suspended solids, Water, Mud deposits, Bottom deposits.

Carcinogenic potencies were tested with the waste water taken during the ebb tide of the river Ohmuta, Japan, and also with mud deposited on the sea bottom, about 1.5 km north from the mouth of the river. The waste water showed poor carcinogenic effect when diluted to a concentration as low as that found in the areas under cultivation where this disease can be easily detected. The mud induced cancers on Porphyra tenera during a 36-day culture after a single contact for periods ranging 80-320 min. The cancerous disease of P. tenera is due to suspended solids in the sea bottom mud which is probably derived from the Ohmuta river as evidenced from the distribution of nitrogenous aromatic compounds in the bottom mud.--Copyright 1973, Biological Abstracts, Inc.
W78-04596

THE COMPARISON OF SLUDGE EXTRACTS AND CHU 10 IN CULTIVATING CHLORELLA PYRENOIDOSA,
Chinese Univ. of Hong Kong. Dept. of Biology.
For primary bibliographic entry see Field 5E.
W78-04616

ACCLIMATION OF FATHEAD MINNOWS AND LAKE TROUT TO RESIDUAL CHLORINE AND BROMINE CHLORIDE,
Wyoming Univ., Laramie. Dept. of Zoology and Physiology.
G. M. DeGraeve, and R. W. Ward.
Journal Water Pollution Control Federation, Vol 49, No 10, p 2172-2178, October, 1977. 3 tab, 17 ref.

Descriptors: *Environmental effects, *Chlorination, *Bioassay, Aquatic life, Fish, *Minnows, Trout, Toxicity, Waste disposal, Effluents, Disinfection, Bromine, Resistance, Lethal limit, Water pollution effects, *Lake trout.

Previous studies on the effects of the total residual chlorine (TRC) and total residual bromine chloride (TRBC) in waste water effluents on aquatic life have suggested that fish are able to tolerate higher levels if levels are initially low and gradually increased. Experiments were conducted at the Grandville, Michigan, waste water treatment plant to determine if fathead minnows and lake trout previously exposed to TRC or TRBC could acclimate and survive in effluents having TRC or TRBC levels above their respective 96-hour TL50 values. The experiments also examined the 7-day survival rate of fathead minnows at maximum TRC levels after previous exposure to sub-lethal levels. The relationships between acclimation time, concentrations of TRC during acclimation, and degree of acclimation achieved by fathead minnows were determined. Results indicated that fathead minnows and lake trout with previous exposure to TRC or TRBC for more than 2 hours did acclimate more readily to chlorinated or chlorobrominated effluents. A linear relationship was observed between previous exposure and tolerance to residual halogen levels in excess of 96-hour TL50 values. Prior exposure to TRC for 4 hours or longer created greater tolerances to TRC in fathead minnows. High TRC concentrations were lethal, regardless of previous exposure history. (Schulz-FIRL)
W78-04617

OCCURRENCE OF ASPERGILLUS FUMIGATUS DURING COMPOSTING OF SEWAGE SLUDGE,
Agricultural Research Service, Beltsville, MD. Biological Waste Management Lab.; and Agricultural Research Service, Beltsville, MD. Soil Nitrogen Lab.
P. D. Millner, P. B. Marsh, R. B. Snowden, and J. F. Parr.
Applied and Environmental Microbiology, Vol. 34, No. 6, p 765-773, December, 1977. 1 fig, 3 tab, 48 ref.

Descriptors: *Sludge, *Pathogenic fungi, *Waste storage, *Spores, *Aeration, Environmental sanitation, Sludge treatment, Sewage disposal, Air pollution, Thermophilic bacteria, Waste water treatment, *Aspergillus fumigatus.

The presence of Aspergillus fumigatus, a fungus which affects the respiratory system, was investigated in sludge, compost, woodchips, and commercial potting mediums. A. fumigatus was detected in all stages of composting; high levels were especially prevalent in crude and screened compost and in stored woodchips from stockpiles older than one month. Levels of the fungus decreased significantly with an increase in the age of the stored compost, yielding negligible levels in compost stored more than six months. Sludge samples indicated that soil type and location could influence A. fumigatus. Levels detected in commercial potting soils varied from undetectable traces to amounts comparable to those detected in one-month-old storage compost. Temperatures greater than 60C in compost limited the growth of A. fumigatus significantly. Airborn spora of the fungus were more abundant in compost sites exposed to air than in noncompost sites, a finding that supports the need for caution by treatment facilities employees with histories of respiratory problems. (Lisk-FIRL)
W78-04621

ENVIRONMENTAL PROBLEMS OF INDIA AND THEIR POSSIBLE TRENDS IN FUTURE,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 5G.
W78-04643

DAMAGE TO POLLUTED LAKES CAN BE REVERSED, STUDY SAYS.
For primary bibliographic entry see Field 5G.
W78-04646

SCIENTIFIC AND TECHNICAL ASSESSMENT REPORT ON NITROSAMINES.
Environmental Protection Agency, Research Triangle Park, NC. Office of Research and Development.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 055, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/6-77-001, June 1977. 109 p, 14 fig, 20 tab, 360 ref.

Descriptors: *Public health, Control, Environmental effects, Water pollution, Pollutant identification, Epidemiology, Chemical analysis, Nitrogen compounds, Air, Food webs, Water supply, Ecology, Nitrites, Monitoring, Measurement, *Nitrosamines, Carcinogens, *Amines.

Possible deleterious effects on human health and welfare of N-nitrosamines (NA) in the environment are reviewed and evaluated. Sources, distribution, measurement, and control technology for NA and their precursors are also considered. NA (characterized by the N-N = 0 group) are formed by the reaction of amines with nitrous acids. Nearly 70% of all N-nitroso compounds studied have been found to be carcinogenic, with a wide range in potency in all species of laboratory animals tested via all routes of administration. The experimentally produced carcinogensis appears to be caused by metabolites rather than by NA themselves. Epidemiological studies to date do not show a direct relationship between exposure to NA and cancer in man. Ambient air concentrations of NA of up to 36 micrograms/cubic meter have been found near an emission source, and of up to 0.2 microgram/cubic meter in major population centers. The relative contributions of natural and man-made sources of NA are indeterminable at present. Average dietary intake of NA is not likely to exceed a few micrograms/day, and intake of NA in municipal drinking water would probably be

much less than 1 microgram/day. NA in cigarettes range from 0 to 180 ng/cigarette. Recommendations are made for research on biological effects of exposure; population exposure patterns; epidemiological patterns related to NA; environmental distribution,
W78-04659

ENTRAPMENT AND IMPINGEMENT OF FISHES BY POWER PLANT COOLING-WATER INTAKES: AN OVERVIEW,
California Univ., Davis. Div. of Wildlife and Fisheries Biology.
For primary bibliographic entry see Field 8I.
W78-04661

TOXICITY OF CADMIUM TO GOLDFISH, CARASSIUS AURATUS, IN HARD AND SOFT WATER,
Brock Univ., St. Catherines (Ontario). Dept. of Biological Sciences.
L. S. McCarty, J. A. C. Henry, and A. H. Houston.
Journal of the Fisheries Research Board of Canada, Vol. 35, No. 1, January 1978, p 35-42, 6 fig, 25 ref.

Descriptors: *Environmental effects, Water quality, Fish, Mortality, *Cadmium, *Toxicity, Water properties, *Hardness(Water), *Goldfish, Water pollution effects.

Variations in the form of cadmium and its concentrations and in water quality were monitored during static bioassays conducted with soft (approximately 20 mg/l CaCO3) and hard (approximately 140 mg/l CaCO3) water. Mortality of the test animals was complete within 16 and 24 h after exposure to 5 and 10 mg/L solution in soft water. LC50 values of 2.76, 2.13, and 1.78 mg Cd/L were estimated on the basis of 48-, 96-, and 240-h periods of observation. The situation in hard-water trials was more complex with only the highest (60 mg Cd/L) and lowest (30 mg Cd/L) effective test concentrations leading to simple sigmoidal cumulative mortality curves. On the basis of 48-, 96-, and 240-h exposures, LC50 values of 46.9, 46.8, and 40.2 mg Cd/L were estimated. (Chilton-ORNL)
W78-04662

A TAXONOMIC AND ECOLOGICAL STUDY OF SOME ALGAE IN TWO PONDS IN SOUTH SHELBY COUNTY, TENNESSEE,
Memphis State Univ., TN.
For primary bibliographic entry see Field 2H.
W78-04663

INVESTIGATIONS OF THE IMPACT OF MERCURY ON ENCLOSED WATER COLUMNS USING A ZOOPLANKTON SIMULATION MODEL,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5A.
W78-04665

RELATIVE TOXICITY OF FREE CYANIDE AND DISSOLVED SULFIDE FORMS TO THE FATHEAD MINNOW (PIMEPHALES PROMELAS),
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
S. J. Broderius, L. L. Smith, Jr., and D. T. Lind.
Journal of the Fisheries Research Board of Canada, Vol. 34, No. 12, December 1977, p 2323-2332, 2 fig, 5 tab, 29 ref.

Descriptors: Environmental effects, *Toxicity, Fish, *Cyanide, *Sulfides, *Hydrogen sulfide, Hydrogen ion concentration, Toxicology, *Minnows, Water pollution effects, Gill permeability theories.

This study was designed to define the change in tolerance limits of the fathead minnow to free cyanide and dissolved sulfide forms as a function of pH. 96-h LC50 concentrations of free cyanide and molecular HCN did not differ greatly and were fairly constant in the pH range of 6.8-8.3. At pH 9.3, the values diverged with the free cyanide values increasing while the HCN values decreased. Except for some increase with rise of pH from 6.5 to 7.1, the 96-h LC50 concentrations of molecular H2S decreased as the pH increased. It was concluded that the acute toxicity to fathead minnows of free cyanide and dissolved sulfide does not depend entirely on the concentration of ambient molecular HCN or H2S, but that the CN and HS anions penetrate the gill epithelium less readily than do the molecular forms and increasingly enhance the toxicities of these solutions as the test pH increases. (Chilton-ORNL)
W78-04666

RELATIONSHIPS OF FISH YIELD TO LAKE PHYTOPLANKTON STANDING CROP, PRODUCTION AND MORPHOEDAPHIC FACTORS,
Cornell Univ., Ithaca, NY. Dept. of Natural Resources.
For primary bibliographic entry see Field 2H.
W78-04667

AQUATIC EFFECTS OF STEAM-ELECTRIC GENERATING PLANTS: FEDERAL REGULATIONS AND POSSIBLE IMPACTS ON MULTIPURPOSE RESERVOIRS IN OKLAHOMA,
Texas Instruments Inc., Dallas. Ecological Services.
P. L. Zweiacker, and L. G. Bowles.
Annals of the Oklahoma Academy of Science, No. 5, 1976, p 124-135, 4 fig, 3 tab, 14 ref.

Descriptors: *Environmental effects, *Powerplants, *Oklahoma, Reservoirs, Evaluation, Forecasting, *Cooling water, Entrainment, *Thermal pollution, Chemicals.

The objective of this study is the prediction or evaluation of the ecological effects of existing or proposed power plants in Oklahoma. There are approximately 22,848,700 acre-feet of storage capacity in existing multipurpose Oklahoma reservoirs with a potential of an additional 26,419,900 acre-feet. Most of the cooling water used by electric power plants is obtained from rivers and places little demand on water resources. Because of the widespread use of closed-cycle cooling systems, impingement is not expected to present a statewide problem. The majority of Oklahoma plants have cooling towers where entrainment mortality is probably 100%. Entrainment problems could be significant if the intake is located in a major spawning area and if the quantity of makeup water constitutes a large percent of the total water body. Widespread use of closed-cycle cooling systems indicates that thermal pollution should not be a problem. Chemical pollution is plant-specific. (Chilton-ORNL)
W78-04668

EVIDENCE FOR PARTIAL DEGRADATION OF TOXAPHENE IN THE AQUATIC ENVIRONMENT,
Texas Univ. at Dallas, Richardson. Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W78-04674

EFFECTS OF MERCURY AND TIN ON FRUSTULAR ULTRASTRUCTURE OF THE MARINE DIATOM, NITZSCHIA LIEBETHRUTTI,
Hawaii Univ., Honolulu. Dept. of Botany.
E. M. Saboski.
Water, Air, and Soil Pollution, Vol. 8, 1977, p 461-466, 10 fig, 1 tab, 4 ref.

Descriptors: Environmental effects, *Water pollution effects, *Mercury, *Tin, *Diatoms, Frustules, Abnormalities.

A culture series was established with diatoms in seawater containing 1.5 microg at/L of Sn- or Hg-ion. Frustule abnormalities were observed to be greater for the Hg- and Sn-ion treated cells than for control cells. Abnormalities common to both Hg and Sn were such features as reduction in length to width ratios, fused carinal dots and change in numbers of carinal dots. Tin treated cells had frustules with two unique abnormalities: carinal dots aligned parallel to the raphe and raphes that were curved. It was suggested that abnormalities may result from enzyme disruption either at the silicon deposition site or at the nuclear level and that Hg or Sn might be found as part of the molecular structure of the abnormal frustules. Only Sn was detected on the surface of the frustule by x-ray probe analysis. Mercury analysis of the frustules was inconclusive. (Chilton-ORNL)
W78-04675

EVALUATION OF 'CAM-1', A WARNING DEVICE FOR ORGANOPHOSPHATE HAZARDOUS MATERIAL SPILLS,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5A.
W78-04679

5D. Waste Treatment Processes

BARK AS A NONINERT TRICKLING FILTER MEDIUM FOR PULP MILL EFFLUENT,
Mississippi State Univ. Mississippi State.
G. R. Lightsey, and J. W. Mitchell.
AIChE Symposium Series, Vol. 72, No. 157, p 112-120, 1976. 11 fig, 7 tab, 14 ref. OWRT A-100-MISS(2).

Descriptors: *Trickling filters, *Porous media, *Bark, *Pulp and paper industry, *Suspended solids, Pulp wastes, Pilot plants, Filtration, Industrial wastes, *Waste water treatment.

Studies were conducted to evaluate the use of pine bark as a trickling filter medium for dewatering primary sludge and for reducing the BOD, COD, and color of the liquid fraction of sludge and bleach plant effluent. Three low rate trickling filter models were used in tests with primary sludge which was recomposed from a kraft pulp and paper mill primary clarifier bottom sludge that had been dewatered to approximately 30% solids by weight. Five filter models were tested with bleach plant effluent from a bleached kraft pulp mill. Filter depths ranged from 1 to 6 ft, and hydraulic loading rates of 1.15-36.8 gal/sq ft/day were used. Tests with primary sludge indicated that a pine bark medium trickling filter was capable of dewatering the sludge to 18% solids and could remove 70-95% of the BOD. At the optimum hydraulic loading rate of more than 4.59 gal/sq ft/day the filter was capable of removing up to 40% of the COD in the liquid fraction of primary sludge. An increase in the nitrogen content of the pine bark medium after filtration suggested that it could be used as an effective soil conditioner. The color and conductivity of the bleach plant effluent were not significantly reduced by passage through the bark trickling filter, although up to 95% of the BOD and 40% of the COD were removed. The optimum loading rate for a single pass, pine bark media trickling filter on the basis of BOD and COD removal was determined as 0.20 gal/sq ft/day. (Schulz-FIRL)
W78-04270

DETECTION OF TRINITROTOLUENE IN WATER BY FLUORESCENT ION-EXCHANGE RESINS,
Naval Weapons Center, China Lake, CA.
For primary bibliographic entry see Field 5A.
W78-04271

CHEMICAL PRODUCTS PLANT SOLVES PROBLEM OF CONTAMINATED WASTE-WATER,
Reichhold Chemicals Ltd. Sainte Therese (Quebec).
C. Charette, and J. Herbineaux.
Water and Pollution Control, Vol. 115, No. 10, p 21, 24-26, October, 1977. 2 tab.

Descriptors: *Chemical wastes, *Resins, *Phenols, *Biological treatment, *Clarification, Treatment facilities, Aeration, Industrial wastes, Sludge treatment, Equipment, Chemical oxygen demand, Waste water treatment.

The chemical products plants of Reichhold Chemicals Limited at Ste. Therese, Quebec, Canada, uses batch production processes in the manufacture of phenolic, urea formaldehyde, alkyd, and polyester resins. A biochemical system had been installed in 1972 for the treatment of waste water from product transfer and cleaning operations which had been previously discharged directly to the municipal sewer system. The system included two 8 foot-deep aerated lagoons, the first of which was used for equalization and the second for biological treatment. Since the system did not have a secondary clarifier, biomass recycling became necessary. A biokinetic design study program was used to evaluate the LIGHTNIN integrated secondary clarifier manufactured by Greey Mixing Equipment Limited. Modifications to the existing facilities included the conversion of three surface aerators to submerged turbine units, and the installation of a clarifier at the outlet end of the original aerated lagoon. The use of submerged turbine aerators allows operation of the system at maximum MLSS concentrations. Effluents are monitored at various locations in the treatment system for pH, phenol, phosphate, formaldehyde, and COD concentrations. An automatic alarm system is used to prevent accidental pollutant discharge due to mechanical failure of system components. (Schulz-FIRL)
W78-04272

TERTIARY WATER TREATMENT FOR ANAEROBIC EFFLUENTS--REDUCES THEIR BOD AND PRODUCES A FERTILISER BY-PRODUCT.
French Patent FR 2336-353. Issued August 26, 1977. Derwent French Patents Abstracts, Vol. Y, No. 43, p 4-5, December, 1977.

Descriptors: *Tertiary treatment, *Fertilizers, *Biochemical oxygen demand, *Nutrient removal, *Patents, *Phosphorus, *Anaerobic conditions, Aerobic treatment, Industrial wastes, Food processing industry, Activated sludge, Sewage treatment, Waste water treatment.

A patent has been issued for a tertiary waste water treatment process to be used with anaerobic, high BOD effluents such as activated sludges, sewage, and alcohol distillery effluent. Slaked lime is added to the anaerobically-treated organic effluent to create alkaline conditions. Carbon dioxide is passed through the treated water to bring about the removal of phosphorus as a solid. The ammonia is separated from the waste water, adsorbed in an ion exchanger, and treated with acid to convert it to an ammonium salt. The waste water then undergoes aerobic treatment and the phosphorus-containing solid is removed. The method produces a fertilizer by-product which contains nitrogen and phosphorus. (Schulz-FIRL)
W78-04273

PHOTOSYNTHETIC BACTERIA IN WASTE TREATMENT--ROLE OF RHODOPSEUDOMONAS CAPSULATA IN AGRICULTURAL/INDUSTRIAL EFFLUENTS,
New South Wales Univ., Kensington (Australia). School of Biological Technology.
H. Sawada, R. C. Parr, and P. L. Rogers.
Journal of Fermentation Technology, Vol. 55, No. 4, p 326-336, 1977. 5 fig, 10 ref.

Descriptors: *Nutrient removal, *Biochemical oxygen demand, *Photosynthetic bacteria, *Primary productivity, Biological treatment, Organic wastes, Algae, Microorganisms, Chemical oxygen demand, Industrial wastes, Waste water treatment.

Laboratory studies were used to examine the use of Rhodopseudomonas capsulata, a typical photosynthetic bacterium, for the treatment of agricultural/industrial waste waters which contain high levels of BOD. Photosynthetic bacterial action was evaluated with three types of industrial effluents, including wood scour liquor, slaughterhouse waste water, and waste water from an antibiotic factory which manufactured Erythromycin. Studies with batch cultures indicated that the three effluents could support strong growth of R. capsulata, although COD and BOD were not significantly reduced in the process. R. capsulata acted as primary microbial flora in competition for nutrients with heterotrophic bacteria in the slaughterhouse and wool scour effluents, and as secondary microbial flora utilizing higher levels of total volatile acids in the antibiotic factory effluent. Although secondary algal growth was observed in batch cultures with wool scour effluent, the algal growth predominated over photosynthetic bacterial growth during the second stage of two-stage continuous treatment. Higher COD reductions in the two-stage system were attributed to higher levels of microbial activity. (Schulz-FIRL)
W78-04274

NEW CONCEPTS IN TREATMENT OF POULTRY PROCESSING WASTES,
Maine Univ. at Orono. Dept. of Civil Engineering.
F. E. Woodard, M. W. Hall, O. J. Sproul, and M. M. Ghosh.
Water Research, Vol. 11, No. 10, p 873-877, 1977. 2 fig, 6 tab.

Descriptors: *Food processing industry, *Poultry, *Industrial wastes, *Coagulation, *Flotation, Pilot plants, Design criteria, Organic wastes, Clarification, Waste water treatment.

A medium-sized poultry processing plant in Belfast Bay, Maine, was the site of a study to develop, design, and operate a new type of system for poultry processing waste water. The system includes a chemical coagulation-dissolved air flotation process which provides secondary treatment in a single stage. The flow of water and poultry through the plant and the routing and volume of waste water flows are described. Average daily waste discharges at the plant include 0.91 mgd water, 5160 lbs BOD, 2600 lbs suspended solids, and 2155 lbs grease. Various modifications were made within the plant to reduce the total volume of waste water generated, including the installation of on-off nozzles on all washdown hoses and at all hand wash stations. Preliminary studies were performed to determine the optimum dosages of aluminum sulfate, soda ash, and cationic polyelectrolyte for the treatment system. In the prototype dissolved air flotation system, waste water passes through a series of rotary screens and an alum solution is added. It then passes through a bar rack and a grit chamber on its way to a wet well where coagulation of the alum flow takes place. The alum floc is dosed with an anionic polymer in the discharge pipe leading to the flocculation tank. Sludge is periodically removed from the air flotation unit and transferred to sludge retention tanks. The clarified effluent is chlorinated prior to discharge. (Schulz-FIRL)
W78-04275

DETERMINATION OF SLUDGE YIELD AND THE SLUDGE DECOMPOSITION COEFFICIENT IN ACTIVATED SLUDGE TREATMENT OF WASTE WATER FROM SOYBEAN CURD MANUFACTURE, (IN JAPANESE),
Hiroshima Univ. (Japan). Dept. of Fermentation Technology.
S. Nagai, K. Tai, and T. Tendo.
Hakkokogaku Kaishi, Vol. 55, No. 5, p 289-293, 1977. 3 fig, 4 tab, 3 ref.

Descriptors: *Food processing industry, *Activated sludge, *Biological treatment, *Sludge treatment, Organic loading, Chemical oxygen demand, Biodegradation, Organic wastes, Industrial wastes, Waste water treatment.

Laboratory experiments were used to evaluate the use of the activated sludge process for the treatment of waste from soybean curd manufacture. Chemical analyses of the waste water revealed a BOD of 13,000 ppm, COD of 10,000 ppm, suspended solids of 380 ppm, nitrogen of 560 ppm, phosphorus of 20 ppm, and total organic carbon of 7,200 ppm. The laboratory-scale system included an aeration vessel with a volume of 1.2 liters and an 0.2-liter settling vessel. The system was capable of removing 92-97% of the organic matter in the waste water. Continuous flow experiments at dilution rates of 0.5-2.0/day resulted in sludge yields of 0.6 g MLSS/g COD and a sludge decomposition coefficient of 0.12/day. Mass balance equations were used to calculate the organic loading rate at which excess sludge would not be produced. Experiments at a loading rate of 0.13 g COD/g MLSS/day verified the predictions from mass balance calculations. (Schulz-FIRL)
W78-04276

ENVIRONMENTAL CONSIDERATIONS AND THE MODERN ELECTROLYTIC ZINC REFINERY.
Mining Engineering, Vol. 29, No. 11, p 31-33, November, 1977.

Descriptors: *Zinc, *Mineral industry, *Recycling, *Water reuse, Monitoring, Metals, Industrial wastes, Acidic water, Copper, Waste water treatment.

Rising energy costs and stricter effluent regulations have encouraged energy-saving modifications in the waste water treatment and disposal practices of electrolytic zinc refining operations. Newly constructed zinc refineries must meet Best Available Control Technology effluent standards for total suspended solids, araenic, cadmium, selenium, zinc, and pH. Modern hydrometallurgic processes for extracting zinc from comples ferrites include the hematite process, the jarosite process, the goethite process, and the conversion process. Environmental considerations have limited the jarosite and goethite processes since waste waters must be neutralized and freed of heavy metal hydroxides prior to discharge. Waste generation within any given process can be minimized by maximum recycling of treated water to the plant, maximum reuse without pretreatment of lightly contaminated water within the plant, and careful control of the water balance. The zinc plant designed by Kaiser Engineers provides maximum recycling and minimum consumption through separation of treatment streams into non-recycleable and recycleable effluents. Three lines ponds with a minimum eight-year storage capacity will contain leach residues for gradual feed to the treatment system. Effluent discharges will be reduced to 7-10% of the plant's total intake of water. (Schulz-FIRL)
W78-04277

POSSIBILITIES OF TREATING ELECTROPLATING SHOP WASTE WATERS WITHOUT GENERATING SPECIAL WASTES. METAL RECOVERY IN PLACE OF SLUDGE DISPOSAL (MOEGLICHKEITEN ZUR BEHANLDLUNG GALVANISCHER ABWAESSER UNTER VERMEIDUNG VON SONDERABFAELLEN, METALLRUECKGEWINNUNG STATT SCHLAMMDEPONIE),
R. Kammel, and H. W. Lieber.
Galvanotechnik, Vol. 68, No. 9, p 789-794, September, 1977. 5 fig.

Descriptors: *Electrodialysis, *Metals, *Membrane processes, *Recycling, *Industrial wastes, Effluents, Separation techniques, Iron, Zinc, Copper, Chromium, Waste water treatment.

Theoretical and practical aspects of cementation and electrodialysis are discussed with respect to the separation of metals from galvanic baths and electroplating effluents. Cementation is suitable for the removal of trace amounts of foreign metals such as copper and chromate ions from zinc baths by the addition of zinc powder. Copper has been removed from acid solutions by the addition of iron sponge or other iron objects with large specific surface areas. Cementation has also been used in the removal of gold and silver from cyanide baths. Electrodialysis with premo-selective membranes has been used to separate iron from sulfuric acid solutions used in iron pickling and to remove copper ions from chromic acid solutions. Current technology in electrodialysis is not amenable to the regeneration of baths which contain organic contaminants. (Takacs-FIRL)
W78-04278

REDUCING POLLUTION CONTROL COSTS OF ELECTROPLATING PROCESSES,
IBM Corp., San Jose, CA. General Products Div.
L. Missel.
Plant Engineering, Vol. 31, No. 25, p 125-127, December, 1977. 2 fig.

Descriptors: *Recycling, *Metals, *Water consumption, *Industrial wastes, *Chromium, Acidic water, Effluents, Nitrogen compounds, Industrial wastes, Costs, Equipment, Waste water treatment.

Process modification and raw material substitution to prevent or reduce the formation of toxic wastes in industrial operations has been suggested for the electroplating industry. Since waste treatment and chemical costs are incurred through the loss of process solutions during product transfer, various methods to minimize losses are suggested, including lengthening the drainage time, using spray nozzles to return solutions to processing tanks, adding wetting agents to plating solutions to maximize drainage from parts, and using low concentration and low viscosity solutions in plating tanks. Countercurrent rinsing of parts by gravity overflow and agitating the parts to move waste products away from part surfaces are suggested methods of reducing the total effluent volume. Fluorinated wetting agents, floating plastic balls, and chemical foam blankets are recommended for suppression of spray from plating baths. The rejuvenation of spent chromic acid has been accomplished with dilution and ion-exchange treatment in chromium plating, conversion coating, chemical polishing, anodizing, and similar operations. Alternatives to cyanide-based plating processes are described. The use of deionized water in bath solutions and intermediate rinses is suggested to reduce buildup of contaminants in plating baths. (Schulz-FIRL)
W78-04279

COMPOSITION OF EFFLUENTS FROM THE BLEACHING OF SPRUCE SULPHATE PULP (ZLOZENIE ODPADOVYCH VOD Z BIELENIA SMREKOVEJ SULFATOVEJ BUNICINY),
Vyskumny Ustav Papieru a Celulozy, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 5A.
W78-04280

MECHANICAL FOAM BREAKER--MEANS FOR FOAM CONTROL IN WASTEWATER TREATMENT,
British Columbia Research Council, Vancouver. Div. of Applied Biology.
K. S. Ng, and L. Gutierrez.
Journal Water Pollution Control Federation, Vol. 49, No. 11, p 2310-2317, November, 1977. 7 fig, 4 tab, 14 ref.

Descriptors: *Foaming, *Pulp wastes, *Pulp and paper industry, *Turbines, Industrial wastes, Equipment, Pilot plants, Turbine blades, Effluents, Waste water treatment.

Pilot-scale studies were used to evaluate the performance of a turbine foam breaking system as a means of detoxifying bleached kraft whole mill effluents. Principle agents involved in the breaking of foam by turbines include suction, shear, and centrifugal forces. The 0.38 cu m/min foam separation pilot plant included units for foam generation, separation, and collapsing. The foam collapsing system included a 0.97 cu m foam collection tank and a 0.25 kw variable speed turbine centrally mounted in the tank. Foam breaking efficiency and power consumption were evaluated with respect to impeller geometry, blade number, and mode of operation. A three-blade, vaned disc turbine operating in a single flow-through mode was recommended as the optimum configuration for foam breaking. Turbine size, rotation speed, tip velocity, and foam flow were cited as major process variables. An equation is presented for foam breaking capacity with respect to rotation speed and turbine diameter. Power consumption is related to foam breaking capacity, rotation speed, and turbine diameter. Capital costs for a foam breaking system designed for handling 56.6 cu m/min of foam at a 680 tpd mill are projected at $108,000. Power requirements for such a system are estimated at 252 kw. (Schulz-FIRL)
W78-04281

CAN WETOX HANDLE SPENT SULFITE LIQUOR.
Canadian Chemical Processing, Vol. 61, No. 11, p 20-22, November, 1977. 1 fig.

Descriptors: *Sulfite liquors, *Oxidation, *Pulp and paper industry, Equipment, Liquid wastes, Industrial wastes, Chemical oxygen demand, Pulp wastes, Waste water treatment, *Wet oxidation.

The Canadian Ontario Research Foundation has investigated the use of wet oxidation for the treatment of spent sulfite liquors from the pulp and paper industry. Studies have indicated that the organic content in waste streams could be reduced by 85-90% at a cost of $.01/gal. Wet oxidation offers a viable alternative to incineration or biological treatment for waste streams which contain organic concentrations of 2-20%. The waste solution is heated to 200-300C and then passed to the wet oxidation reactor where compressed air is added to facilitate the oxidation of organics. Waste heat from the system can be used to preheat the influent stream or for other operations in the treatment plant. The Zimpro wet oxidation system was first applied to pulp wastes but has since been used in municipal waste water treatment. Low-rate units which operate at 180C and 2.5 MPa have been used to eliminate 5-10% of the BOD and condition sewage sludge for bacterial digestion. High-rate units which operate at 260C and 10 MPa pressure have been used for total destruction of organics. The Wetox process developed by the Ontario Research Foundation uses mechanical agitation to promote contact of the waste solution with injected air. At optimal operating conditions of 230C and 750 rpm stirrer speed, the COD is spent sulfite liquors is reduced 85-90%. Current research at the Ontario Research Foundation has been directed toward developing a titanium-lined reactor vessel. (Schulz-FIRL)
W78-04282

RECOVERY OF USEFUL BY-PRODUCTS FROM TEXTILE WASTES,
Shri Ram Inst. for Industrial Research, Delhi (India). Environmental Protection Cell.
P. K. Mair, A. K. Jain, and S. Purwar.
Indian Chemical Journal, Annual Number, 129-136, 1977. 2 fig, 3 tab, 16 ref.

Descriptors: *Textiles, *Recycling, *Water reuse, *Chemical wastes, *Activated carbon, Dyes, Fibers(Plants), Biochemical oxygen demand, Cotton, Industrial wastes, Waste water treatment.

The recovery of chemicals and water from textile effluents has been cited as a cost-effective means of pollution abatement. General characteristics are presented for waste water produced at a cotton finishing plant, a dyehouse, and a bank note printing press. Sodium hydroxide has been recovered from cotton textile mill discharges through evaporation and dialysis. Applying to textile wastes the Erco Envirotech salt recovery process, used for pulp and paper mill wastes, is suggested. Since approximately 45% of the total BOD load at a textile mill originates from the starch used in sizing baths, various processes have been considered for the recovery of carboxymethyl cellulose (CMC) and polyvinyl alcohol (PVA). Chemical precipitation with metallic salts has been used to recover 75-85% of the CMC in sizing bath effluents for reuse, while adsorption and molecular filtration have been used for PVA. Dyehouse wastes, another major source of pollution from the textile industry, contribute approximately 17-20% of the total BOD and 30% of the total effluent volume. Although the feasibility of dye recovery is highly dependent on the individual situation, further research into dye recovery is suggested. Research on the use of activated carbon in the treatment of textile waste water for reuse is described, as is the recovery of wool grease, cotton wax, and lube oils. The recovery of plant fibers and seeds is examined with respect to the production of animal feed supplements and the manufacture of spun yarn of non-woven textiles. (Schulz-FIRL)
W78-04284

EFFECT OF EFFLUENT COMPOSITION VARIABLES ON FLOCCULATION OF SUSPENDED SOLIDS IN LIME-SULFIDE UNHAIRING EFFLUENTS,
Agricultural Research Service, Philadelphia, PA. Eastern Regional Research Center.
E. H. Bitcover, W. F. Happich, J. E. Cooper, E. M. Filachione, and J. W. Harlan.
Journal of the American Leather Chemists Association, Vol. 72, No. 11, p 426-443, November, 1977. 12 tab, 10 ref.

Descriptors: *Flocculation, *Polyelectrolytes, *Suspended solids, *Tannery wastes, *Effluents, Coagulation, Industrial wastes, Hydrogen ion concentration, Salts, Organic wastes, Waste water treatment.

Previous studies have indicated that hair pulping and unhairing effluents which differ widely in composition require different polyelectrolytes for optimum flocculation and suspended solids reduction. Studies were conducted to quantify the effects of various parameters on flocculation processes. Unhairing effluents were obtained from a tannery which processes fresh hides in a paddle vat with a lime-sulfide hair pulping process and from a tannery which processes salt-cured hides with a hide processor and a lime-sulfide hair pulping formula. Fourteen coagulant aids were evaluated as flocculants for the unhairing effluents. These include a series of synthetic, high molecular weight, water-soluble, acrylamide-based, polyelectrolytes manufactured by Allied Colloids of Ridgewood, New Jersey; a series of inorganic colloids manufactured by Georgia Kaolin of Elizabeth, New Jersey; and other polyelectrolytes. Composition variables, including pH, salt content, suspended solids, and soluble organic material, were measured in several fractions of the unhairing effluents, including unscreened effluent, screened effluent, solids settled for 30 minutes, and supernatant liquor. Polyelectrolyte performance was evaluated with respect to effluent age, salt content, combined age and salt content, effluent dilution, effluent pH, and screening. (Schulz-FIRL)
W78-04285

USE OF HYDROGEN PEROXIDE TO CONTROL SULFIDE IN TANNERY WASTE STREAMS,
E. T. O'Neill.
The Leather Manufacturer, Vol 94, No 11, p 14-17, November, 1977.

Descriptors: *Hydrogen sulfide, *Anaerobic conditions, *Oxidation, *Chemical wastes, *Tannery wastes, Effluents, Sulfur compounds, Chemical reactions, Odor, Industrial wastes, Waste water treatment.

Tannery processes involve the use of a wide variety of chemicals, including lime, sodium sulfide, sodium dichromate, sulfuric acid, and ammonia compounds. The reduction of these chemicals in waste water streams can lead to the production of potentially dangerous hydrogen sulfide concentrations. The use of hydrogen peroxide for odor and sulfide control has been evaluated by several tanneries. At a tannery in the western part of the United States, sulfuric acid is first added to the waste stream to lower the pH from about 11.0 to 7.0. The daily waste stream normally contained 60,000 gal of raw processing waste water having high levels of lime and metallic salts and over 200 ppm of sulfides. Hydrogen peroxide was injected into a drainage channel leading from the hide processing vats to provide a concentration of 200 ppm during peak flow periods, and was also added to 21,000-gal holding tank. The oxidation processes effectively reduced hydrogen sulfice levels to below the required 0.5 ppm limit. Hydrogen sulfide has also been used at a midwestern tannery for the treatment of 87,000 gpd of highly alkaline waste water from dehairing operations. Iron pickly liquor which had been added to beam house wastes imparted a black color to the tannery effluent and only reduced the sulfides to a level of 35-50 ppm. After neutralization and hydrogen sulfide treatment to provide concentrations of 100 ppm in the waste stream, sulfide levels were reduced to below 1 ppm. (Schulz-FIRL)
W78-04286

THE INTERNATIONAL COOPERATION IN STUDYING THE HEALTH ASPECTS OF ORGANIC CONTAMINANTS IN INDIRECTLY REUSED WASTE WATER,
International Reference Center for Community Water Supply, Leidschendam (Netherlands).
B. C. J. Zoeteman.
Annals of the New York Academy of Sciences, Vol. 298, p 561-573, September, 1977. 2 fig, 6 tab, 24 ref.

Descriptors: *Water reuse, *Public health, *Sewage effluents, Organic compounds, Potable water, Water supply, Data collections, Toxins, Regulation, Western Europe.

Recent concern about the health effects of reuse of waste water for potable supply was prefaced by numerous discussions of the topic during the 1950's. Although direct reuse via sewage effluent recycling is mostly limited to pilot projects, many water supplied worldwide draw upon rivers with a high sewage content. A 1975 meeting convened by the WHO International Reference Centre for Community Water Supply dealt with the health effects of reuse practices. Several suggested fields for which international cooperation would be of great mutual benefit to the U.S. and Western Europe are examined in this paper. These include: (1) collaboration on data collection for individual organic compounds in water; (2) obtaining a consensus on standard test methods for toxicity of tap water and on specific criteria for residual toxicity of water, and; (3) exchanging information on national epidemilogic programs in relation to the health aspects of indirect water reuse, which is necessary to establish an internationally accepted methodology for such studies and to extrapolate results from one country to another. (Eberle-NWWA)
W78-04305

METHOD AND APPARATUS FOR PURIFYING EMULSIONS AND CONTAMINATED WATER WITH ELECTROLYSIS,
P. A. Valanti.
U.S. Patent No. 4,048,031, 5 p, 11 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 962, No 3, p 737, September 13, 1977.

Descriptors: *Patents, *Water purification, *Water treatment, *Water quality control, *Electrolysis, Anodes, Cathodes, Flocculation.

An arrangement is provided for moving at least one aluminum anode with respect to a cathode, to maintain a fixed determined distance between the anode and cathode. An emulsion or contaminated water to be treated is run in the region between the electrodes, and means are provided for running the emulsion or water along the aluminum anode before it reaches the space between the electrodes. The flock is then removed from the resultant flocculated liquid. The electrodes are coupled to a low-tension direct-current source. By using suitable electrodes and an electrode distance of a few millimeters power consumption is greatly reduced. (Sinha-OEIS)
W78-04307

WATER PURIFICATION APPARATUS AND METHOD,
R. D. Cooksley.
U.S. Patent No. 4,045,293, 14 p, 15 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 961, No 5, p 2211, August 30, 1977.

Descriptors: *Patents, *Water purification, Water quality control, *Water pollution treatment, *Potable water, Vaporization, *Condensation, Filtration, Foaming, Equipment.

In this water purification method, water containing impurities producting substantial foaming is heated in a boiler tank to produce steam and a contact surface member above the boiler tank is heated to a temperature substantially above the boiling point of water. Water droplets which may be carried by the steam vapors from the boiler and/or foam will be immediately vaporized as it comes in contact with the contact surface means. The steam vapors pass through a condenser assembly, and the condensate passes through a filter assembly before storage in a tank. The contact surface means comprises screen members providing a tortuous path and high heat conductivity. Baffle members may be interposed in the flow path for vapors from the boiler tank to the stack. Valves and a control circuite are included to automatically control the volume of water in the boiler, to cut off water flow to components and to drain the assembly upon shutdown. (Sinha - OEIS)
W78-04318

METHOD AND DEVICE FOR OXYGENATING WATER WITH VIBRATIONS AND UNDER PRESSURE STROKES,
P. H. Isteri.
U.S. Patent No. 4,045,336, 7 p, 3 fig, 25 ref; Official Gazette of the United States Patent Office, Vol 961, No 5, p 2223, August 30, 1977.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, *Aerobic treatment, *Oxygenation, Gases, Equipment.

This invention provides a device by means of which waste water can aerobically be cleaned by increasing the oxygen content in waste water. The invention is characterized in the gases are separated by pressure strokes on the liquid and/or by setting the liquid in vibrating motion after which a desired gas, e.g. oxygen, is fed into the liquid. Water flowing along a suction pipe is set to vibrate by means of a vibrator from where water is discharged into a tank and noxious gases escape from the water ghrough the tank opening. The water is sucked out of the tank by means of a propeller pump into the gas feed zone. The gas feed zone is connected to a source of gas and gas bubbles formed on wet surfaces of a dispersion means are mixed with flowing water. The propeller pump then presses the treated water into a supply pipe. (Sinha - OEIS)
W78-04319

APPARATUS FOR TREATING WASTE WATER,
Ishigaki Kiko Co., Tokyo (Japan). (Assignee).
I. Yokota.
U.S. Patent No. 4,045,344, 15 p, 15 fig, 3 tab, 11 ref; Official Gazette of the United States Patent Office, Vol 961, No 5, p 2226, August 30, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution control, Microorganisms, *Aeration, Tubes, Equipment.

An apparatus for treating waste water such as sewage has at least one bundle of a number of straight tubes submerged in the waste water to be treated. The bundle is provided with crossing passages extending across the bundle and are arranged intermittently along the bundle with certain intervals between so that no Poiseuille flow is formed in each of the tubes. The waste water is flowed through the bundle of straight tubes in the direction of the bundle. Organic substances in the waste water are removed due to decomposition caused by microorganisms which adhere to the inner surface of each tube. Owing to the presence of the crossing passages, removal of the organic substances proceeds effectively and promptly due to uniform flow distribution across the bundle, a disturbance of flow given to the water propagation of various kinds of microorganisms. The apparatus is constructed so that air is jetted into the waste water to recirculate the water and also to enrich dissolved oxygen in the water. (Sinha-OEIS)
W78-04320

CLARIFICATION PLANT,
Heilmann and Littmann Bau A.G., Munich (West Germany).
J. Schleich, and H. Zwisler.
U.S. Patent No. 4,045,355, 9 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 961, No 5, p 2230, August 30, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Settling basins, Oxidation lagoons, Treatment facilities.

A clarification plant is described in which the earth basin has an oval contour and surrounds the concentric partitions on one side in a concentrically semi-circle, but is elongated in an acutely tapering, arched curve on the other side including the outlet. Numerous advantages result from the oval basic shape of the earth basin. The water surface in the outer range is enlarged by the oval elongation so that the absorption of oxygen during final clarification is enhanced. Upright perforated air pipes open into the activating area and have openings arranged in such a manner that they release air in the same circumferential direction so that the waste water circulated in the activating area. (Sinha-OEIS)
W78-04321

SCUM SKIMMER APPARATUS,
Harsco Corp., Camp Hill, PA. (Assignee).
N. S. Glover.
U.S. Patent No. 4,046,693, 13 p, 9 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 962, No 1, p 296-297, September 6, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution control, Anaerobic conditions, Aquatic microorganisms, *Scum, Sludge treatment, *Skimming, Equipment.

In aerobic systems, microorganisms are mixed with waste water containing organics and aerated with oxygen for a predetermined amount of time. After aeration, the mixture is transferred to a settling zone or clarifier tank where the solid organic contaminants and microorganisms settle. The anaerobic sludge will eventually float to the top of the settling tank where is is referred to as scum. Removal of the floating particles and scum on the surface of the clarifier liquid is accomplished by a skimmer. The primary object of this invention is to provide a skimmer blade which is air lifted out of the clarified liquid upon movement away from the scum trough. The skimmer blade is adjustable in height to compensate for the varying height of the liquid in the clarifier tank. The scum skimmer skims in only one direction to eliminate stagnated areas at the end of the tank. (Sinha-OEIS)
W78-04329

PHOSPHOROUS REDUCTION FROM CONTINUOUS OVERFLOW LAGOONS BY ADDITION OF COAGULANTS TO INFLUENT SEWAGE,
Ontario Ministry of the Environment, Toronto.
H. J. Graham, and R. B. Hunsinger.
Canada-Ontario Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, Research Report No. 65, 1977. 76 p, 43 fig, 2 tab, 6 ref, 3 append. 71-1-16, 71-1-17, 72-1-25.

Descriptors: *Phosphorus, Reduction(Chemical), Lagoons, *Sewage lagoons, *Sewage treatment, Influent streams, *Coagulation, Lime, Methodology, Waste water treatment, *Ferric chloride, *Alum.

To reduce the effluent total phosphorus concentration below 1 mg per l from continuous discharge lagoons, ferric chloride, alum and lime were added continuously and singularly to the influent raw sewage at three waste stabilization ponds. During a two-year observation period, phosphorus and other parameters were monitored to assess the effect of each prime coagulant. A batch treatment with ferric chloride at one location quickly reduced the effluent phosphorus concentration below 1 mg per l, and the continuous addition of more ferric chloride to the raw sewage maintained the low phosphorus concentration during the entire program. The optimum dosage was found to be 20 mg per l as FE (+3). The continuous alum addition also reduced effluent total phosphorus concentration below 1 mg per l, and the dosage necessary was 225 mg per l alum. With both ferric chloride and alum there was no evidence of resolubilization of the precipitated phosphorus even under anaerobic conditions. With the lime, effluent total phosphorus concentration approached 1 mg per l, but was seldom below that value even with a dosage of 400 mg per l lime. The effluent phosphorus concentration was higher than in the 'treated' raw sewage, indicating that resolubilization did occur in the lagoon. As expected the lagoon pH was significantly increased. At all locations there was no appreciable change in any other effluent parameters. The sludge build-up during the experiments was monitored and did not appear to be excessive. Liquid ferric chloride and alum were readily used in this form of treatment. The hydrated lime as used here was labour intensive and caused numerous problems such as scaling and pump failure. (WATDOC)
W78-04345

RELIABILITY OF NITRIFICATION SYSTEMS WITH INTEGRATED PHOSPHORUS PRECIPITATION,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
P. M. Sutton, K. L. Murphy, B. E. Jank, and B. A. Managhan.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 64, 1977. 115 p, 21 fig, 11 tab, 26 ref, 3 append. 75-3-21.

Descriptors: *Nitrification, Effluents, *Waste water treatment, *Industrial wastes, *Phosphorus, Chemical precipitation, Alkalinity, Sludge, Model studies, *Steady flow conditions, *Non-steady flow conditions.

The desire to produce high quality effluents for municipal wastewater treatment plants has led to increasingly stringent limitations on the discharge of phosphorus and ammonia-nitrogen. The addition of iron or aluminum salts to a nitrifying activated sludge plant represents an economical method for phosphorus and nitrogen control. In this study, the effects of metal ion addition on nitrification were assessed by parallel operation of combined and separate sludge carbon removal-nitrification systems with and without chemical addition for phosphorus removal. Paired data analyses indicated little or no effect on filterable total Kjeldahl nitrogen (TKN) removal and nitrate production. Significant increases in alkalinity consumption and sludge production due to addition of Ae(+3) and Al(+3) were observed, and the results were compared to theoretical values. The capacity of nitrifying activated sludge system to meet effluent variability criteria was determined by parallel operation of combined sludge systems under various flow conditions at temperatures down to 5 degrees C with and without chemical addition for P removal. The solids retention time required to produce a consistently low effluent filterable TKN concentration will be affected by the magnitude and variability of the influent filterable TKN loading under steady or variable flow conditions. The results indicate that combined sludge systems designed to operate at high solids retention times can produce an effluent filterable TKN concentration of less than 2.5 mg per l 90 percent of the time at wastewater temperatures as low as 5 degrees C. (WATDOC)
W78-04346

DEMONSTRATION OF THE 'CABOS' WASTEWATER TREATMENT SYSTEM FOR VESSELS (1975-77),
Ontario Research Foundation, Sheridan Park.
V. Pancuska, and D. K. Smith.
Canada/United States Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, Technology Development Report No. EPS 4-WP-77-6, November, 1977. 51 p, 6 fig, 5 tab, 3 append.

Descriptors: *Waste water treatment, *Sewage treatment, *Sewerage, Ships, Water pollution sources, Carbon, Adsorption, Filtration, Ozone, Disinfection, Laboratory tests, Effluents, *Sewage flow equalization, Bio-oxidation, Clarification.

'CABOS' is a new, modified biological sewage treatment system developed as part of the Government of Canada's vessel waste program under the 1972 Canada-U.S. Agreement on Great Lakes Water Quality. This report describes evaluation of the first prototype system during the 1975 shipping season aboard the SS John A. France, a bulk carrier owned and operated by Scott Misener Steamships Limited. The system included sewage flow equalization, carbon adsorption, bio-oxidation, clarification, filtration and ozone disinfection. The average effluent quality during the various testing periods under different loading conditions ranged from 6 to 25 mg per l BOD5 and from 5 to 13 mg per l SS. This was well within the prescribed limits of the new Great Lakes Sewage Pollution Prevention Regulations, which specify 50 mg per l BOD5 and 50 mg per l SS. This intense testing program, carried out by the Ontario Research Foundation (ORF), was followed in 1976 by routine operation by the ship's crew with minimum ORF supervision and sampling. During 1976, ORF investigated a suitable, automatic effluent quality monitoring system as required by the Regulations under the Canada Shipping Act. The efforts of ORF to select, procure and laboratory test suitable effluent monitoring equipment are also described in this report. Finally, some information is presented on the second prototype which will be further modified in the first production model for official land testing and approval as required under the Regulations. (WATDOC)
W78-04347

NITRILOTRIACETIC ACID (NTA) IN THE CANADIAN ENVIRONMENT,
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
For primary bibliographic entry see Field 5B.
W78-04350

REPORT OF THE LAND DISPOSAL OF SLUDGE SUBCOMMITTEE PROJECTS CONDUCTED 1971 - 1978,
For primary bibliographic entry see Field 5E.
W78-04351

HEATED DISCHARGE CONTROL AND MANAGEMENT ALTERNATIVES SMALL WATER BODIES AND RIVERS.
MacLaren (James F.) Ltd., Toronto (Ontario).
Water Pollution Control Directorate, Fisheries and Environment Canada, Ottawa, Canada, Economic and Technical Review No EPS 3-WP-77-13, October, 1977. 285 p, 57 fig, 8 tab, 4 append.

Descriptors: *Heated water, *Hydrothermal studies, *Rivers, Control, *Management, Biology, Effluents, Coolants, Cooling, Methodology, Thermal conductivity, Heat balance, Heat transfer, Stratification, *Thermal pollution, *Nonstratified water bodies, *Stratified water bodies, *Waste heat disposal.

Basic concepts of waste heat management on shallow and deep small water bodies and rivers are reviewed and examples are given. This study defines a small water body as a body in which the far field hydrothermal effects of a heated discharge can be detected in a major portion or practically all of the water body. Environmental effects due to warming of a small natural water body are consequently not limited to the immediate area of the outfall. The report divides small water bodies into three categories: rivers, nonstratified water bodies, and stratified water bodies. Management and control alternatives for each category are discussed, as well as the biological effects of various cooling systems, and methods for prediction and thermal modelling. Emphasis is placed on the significance of site-specific variations and the necessity for consideration of all alternatives before selection of a cooling system for a particular site. (WATDOC)
W78-04353

DEVELOPMENT OF PREDICTION MODELS FOR CHEMICAL PHOSPHORUS REMOVAL, VOLUME 1,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
B. P. Prested, E. E. Shannon, and R. J. Rush.
Canada-Ontario Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, Research Report No 68, 1977. 52 p, 6 fig, 6 tab, 9 ref, 3 append. 73-3-9.

Descriptors: *Phorphorus removal, *Chemical reactions, *Model studies, Analysis, Water treatment, Forecasting, Detergents, Waste water treatment, Costs, Data collections, *Performance, *Jar test predictions, Full scale performance.

This project was initiated to establish a data bank of phosphorus removal treatability study results. The jar test and full scale treatability data were analyzed to obtain trends, cost data and other information that may prove beneficial in subsequent stages of the Canada-Ontario research program or

similar programs. The accuracy of jar tests in predicting full scale chemical dosage requirements was assessed. Some simple and useful regression equations relating chemical dosage to wastewater phosphorus levels were derived. The effect of the Canadian requirements to limit the phosphorus content of laundry detergents on wastewater phosphorus levels (20 percent reduction) and on chemical phosphorus removal programs are also discussed. (WATDOC)
W78-04354

STORAGE FOR STORM WATER QUALITY CONTROL - MEADOWVALE TEST SITE STUDY,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04357

REUSE OF WASTE S02 AND PHOSPHATE SEWAGE SLUDGES BY SOLIDIFICATION WITH LIME AND FLY ASH.
Acres Consulting Services Ltd., Niagara Falls (Ontario).
Canada-Ontario Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, Research Report No. 69, 1977. 22 p, 9 fig, 5 tab, 3 ref.

Descriptors: *Sewage sludge, *Sludge disposal, Wastes, *Waste treatment, *Waste storage, *Phosphates, Lime, Fly ash, Landfills, Land use, Land management, Recycling, Sulfur dioxide, *Solidification.

The phosphate-bearing sewage sludge disposal problem is becoming more acute each year. Not only are sludge volumes increasing, but disposal methods are becoming more expensive, in part because suitable landfill sites within easy hauling distance are being exhausted. These landfilled sludges are difficult to consolidate sufficiently for future use as building lots, thus reducing land use values. New, less expensive ways of disposing of phosphate-bearing sewage sludge are, therefore, urgently required. The laboratory phase of this research work indicates the feasibility of mixing sewage sludge with certain other waste ingredients to form a self-setting mix which consolidates well and is capable of long term retention of the phosphates in a cementing matrix. The mix ingredients consisted of fly ash and S02 sludges from coal burning thermal power plants and spent acids from industrial processes. Hence, several waste disposal problems may be solved simultaneouly. The only commercial commodity required for the process is lime which is easily obtainable and relatively inexpensive. The sludge per fly ash mixture can be produced either as a compactible mix or a liquid slurry. The compactible mix is an excellent base material for road and parking lot construction and could supplement rapidly depleting deposits of natural sand and gravel. The liquid slurry could be piped to landfill sites where it should set-up and gain sufficient strength so that these areas could be used as building sites. The cementing matrix, when mixed with as much as 6 percent dry phosphate-bearing sewage sludge, will have adequate strength for highly loaded (greater than 450 psi) landfill. (WATDOC)
W78-04360

CHEMICAL SEWAGE SLUDGE DISPOSAL ON LAND (LYSIMETER STUDIES) VOLUME 1,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
For primary bibliographic entry see Field 5E.
W78-04361

SCAVENGING AND FLOCCULATION OF METAL-BEARING WASTEWATERS USING POLYELECTROLYTES,
McMaster Univ., Hamilton (Ontario); and Department of the Environment, Burlington (Ontario). Wastewater Technology Centre.
P. M. Huck, K. L. Murphy, and B. P. LeClair.
Technology Development Report EPS 4-WP-77-7, November, 1977. 98 p, 13 fig, 25 tab, 47 ref, append.

Descriptors: *Cleaning, *Flocculation, *Metals, Physical properties, *Drainage water, *Polyelectrolytes, Polymers, Mine drainage, Copper, Zinc, Heavy metals, Alkalis(Bases), Variability, Model studies, *Empirical modelling, *Mechanistic modelling.

This study determined optimum conditions for the use of polymers in flocculation of metal hydroxides present in neutralized mine drainage. Using the criterion of supernatant particulate metal concentration following flocculation and settling, optimum polymer properties and mixing conditions were obtained for both strong and weal simulated minewaters containing iron. It was shown that these conditions also provided minimum metal residuals (less than 0.3 mg per 1) for simulated minewaters containing copper or zinc. For two-metal systems, the residual particulate metal concentrations achieved were lower than for the corresponding single-metal systems. Near the optimum, mixing conditions were more important than polymer properties. Optimum mixing times decreased greatly as minewater strength increased, as would be expected from kinetic considerations. Optimum mixing speeds increased moderately with increasing initial metal concentration, probably because of a corresponding increase in floc strength. Polymer molecular weight had no effect over the range investigated. The polymer degree of hydrolysis was unimportant in the range from 2 to 35 percent for the three metals at various initial concentrations. The optimum polymer dosage was not narrowly defined, but could be related to the minewater strength as 1.7 times 0.001 the initial metal concentration. Experiments performed to determine the best kinetic model for the process demonstrated that it could not be represented by a simple aggregation model, and that none of the available models incorporating floc breakup were adequate. A new model was proposed which incorporated for the first time the decrease in the aggregation rate with time. (WATDOC)
W78-04362

WASTEWATER USER CHARGES AND INDUSTRIAL COST RECOVERY: GUIDELINES AND EXAMPLES,
Department of Fisheries and Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 5G.
W78-04364

CONSERVATION OF WATER, CHEMICALS, AND ENERGY IN DYEING NYLON CARPET,
Georgia Inst. of Tech. Atlanta. School of Textile Engineering.
For primary bibliographic entry see Field 3E.
W78-04370

ADAPTATION OF ACTIVATED SLUDGE FOR CYANIDE, (IN JAPANESE),
Hyogo Prefecture Environmental Science Inst., Kobe (Japan).
M. Furuki, and H. Kitamura.
Hakkokogaku Kaishi, Vol. 55, No. 5, p 269-275, 1977. 10 fig, 11 ref.

Descriptors: *Activated sludge, *Nitrogen compounds, Toxicity, *Inhibitors, *Sludge treatment, Resistance, Chemical wastes, Analytical techniques, Waste water treatment, *Cyanide.

Laboratory studies with the two-stage activated sludge process were used to examine the acclimation of activated sludge in the second aeration tank to cyanide in waste water. Reversible substrate inhibition in the second aeration tank was attributed to the presence of cyanide. Activated sludge which had been previously acclimated to higher concentrations of cyanide was more effective in cyanide degradation. Increasing the cyanide load to the aeration tank also increased the degree of cyanide removal. The extent of respiration inhibition by cyanide was counteracted by previous acclimation of the activated sludge to higher concentrations of cyanide. (Schulz-FIRL)
W78-04375

POTTERY EFFLUENTS AND THE WATER AUTHORITY,
Severn-Trent Water Authority, Birmingham (England).
K. Parsons, and N. Harkness.
Transactions and Journal of the British Ceramic Society, Vol. 76, No. 5, p 11-13, 1977.

Descriptors: *Sewerage, *Suspended solids, *Pollution taxes(Charges), *Sampling, *Industrial wastes, Clays, Costs, Monitoring, Municipal wastes, Foreign countries, Waste water disposal, Waste water treatment.

In England, the discharge of industrial effluents is regulated by the Drainage of Trade Premises Act of 1937 and the Public Health Act of 1961. The 1961 act placed the responsibility of regulation on local authorities. A series of agreements on charging, effluent quality, and treatment and disposal standards for industries in the Stoke-on-Trent area resulted from the 1961 act. Since 1974, taxation for the discharge of industrial effluents into the Severn-Trent municipal sewer system has been based on a formula which accounts for the volume, COD, and suspended solids level of the effluent. The charge is levied according to results from analyses of composite samples taken at least 12 times per year. The Strongford sewage treatment plant which serves the Stoke-on-Trent area utilizes the activated sludge process, anaerobic digestion, filtration, and chemical conditioning for the combined municipal and industrial wastes. In an effort to limit clay deposition in the area's sewers, suspended solids standards have been set for effluents from local ceramic industries. (Schulz-FIRL)
W78-04377

PUTTING ACTIVATED CARBON IN PERSPECTIVE TO 1983 GUIDELINES,
Engineering Science, Inc., Austin, TX.
For primary bibliographic entry see Field 5G.
W78-04378

SORTING THE CHEMICAL WHEAT FROM THE CHAFF.
Manufacturing Chemist and Aerosol News, Vol. 48, No. 10, p 27-36, 1977. 13 fig.

Descriptors: *Filtration, *Filters, *Equipment, *Chemical wastes, *Industrial wastes, Centrifugation, Separation techniques, Porous media, Dewatering, Waste water treatment.

The latest developments in filtration equipment are examined with particular reference to the pharmaceutical and cosmetic sectors of the chemical industry. Filter selection is generally based on the size of particle and quantity of material retained by the medium, the permeability of the clean medium, and the liquid flow rate. Filter presses, centrifugal filtration, rotary vacuum filters, pressure leaf filtration, on-line filtration, tube filtration, sterilizing filtration, membrane filtration, ultrafiltration, and laboratory units are discussed in detail. Sieves, screens, separators and associated equipment are also considered. (Baker-FIRL)
W78-04379

THE FUTURE FOR SILICONES.
International Dyer and Textile Printer, Vol. 158, No. 8, p 375-377, October, 1977. 2 fig.

Descriptors: *Chemical wastes, *Acidic water, *Chemical industry, *Neutralization, *Treatment facilities, Industrial plants, Europe, Technology, Filters, Industrial wastes, Waste water treatment, Waste water disposal, *Silicone manufacture.

The Dow Corning silicone manufacturing plant at Barry, Wales, includes chemical processing units using advanced technology, safety services, modern waste water treatment lagoons, and in-plant control. The most important products manufactured at Barry are dimethyl dichlorosilanes. Environmental protection expenditures amount to about 10% of the total capital outlay. The sophisticated waste water treatment system can handle up to 30,000 gal/hr of raw effluent and will be able to treat the additional waste from a five-fold increase in production of silicone. Disposal of dilute hydrochloric acid mixed with some sulfuric comprises the main effluent problem. The treatment system was built in conjunction with the Welsh National Water Authority. The first stage skims off immiscible solvents and debris for incineration. The remaining acid waste water then enters two equalization ponds. The acids are then neutralized by lime addition. The resulting solid calcium sulfate is removed by settling and dewatering and then transported to a landfill. Sand filters then remove any remaining fine solids. Much of the water is recycled; any surplus is discharged to the river. Waste chlorosilanes are hydrolized using recycled water; the resulting hydrochloric acid is returned to the treatment plant. (Snyder-FIRL)
W78-04380

HEALTH AND ENVIRONMENTAL PROTECTION IN A DIAMOND POLISHING FACTORY,
Drukker (D.) and Zn N. V., Amsterdam (Netherlands).
G. Meijer.
Industrial Diamond Review, p 348, October, 1977.

Descriptors: *Neutralization, *Lead, *Filtration, *Industrial wastes, *Treatment facilities, Water reuse, Chemical wastes, Waste water treatment.

Waste water treatment facilities at the Drukker-Dumig Diamond Factory in Cuyk, Holland, were designed to accomodate the heavy metals and acids generated during the manufacture of polished gemstones and industrial diamond products. Accumulated lead and abrasive particles in waste water from the scouring process had been removed in four settling tanks. A filter system, manufactured by Golden Super B. V., was added to further reduce the lead content of the waste water. The system included 50-, 20-, and 10-micron filters which produced a lead-free effluent. The scouring process was later modified by eliminating the need for lead reconditioning of the cast iron polishing scaives to prevent the accumulation of lead in scouring waste water. Strong acids and hydroxides from diamond cleaning processes are neutralized before discharge to the municipal sewer system. Installation of the 10,000-Dutch guilder waste treatment facilities at Drukker-Dumig has reduced the annual waste water treatment surcharge levied on the factory from 10,000 to 195 guilders. (Schulz-FIRL)
W78-04381

PILOT DEMONSTRATION OF RENOVATION AND REUSE OF WASTEWATERS FROM ORGANIC CHEMICAL MANUFACTURING.
Union Carbide Corp., South Charleston, WV.
M. Scherm, and C. T. Lawson.
Industrial Water Engineering, Vol 14, No 6, p 16-22, October-November, 1977. 7 tab, 3 fig.

Descriptors: *Water reuse, *Tertiary treatment, *Chemical wastes, *Industrial water, *Industrial wastes, Pilot plants, Coagulation, Filters, Activated carbon, Suspended solids, Waste water treatment.

A study was conducted by Union Carbide Inc. to examine the costs and water quality resulting from a best state-of-the-art process for treating waste water from the Union Carbide Caribe organic chemical manufacturing complex in Puerto Rico. The effects of residual contaminants in renovated water used as boiler or cooling tower makeup were also examined. A pilot-scale plant was designed to continuously treat 5 gpm of biological effluent from a 7.5-day detention time activated sludge pilot plant which treated pH-adjusted, clarified and equalized waste water from the chemical manufacturing complex. Tertiary treatment included suspended solids removal by coagulation/flocculation, followed by a 2-stage tube clarifier, a multi-media filter, granular activated adsorption columns, and multi-media pressure filter for final suspended solids removal. The tertiary treatment plant produced water of a quality sufficient for use as high-pressure boiler feedwater. Water of a high enough quality for use as cycle cooling water was produced with fewer unit operations. The use of renovated waste water as cooling or makeup water required heat exchangers to be constructed of A-249 stainless steel to maintain satisfactory corrosion and heat transfer characteristics. Treatment costs at a 67% water recovery rate were projected at $7.50/1,000 gal. (Schulz-FIRL)
W78-04382

A WASTE STREAM MANAGEMENT SYSTEM,
Dow Chemical Co., Pittsburgh, Pa.
For primary bibliographic entry see Field 5G.
W78-04383

PACKAGE PLANT FOR SLUDGE DISPOSAL.
For primary bibliographic entry see Field 5E.
W78-04384

ENVIRONMENTAL TRACE ANALYSIS OF ORGANICS IN WASTE WATER BY GLASS CAPILLARY COLUMN CHROMATOGRAPHY AND ANCILLARY TECHNIQUES,
Colorado Univ., Boulder. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-04387

GIANT MOTIONLESS MIXER MADE FROM FR POLYESTER FOR WASTEWATER PH CONTROL.
Chemical processing, Vol. 41, No. 1, p 106, January, 1978.

Descriptors: Chemical industry, *Neutralization, *Sulfur compounds, *Mixing, *Chemical wastes, Industrial wastes, Waste water treatment, Acid-base equilibrium, Effluents, Hydrogen ion concentration.

A pH adjusting, corrosion-resistant mixer has been developed by Kenics Corp. of North Andover, Massachusetts, for chemical waste treatment. The 27-ft long mixer has a 54-in diameter and an internal, immobile double helix with alternating spirals along the edge to change the flow direction during mixing. A built-in injector adds sulfuric acid to neutralize an effluent flow of 25,000 gal/min. The unit is constructed of fiberglass-reinforced polyester resin to prevent corrosion by the chemical-containing wastes. The hand-laid helices, also composed of fiberglass, are resistant to separation due to thermal expansion; the entire unit was constructed to withstand the hydraulic pressures of a large effluent flow. A 3,000 lb unit has been installed at the FMC Corporation chemical plant is South Charleston, West Virginia. (Lisk-FIRL)
W78-04388

THE TREATMENT PLANT AND INTRAPLANT MEASURES IN THE WASTE WATER TREATMENT OF BASF (DIE KLAERANLAGE DER BASF UND FLANKIERENDE MASSNAHMEN BEI DEN BETRIEBEN),
H. Enselhard, and K. G. Malle
Forum Staedte Hygiene, Vol 28, No 11, p 305-310, November, 1977. 9 fig, 2 ref

Descriptors: Chemical industry, *Chemical wastes, *Organic wastes, *Sulfur compounds, *Biochemical oxygen demand, Chemical oxygen demand, Carbon, Municipal wastes, *Waste water treatment, *Treatment facilities, Industrial wastes

Additional treatment measures for waste water discharged into the Rhine River by BASF, the largest integrated chemical plant in Europe, were examined. The removal of nondegradable waste unaffected by biological treatment has been attempted within the treatment facilities of the chemical plant. Methods and facilities for the effective treatment of residual sulfuric acid and waste water containing high organic concentrations have been implemented. A mechanical-biological treatment plant has been purifying waste water from both the chemical plant and the city of Ludwigshafen, West Germany, since 1974. The chemical plant produces a daily waste water flow of 500,000 cu m with 350 tons BOD, while the municipal daily flow averages 50,000 cu m with 18 tons BOD. The BOD content in waste water discharged into the Rhine by the chemical plant in 1976 was decreased by more than 95%, reduced from more than 250 tons/day to less than 25 tons/day. Similarly, COD decreased by 88%, from over 600 tons/day to about 125 tons/day. Estimated construction costs of the treatment facilities totalled 450 million Deutsche-Marks, and operating costs including depreciation in 1975 were estimated at 114 million Deutsche-Marks. (Lisk-FIRL)
W78-04390

PROCESS FOR THE PURIFICATION OF WASTE WATERS.
Australian Patent 487,459. Issued October 27, 1977. The Australian Official Journal of Patents, Trademarks, and Designs, Vol 47, No 40, p 3621, October, 1977.

Descriptors: *Food processing industry, *Ion exchange, *Resins, *Patents, *Separation techniques, Cathodes, Electrochemistry, Organic wastes, Industrial wastes, Waste water treatment.

A patent has been issued for a treatment process that is applicable to waste water from the regeneration of ion exchange resins used to purify sugar liquors. The waste water produced during the regeneration of an anionic resin is passed to the anodic zone of an electrolytic cell. The electrolytic cell is equipped with a cation-selective ion exchange membrane. A solution which is concentrated with respect to the regenerating anion is recovered from the anodic section of the cell. The solution obtained from the cathiodic region of the cell is essentially free of organic compounds. During treatment of waste water from the regeneration of a cationic resin, the solution is fed to the cathodic zone of an electrolytic cell which has been equipped with an anion-selective ion exchange membrane. In this case, the solution in the anodic compartment is concentrated with respect to organic compounds. The two concentrated solutions are combined and then fed to an evaporator for recovery of the organic compounds in a dry form. (Schulz-FIRL)
W78-04391

EFFLUENT TREATMENT IN MEAT AND POULTRY PROCESSING INDUSTRIES,
Alwatech Ltd., High Wycombe (England).
D. Hopwood.
Process Biochemistry, Vol 12, No 8, p 5-8, 44, 46, October, 1977. 1 fig, 4 tab, 29 ref.

Descriptors: *Food processing industry, *Poultry, *Biochemical oxygen demand, *Industrial wastes, Effluents, Activated sludge, Biological treatment, Filtration, Sludge disposal, Costs, Waste water treatment, Waste water disposal.

The wide range of processes available for the treatment of meat and poultry processing wastewaters are discussed with respect to the importance of choosing the system best suited to each individual establishment in practical and economic terms. Because of their biodegradable and non-toxic nature, meat and poultry wastewaters are not difficult to treat. The difficulty lies not in finding a technically viable system, but in finding the most practical and economical system for a given situation. Topics discussed in the paper include: preliminary treatment of the effluent, land application, lagooning, biological filtration, activated sludge processes, anaerobic biological treatment, chemical precipitation, protein recovery by precipitation with lignosulfonic acid, protein recovery by adsorption, water resue, sludge disposal, and economic considerations. (Baker-FIRL)
W78-04393

FOOD FROM WASTE.
For primary bibliographic entry see Field 5E.
W78-04394

RECOVERY OF WATER FOR RE-USE.
Food Manufacture, Vol 52, No 10, p 39, October, 1977.

Descriptors: *Water reuse, *Recycling, *Effluents, *Sludge treatment, *Industrial wastes, Water consumption, Separation techniques, Waste water treatment.

Industrial water reuse was discussed in one of a series of papers presented at the Food Manufacture conference, held in October 1977, in London, England. Water consumption can be lowered in industrial operations by reductions in water intake, leakage, and product wasting. Various process modifications to reduce overall water consumption are possible. Waste water treatment usually involves some configuration of equalization, pretreatment, aerobic biological treatment, or anerobic biological treatment. The sale of dried sludge from the food processing industry may be feasible in a large-scale operation. (Baker-FIRL)
W78-04395

TECHNIQUES FOR DAIRY WASTE RECOVERY.
Food Manufacture, Vol 52, No 10, p 41, October, 1977.

Descriptors: *Dairy industry, *Milk, *Industrial wastes, *Recycling, *Effluents, Food processing industry, Separation techniques, Waste water treatment.

Techniques for recovering milk solids from wastes were discussed in one of a series of papers presented at the Food Manufacture conference, held in October of 1977 in London, England. The pollutant load in dairy waste is considerable and the cost of treatment can be high. To reduce waste water treatment costs, spillages must be reduced and all possible milk solids recovered. Milk spillage caused by overflow and cleaning operations produces approximately 50% of the total quantity of waste generated during dairy operations; whey spillage, cheese scaping wastes, separator sludge, and milk solids comprise the remainder. The sale of byproducts from dairy waste treatment, even at a loss, is considered advantageous because of the reduction in pollutant discharge. (Baker-FIRL)
W78-04396

FLOCCULATION WITH FLOTATION.
Effluent and Water Treatment Journal, Vol 17, No 11, p 607, November, 1977. 1 fig.

Descriptors: *Flocculation, *Food processing, *Oil industry, *Pulp and paper industry, *Separation techniques, Waste water treatment, Industrial wastes, Sludge treatment, Equipment, Design data, *Flotation.

Flockation, a combination flocculation-flotation treatment system for the removal of suspended solids from waste water, is discussed. The system requires less space than sedimentation processes and reduced flocculation time from 2-3 hrs to 35-40 min. Waste water is treated with a flocculant and sent through a series of mixing and flocculation chambers. The effluent is then passed into a flotation tank and is treated with air-injected water. The floc adheres to fine air bubbles and rises to the surface where it is removed continuously by scrapers or rotation rollers. The Flockation system has been shown effective in the removal of metals from plating and finishing industries wastes, fats and proteins from food processing wastes, and fiber from paper industry wastes. The system thickens the sludge to 12% of its original volume. (Lisk-FIRL)
W78-04397

FILTERING VIBRATORY-DEBURRING EFFLUENT.
Machinery and Production Engineering, Vol 131, No 3383, p 381, October, 1977.

Descriptors: *Filters, *Suspended solids, *Filtration, *Metals, *Treatment facilities, Industrial wastes, Water resuse, Equipment, Waste water treatment.

The Rank-Xeroz Ltd. factory in Mitcheldean, England, has installed a Carlson 60-cm plate and frame filter unit to treat waste water from the vibratory deburring of aluminum alloy castings. The filter, which has been used in the past for distillery wastes, has effectively reduced the suspended solids level in the effluent from 2800 to 11 mg/liter. The system was installed to comply with local water authority regulations which included a maximum suspended solids standard of 400 mg/liter in waste water discharged to the sewer system. The high reduction in suspended solids has allowed the reuse of treated waste water in factory operations. The filter unit was suppied by Carlson-Ford Ltd. of Ashton-under-Lyme, Lancastershire, England. (Schulz-FIRL)
W78-04398

EFFLUENT FILTRATION PLANT AT RANK XEROX, MITCHELDEAN WORKS,
Rank Xerox Ltd., Gloucestershire (England).
M. G. Carter.
Effluent and Water Treatment Journal, Vol 17, No 2, p 536-539, October, 1977. 1 tab, 1 fig.

Descriptors: *Filtration, *Suspended solids, *Industrial wastes, *Filters, *Equipment, Treatment facilities, Separation techniques, Waste water treatment.

Waste water treatment at the Rank Xerox Ltd. plant in Mitcheldean, England, is described. Effluents discharged from the vibratory deburring of aluminum castings must meet a 400 mg/liter suspended solids maximum set by the Severn-Trent Water Authority. Partial settling in a catchment pit had been previously used to reduce the suspended solids from 2800 to 522 mg/liter. In 1976, the catchment pits were replaced by a standard Carlson-Ford 60 cm Kieselguhr filter equipped with 20 plates and frames. Grade W2 pads and B-WS facing papers are used to remove most of the particulate matter and complete the final polishing. Clarcel Flo CR is used as a filter aid to prolong the life of the filter. The dispensing system has been modified so that the filter aid is added directly to the collection sump. Suspended solids levels in effluents discharged from Rank Xerox are now less than 5 mg/liter. (Schulz-FIRL)
W78-04399

REVERSE OSMOSIS PROVIDES REUSABLE WATER FROM ELECTRONICS WASTE,
IBM Corp., Manassas, VA.
C. Caprio, M. D. Beasley, and L. Luttinger.
Industrial Water Engineering, Vol 14, No 6, p 24-30, October-November, 1977. 4 tab, 9 fig.

Descriptors: *Reverse osmosis, *Membrane processes, *Separation techniques, *Acidic water, *Industrial wastes, Desalination, Operation and maintenance, Water reuse, Recycling, Waste water treatment.

Reverse osmosis (RO) has been used at the IBM facility in Manassas, Virginia, to provide reusable water from electronics waste. Pilot-scale, two-stage hollow fiber and spiral wound RO units, manufactured by the Permutit Corp. of Princeton, New Jersey, were tested with dilute acid wastes from IBM. A hollow fiber (RO) system was selected in 1977 for waste water recycling, with provisions for maintaining the Fouling Index (FI) below 3.0 and cleaning the permeators whenever signs of plugging or fouling occurred. The pretreatment quality of the dilute acid waste was to be monitored with FI measurements. The maintenance of an acceptable FI was to involve more careful control of the in-line coagulation via zeta potential control of the polyelectrolyte. The flexible system was designed to separate the dilute acid waste and raw municipal water if fouling tendencies became prevalent. The final choice of membrane configuration will be based on several factors, including: initial system cost, additional capital and operating costs associated with pretreatment, membrane cleaning and replacement requirements, and compatibility with existing equipment and processes. A target date of September 1, 1977, was set for operational status for the first phase of the recycling program. (Baker-FIRL)
W78-04400

METHOD AND DEVICE FOR SLUDGE TREATMENT.
Australian Patent 487,041. Issued October 6, 1977.
Australian Official Journal of Patents, Trade Marks, and Designs, Vol. 47, No. 37, p 3386, October, 1977.

Descriptors: *Sludge treatment, *Alkalis(Bases), *Oxides, *Patents, *Dewatering, Sludge disposal, Industrial wastes, Waste water treatment, Sanitary engineering.

A process for the conversion of metal hydroxides in sludge to metal oxides has been patented. The sludge is first dewatered to the point where it becomes thixotropic. In this thixotropic state, the sludge is treated to reduce it to a thin layer or film. A drying process further reduces the film or layer of metal hydroxide to the form of scales or grains. These metal hydroxide scales or grans then undergo calcination and the crystal water is removed, converting the residual scales or grain into metal oxide poweder. This powder, which is non-toxic, can be properly disposed of without adverse effects on the environment. (Lisk-FIRL)
W78-04401

POLYETHYLENE PIPELINE CARRIES TREATED BALLAST FOR UNDERWATER DISCHARGE.
For primary bibliographic entry see Field 5E.
W78-04402

PULP AND PAPER MILL SLUDGE IN FIBRE BOARD,
Norwegian Pulp and Paper Research Inst., Oslo.
For primary bibliographic entry see Field 5E.

W78-04404

THREE EVAPORATOR FLOW DIAGRAMS THAT ADAPT TO CURRENT ENERGY COSTS AND EMISSION REQUIREMENTS,
Rosenblad Corp., Princeton, NJ.
A. E. Rosenblad.
AIChE Symposium Series, Vol. 72, No. 157, p 83-88, 1976. 10 fig, 3 tab, 3 ref.

Descriptors: *Pulp and paper industry, *Water consumption, *Energy, *Costs, *Separation techniques, Evaporation, Industrial wastes, Heat transfer, Waste water treatment.

Flow diagrams are presented for three evaporators which adapt to current energy costs and emission requirements for odor control in kraft mill operations. These approaches for the concentration of black liqour incorporate features that reduce both operating costs and secondary treatment requirements for the evaporator condensates. The vapor recompression cycle and heat releases from both continuous and batch digesters are used to reduce operating costs. Countercurrent steam and condensate flows are used in conjunction with large venting rates to provide stripped condensate from the bulk of evaporation, leaving only a very small amount of condensate requiring secondary treatment. Three specific cases are discussed with respect to steps taken to meet pollution control goals. In the first case the objective was to increase the total evaporation capacity in a kraft mill and clean up the evaporator condensates. A second case focused on providing an economical heat balance for new kraft mills using Kamyr continuous digesters. In the third example the heat releases from batch digesters were used to reduce steam consumption and to separate evaporator condensates. (Baker-FIRL)
W78-04405

TWO-STAGE ACTIVATED SLUDGE BETTER THAN SINGLE FOR TOXICITY REDUCTION.
Canadian Pulp and Paper Industry, Vol. 30, No. 16, p 28-29, November, 1977. 1 fig, 2 tab.

Descriptors: *Pulp and paper industry, *Activated sludge, *Toxicity, *Bioassay, *Pilot plants, Industrial wastes, Biochemical oxygen demand, Pulp wastes, Biological treatment, Waste water treatment.

A two-stage biological system, manufactured by Cellulose Attisholt AG of Luterbach, Switzerland, was tested for the treatment of effluents from kraft pulp and paper mills. The specific objectives of the study were to determine the capabilities of a two-stage sludge system in reducing the acute toxicity of kraft mill effluents and to compare its efficiency with a conventional single-stage activated sludge plant for the removal of BOD and toxicity. The variability in toxicity of treated and untreated kraft bleachery effluent was investigated with respect to time and treatment process operation. Extreme fluctuations in median survival time of rainbow trout were observed for hourly samples collected over a 24-hour period. The studies concluded that both the single- and two-stage activated sludge systems were incapable of reducing toxicity to a consistent level. (Baker-FIRL)
W78-04406

THE BUILDUP OF DISSOLVED ELECTROLYTES IN A CLOSED PAPER MILL SYSTEM,
Scott Paper Co., Philadelphia, PA.
S. D. Alexander, and R. J. Dobbins.
TAPPI, Vol. 60, No. 12, p 117-120, December, 1977. 2 fig, 10 ref.

Descriptors: *Water reuse, *Pulp and paper industry, Effluents, *Recycling, *Water quality, *Industrial water, Industrial wastes, Effluents, Waste water treatment, *Electrolytes.

The use of a closed mill water system is discussed as a means of pollution abatement for the pulp and paper industry. Closure of the paper mill water system eliminates the need for extensive secondary and tertiary water treatment facilities. However, closure may also allow the concentration of dissolved solids in mill water to be drastically increased through water reuse, possibly affecting water quality and paper properties. Theoretical considerations are used to demonstrate that, at complete closure, the concentration of dissolved solids in the headbox can be up to 160 times the level anticipated for a completely open mill. An enrichment factor is defined to express the chemical buildup in a paper mill water recycling system. Completely and partially soluble species, as well as those species which are preferentially adsorbed by the paper web, are incorporated by the enrichment factor. The use of the enrichment factor is detailed and verified with data from pilot studies at a 200 ton/day integrated groundwood pulp and paper mill. (Baker-FIRL)
W78-04407

POLLUTION CONTROL SEMINAR GETS RAVES FOR N.E. CLUB.
The Leather Manufacturer, Vol. 94, No. 12, p 9-10, December, 1977.

Descriptors: *Tannery wastes, *Treatment facilities, *Solid wastes, *Sulfides, *Suspended solids, Biochemical oxygen demand, Hydrogen sulfide, Waste disposal, Industrial wastes, Pollution abatement, Legal aspects, Waste water treatment.

Because disposal of solid wastes from tanneries may become legally or economically impossible, development of by-product technologies, such as energy recovery, fiber utilization, and protein/nitrogen utilization, is recommended. A recently-developed incineration process will generate energy and recover virtually all the chrome in tannery wastes, producing nitrate-rich ash containing no hexavalent chromium. Flow, suspended solids, BOD, and sulfide in waste water deserve more consideration by tanneries. A decrease in water usage is also recommended. Coagulation and flotation are generally more efficient than settling basins in removing suspended solids. The TNO Unhairing System uses no lime and minimizes water flow. Eliminating lime will not totally eliminate sulfide problems because organic sulfides are generated biologically. Sulfides may be removed by oxidation with air and a manganese sulfate catalyst or removed in the form of H2S by the addition of acid. The H2S is recovered for recycling. Process modifications as well as waste water treatment should be considered. Air pollutants from tanneries include hydrocarbons, sulfur oxides, and H2S. (Snyder-FIRL)
W78-04408

INCINERATION OF TANNERY WASTE,
Jones and Beach Engineers, Inc., Stratham, NH.
For primary bibliographic entry see Field 5E.
W78-04409

FUNDAMENTAL PRINCIPLES OF SLUDGE ANALYSIS (GRUNDLAGEN DER ANALYTIK VON SCHLAEMMEN),
For primary bibliographic entry see Field 5A.
W78-04410

PRECIPITATOR RECLAIMS WATER FROM WASTE STREAMS.
Chemical Engineering, Vol. 85, No. 1, p 41-42, January, 1978. 1 fig.

Descriptors: *Water reuse, *Chemical precipitation, Equipment, *Sulfur compounds, *Industrial wastes, Disinfection, Lime, Waste water treatment, *Chemical precipitation.

A precipitator has been manufactured by Precipitator, Inc., of Santa Fe Springs, California, for the reclamation of water from waste streams. The Lindman precipitator is a physical and chemical wastewater treatment system, using sulfur dioxide, iron, and lime in a continuous-flow process. The system is not affected by the presence of heavy metals or toxic organics. Test results indicate that it can significantly reduce total dissolved solids. The sterile products, clear water and sludge, can be used as soil conditioners or fuel. The workings of the system are described along with test results and operational data. Operating costs for the system are estimated at $0.21/1,000 gal of feed. (Baker-FIRL)
W78-04411

VALDEZ OUTFALL LINE IS EARTHQUAKE-PROOF.
For primary bibliographic entry see Field 5E.
W78-04413

TREATMENT OF ACID MINE DRAINAGE BY THE ALUMINA-LIME-SODA PROCESS,
Midwest Research Inst., Kansas City, MO.
J. W. Nebgen, D. F. Weatherman, M. Valentine, and E. P. Shea.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 930, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-76-206, September 1976. 105 p, 15 fig, 17 tab, 5 ref, 2 append.

Descriptors: *Acid mine water, *Mine drainage, *Chemical precipitation, *Treatment facilities, *Neutralization, Mine wastes, Lime, Industrial wastes, Waste water treatment, Waste water disposal, *Alumina-lime-soda process.

In the alumina-lime-soda process, water containing sulfate salts, such as acid mine drainage, is first contacted with sodium aluminate and lime to cause the precipitation of dissolved sulfate in the form of calcium sulfoaluminate. The resulting alkaline water is carbonated to remove excess hardness. A 190 liter/day bench-scale unit was operated at the Commonwealth of Pennsylvania's Acid Mine Drainage Research Facility in Hollywood, Pennsylvania, to provide experimental data for the design and construction of a demonstration plant. The treated water met drinking water specifications. The waste constituents were removed in the form of easily dewatered solids. The cost of sodium aluminate had the greatest influence on the econimics of the process. The increased demand caused by widespread use of the process should generate increased interest in alternate sodium aluminate sources. Operating costs for treating acid mine drainage with 700 mg/liter acidity and a sulfate concentration of 750 mg/liter were estimated at $0.21-0.27/cu m. (Snyder-FIRL)
W78-04414

TREATMENT OF EFFLUENT WATERS FROM VEGETABLE OIL REFINING,
Archer Daniels Midland Co., Decatur, IL.
D. F. Gill, Jr, and J. C. Ielase.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 875, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-600/2-76-294, December, 1976. 89 p, 24 fig, 22 tab, 3 ref, 3 append.

Descriptors: *Oilseed crops, *Industrial wastes, Pollutant identification, *Chemical precipitation, *Treatment facilities, Soybeans, Biochemical oxygen demand, Annual costs, Income, Waste water treatment.

The Archer Daniels Midland Company, Inc., operates a plant at Decatur, Illinois to extract and refine oil from seeds, primarily soybeans. The extraction plant produces 150,000 gpd of waste water; the refinery produces 134,000-183,000 gpd. A study was undertaken to identify the waste

streams, characterize the waste water, and determine and implement optimum treatment. Surface skimming as the only treatment resulted in an original BOD loading of 0.0135 kg/kg of oil processed. Refinery washwater was the largest source of BOD and fat; cooling tower blowdown and water from acidulation contributed smaller amounts. Pretreatment of the wash water by adding 0.25% calcium chloride and adjusting the pH to 5-6 was capable of reducing the overall BOD by 71%. Process modifications, increased production supervision, and a clarifier for controlling process upsets produced a further 50% reduction in BOD, bringing the waste strength to within municipal discharge limits. The annual operating cost for the system was $75,000; byproduct recovery revenues ranged $20,000-$180,000/yr. (Snyder-FIRL)
W78-04415

INDUSTRIAL WASTE AND PRETREATMENT IN THE BUFFALO MUNICIPAL SYSTEM,
McPhee, Smith, Rosenstein Engineers Buffalo, NY.
K. Peck, and J. C. Gorton, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 937, Price codes: A09 in paper copy, A01 in microfiche. Report EPA-600/2-77-018, January 1977. 184 p, 19 fig, 30 tab, 31 ref, 3 append.

Descriptors: *Activated sludge, *Sewerage, *Pollutant identification, *Industrial wastes, *Municipal wastes, Biological treatment, Sewage treatment, Treatment facilities, Waste water treatment, Waste water disposal, New York, *Buffalo(NY).

The requirements and effects of combined industrial and domestic waste water treatment were investigated in Buffalo. Industrial users and types of discharges, as well as quality and quantity of waste water from 85 large industries in Buffalo and 79 other industries, were determined. Material balances were used to define the volume and waste characteristics of residential and industrial users and inflow/infiltration in Buffalo. A program for industrial waste control, including revised regulations for sewer use, a permit system, and a monitoring program, was developed. An ad valorem tax which was levied in conjunction with waste water service charges and surcharges for high strength industrial wastes was used to cover the cost of treatment. A 95,000 liter/day activated sludge pilot plant was used to evaluate the effects of industrial users on treatment processes and determine metal concentrations in the effluent and waste sludges. The sludge produced by sewage treatment in Buffalo could be disposed of by soil conditioning, landfill, or disposal with refuse. (Snyder-FIRL)
W78-04416

PROCEEDINGS OF THE SIXTH NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES, APRIL 9-11, 1975.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 360, Price codes: A21 in paper copy, A01 in microfiche. Report EPA-600/2-76-224, December 1976. 475 p, 140 fig, 88 tab, 108 ref.

Descriptors: *Food processing, *Industrial wastes, *Waste water treatment, *Waste water disposal, Canneries, Effluents, Recycling, Pollution abatement, Pilot plants, Treatment facilities, Sludge treatment, Sludge disposal.

The Sixth National Symposium on Food Processing Wastes, co-sponsored by the National Canners Association and the Wisconsin Canners and Freezers Association, was held in Madison, Wisconsin, on April 9-11, 1975. Twenty papers given at the symposium are presented, including various topics related to the waste treatment and disposal of cannery and meat packing wastes. Process modifications for the reduction of waste water volume and strength are described. (See W78-04418 thru W78-04431) (Schulz-FIRL)
W78-04417

INVESTIGATION OF AN ANAEROBIC-AEROBIC LAGOON SYSTEM TREATING POTATO PROCESSING WASTES,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
J. N. Dornbush, D. A. Rollag, and W. J. Trygstad.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 3-21, 3 fig, 3 tab, 5 ref. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Potatoes, *Aeration, *Oxidation lagoons, *Treatment facilities, Aerated lagoons, Anaerobic conditions, Pilot plants, Organic wastes, Biochemical oxygen demand, Odor, Suspended solids, Industrial wastes, Waste water treatment.

The treatment efficiency of the potato processing waste treatment units at Midwest Foods Corporation in Clark, South Dakota, was investigated prior to the 1973-1974 processing season. The system included a 100,000 cu ft anaerobic lagoon, folowed by a 404,000 cu ft aerobic lagoon. The aerobic conditions in the aerated lagoon and stabilization pond indicated these units had recovered from previous overloading. The adoption of dry-caustic peeling and other water conservation practices reduced water usage from 3500 gal per ton of raw potatoes to approximately 813 gal. The anaerobic lagoon removed 74% of the BOD and 78% of the suspended solids (SS), despite an average BOD loading of 45.5 lbs/1000 cu ft/day, over three times higher than the design value. The anaerobic lagoon's styrofoam-straw cover maintained adequate temperatures in the lagoon and helped control odors. The BOD:N:P ratios indicated that the use of an anaerobic lagoon prior to aerobic treatment conserved inorganic nutrients. The aerated lagoon, operated well wihtin the BOD loading range, removed 82% of BOD and 68% of SS. The stabilization pond, operating at about 50% of its design BOD loading, removed 77% of BOD and 79% of SS. The treatment system as a whole removed 99% of BOD, 98.5% of SS, and 96.3% of COD. Silt which builds up in the anaerobic lagoon at a rate of 40.5 cu ft/operating day could eventually decrease its capacity. (See also W78-04417) (Snyder-FIRL)
W78-04418

UTILIZATION OF CHITOSAN FOR RECOVERY OF COAGULATED BY-PRODUCTS FROM FOOD PROCESSING WASTES AND TREATMENT SYSTEMS,
Georgia Univ., Experiment. Dept. of Food Science.
W. A. Bough, D. R. Landes, J. Miller, C. T. Young, and T. R. McWhorter.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 22-49, 6 fig, 8 tab, 29 ref. Report EPA-600/2-76-224.

Descriptors: *Canneries, *Activated sludge, *Polymers, *Coagulation, *Reclamation, Food processing industry, Byproducts, Feeds, Biological treatment, Industrial wastes, Waste water treatment.

Chitosan, manufactured from seafood wastes, is composed of glucosamine residues linked by beta, 1-4 glycosidic bonds. The use of coagulated by-products from chitosan treatment for animal feeds has been considered by the food processing industry. Chitosan was evaluated for coagulation of activated sludge in pilot studies at a brewery and at a cannery processing pimentos, leafy greens, and grean beans. Activated sludge from the brewery clarifier was fed to a continuous centrifuge at a rate of 26-32 gpm. Chitosan treatment with a 3 rpm differential between the centrifuge bowl and sludge conveyor speeds resulted in 30.7% capture of suspended solids with polymer addition. A 22.4% capture was obtained without polymer addition. Total solids concentrations in the cannery waste sludge cake increased by 1% when chitosan was added. Fat, fiber, and ash in coagulated brewery sludge averaged 2.0, 6.6, and 16.1%, respecitvely. Protein concentrations were measured as 50.8% by Kjeldahl analysis and 28.5% by amino acid content. Coagulated solids from egg breaking wastes contained 4.9% ash, 39.4% fat, 45.6% protein by Kjeldahl analysis, and 41.8% protein by amino acid analysis. Rats fed less than 5% chitosan grew as well as those fed the control diet without added chitosan. (See also W78-04417) (Snyder-FIRL)
W78-04419

EGG BREAKING AND PROCESSING WASTES CONTROL AND TREATMENT,
Cornell Univ., Ithaca, NY. Dept. of Agricultural Engineering.
W. J. Jewell, W. Siderewicz, R. C. Loehr, R. R. Zall, and O. F. Johndrew, Jr.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 61-104, 15 fig, 9 tab, 12 ref. Report EPA 600/2-76-224.

Descriptors: *Food processing industry, *Biological treatment, *Pollutant identification, *Chemical oxygen demand, Activated sludge, Aerated lagoons, Anaerobic conditions, Industrial wastes, Waste water treatment, Waste water disposal.

Five egg-breaking facilities, three in New York State and one each in Georgia and Arkansas, were monitored to assess the effect of in-plant modifications to reduce waste quantities. The COD of the waste water exceeded 6000 mg/liter, and BOD was about 60% of the COD. Where in-plant waste management was inadequate, up to 15% of the egg product was lost to the sewer. In-plant modifications reduced BOD by an average of 50% and waste water volume by 24%. The additional product recovered through in-plant modifications to reduce waste was valued at $250-500/day for a medium sized facility, not including the savings from a reduction in waste treatment costs. Treatability studies were conducted on waste water from three egg-breaking plants in New York State, the largest of which had a total design waste flow under 200,000 gpd. A 20-liter reactor was used to simulate aerated lagoon treatment. Treatability was also evaluated with a 5.5-liter activated sludge reactor, followed by an 800 m/liter clarifier. The applicabilities of a rotating biological contactor and an anaerobic-aerobic lagoon series were also examined for egg-breaking wastes. The wastes responded favorably to biological treatment. Conventional processes, such as activated sludge and aerobic lagoons, did not reduce high concentrations of organic material to levels acceptable for direct discharge to surface waters. An anaerobic lagoon followed by an aerobic lagoon had an overall COD removal efficiency of over 98%. (See also W78-04417) (Snyder-FIRL)
W78-04420

TREATMENT CAPABILITIES OF AN EXTENDED AERATION SYSTEM FOLLOWING ANAEROBIC LAGOONS TREATING MEAT PACKING WASTES,
Balyardt and Wells, Omaha, NE.
W. J. Wells, Jr, P. B. Wells, and D. D. Alleman.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 131-150, 8 fig. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Treatment facilities, *Aeration, *Anaerobic conditions, *Lagoons, Biological treatment, Biochemical oxygen demand, Organic wastes, Industrial wastes, Odor, Waste water treatment.

The Monfort Packing Company in Greely, Colorado, has used anaerobic lagoons, extended aeration, and two polishing ponds to treat 2.67 mgd of meat-packing waste water. The oxygen demand of sulfides in the anaerobic lagoon effluent required special consideration in the application of extended aeration to the meat-packing wastes. Although nitrification was not required for the Monfort facility, nitrification could be achieved in the anaerobic effluent by the addition of alkalinity, deepening of the aeration basins, and the installation of either static tube aerators or a diffused aeration system. The extended aeration facility at Monfort achieved an average BOD removal of 98.2%. Odors arising from the anaerobic lagoon were attributed to high sulfate concentrations in the area's water supply. During February 1975, BOD in effluent from the final polishing pond averaged 21 mg/liter; suspended solids in the final pond averaged 30 mg/liter. The polishing pond served as a buffer against occasional upsets in the extended aeration system. (See also W78-04417) (Snyder-FIRL)
W78-04421

A PROGRESS REPORT ON A SYSTEMS APPROACH TO EFFLUENT ABATEMENT IN HAWAII,
Hilo Coast Processing Co., Pepeekeo, HI.
R. T. Webb.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 151-179, 15 fig, 10 tab. Report EPA-600/2-76-224.

Descriptors: *Sugarcane, *Food processing, *Treatment facilities, *Suspended solids, *Harvesting, Hawaii, Pollutant identification, Analytical techniques, Effluents, Pollution abatement, Industrial wastes, Waste water treatment.

The degree of soil pick-up during sugar cane harvesting has been measured by analyses of ashed cores of harvested material. A new cane materials handling (CMH) method averaged 4% ash weekly, a level that was considered to be economically treatable by planned waste water treatment facilities. A pivoted, extendable box was added to in-field transporters to allow direct roadside loading of the cane into trucks. Improvements in the raw material quality to minimize waste water treatment requirements at the plant have also allowed modifications in harvesting machines. Removal of soil from the cane by air blasting reduced the quantity of suspended solids in the wash water. The soil reduction efficiency of the new CMH system was reduced by rainfall. The cost of hauling excess material eliminated by CMH approached $1 million, aside from the costs of waste water treatment. The CMH system reduced the quantity of dry solids requiring waste water treatment from 1400 tons/day to 350 tons/day. Preliminary cost estimates have indicated that treatment facilities required by traditional harvesting methods are economically feasible if the 4% ash entrainment standard is met. (See also W78-04417) (Snyder-FIRL)
W78-04422

A FRUIT PROCESSOR'S WASTE TREATMENT EFFLUENT VARIABILITY AND PLANNING FOR ATTAINMENT OF 1983 EFFLUENT GUIDELINES.
Bovay Engineers, Inc., Spokane, WA.
L. A. Esvelt.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 204-222, 4 fig, 7 tab, 6 ref. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Pome fruits, *Peaches, *Activated sludge, *Aerated lagoons, Biological treatment, Treatment facilities, Apples, Biochemical oxygen demand, Industrial wastes, Waste water treatment, Waste water disposal

The Snokist Growers fruit cannery in Yakima, Washington, constructed a 6,000,000-gal, aerated lagoon system during 1967 for the treatment of cannery wastes. The system was upgraded in 1968 for the mixed activated sludge process with provisions for limited sludge reaeration. The aeration basin was coupled with a 90-ft diam secondary clarifier. A 1,500,000-gal aerated lagoon was used for activated sludge reaeration. Research indicated that biological treatment was feasible for the fruit processing wastes. The system, operated with nutrient addition, removed over 99% of the BOD. The amendments to the Federal Water Pollution Control Act passed in 1972 required industries to use Best Practicable Treatment for waste waters by 1977 and Best Available Treatment by 1983. Snokist Growers' treatment system was presented as an example when guidelines were being developed for peach, pear, and apple processing industries. Improvements being evaluated for compliance with 1983 standards include the use of waste activated sludge as a cattle feed supplement and the potential for waste water reuse in plant operations. (See also W78-04417) (Snyder-FIRL)
W78-04423

MEATPACKING WASTEWATER TREATMENT BY SPRAY RUNOFF IRRIGATION,
Industrial Environmental Research Lab.-Cincinnati, Corvallis, OR. Corvallis Field Station.
J. L. Witherow, M. L. Rowe, and J. L. Kingery.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 256-287, 3 fig, 5 tab, 5 ref, append. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Overland flow, *Irrigation systems, *Treatment facilities, *Pilot plants, Phosphorus, Nitrogen, Suspended solids, Organic wastes, Industrial wastes, Waste water treatment, Waste water disposal.

A pilot-scale spray irrigation system was operated at the W. E. Reeves Packinghouse in Ada, Oklahoma, to evaluate the system for treating meat-packing waste water. A goal of 80% removal of both total nitrogen and phosphorus was set and the economic feasibility of the system was examined. The pilot plant included three 1.0-acre irrigation plots. The pilot studies indicated that treatment by screening, spray irrigation and disinfection could produce an effluent which would meet 1977 national discharge limitations. The spray irrigation system removed over 90% of the total nitrogen and 60-90% of the total applied phosphorus. Hydraulic and organic loadings affected removals slightly. Rainfall increased the waste load discharge, indicating the need for control of volume or suspended solids during intense rainfall to meet 1983 treatment standards. Annual capital and operating costs for the pilot system were $0.25/1000 gal. (See also W78-04417) (Snyder-FIRL)
W78-04424

WASTEWATER MANAGEMENT AT HICKMOTT FOODS, INC.,
California Univ., Davis.
G. Ichobanoglous, B. Ostertag, and E. Fernbach.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 288-322, 6 fig, 14 tab, 3 ref. Report EPA-600/2-76-224.

Descriptors: *Canneries, *Tomatoes, *Food processing industry, *Biological treatment, *Activated sludge, Asparagus, Sweet potatoes, Industrial wastes, Waste water disposal, Waste water disposal, Waste water treatment.

Hickmott Foods, Inc., a small independent cannery in Antichoch, California, processes approximately 1,050 tons of raw tomatoes daily. The tomato canning operation generates approximately 880 tons of finished product and 170 tons of wastes daily, with approximately 11 tons of raw product lost to the waste water stream. A waste water control scheme was instituted in 1971 by Hickmott Foods in response to local regulations which required the plant to remove 94% of the BOD and 91% of the suspended solids in the waste water prior to discharge. Various process modifications have significantly reduced the strength and volume of waste water from the canning process. The raw tomato content in the waste water was reduced by the incorporation of dry peeling and various floor waste management practices. The treatment system at Hickmott utilizes raw solids separation, neutralization, nutrient addition, activated sludge process, sedimentation, activated sludge, solids thickening, and cooling water treatment. Sludge from the treatment operation is disposed by land application or used as a cattle feed supplement. The $885,000 treatment facility was operated during the 1974 season at a cost of $4.28/ton of raw tomatoes. (See also W78-04417) (Schulz-FIRL)
W78-04425

PILOT-SCALE TREATMENT OF BRINED CHERRY WASTEWATERS,
Environmental Associates Inc. Corvallis, OR.
A. F. Mauldin, B. W. Hemphill, M. R. Soderquist, D. W. Taylor, and E. Gerding.
In: Proceedings of the Sixth National Symposium on Food Processing Waste, April 9-11, 1975. 1976, p 323-342, 8 fig, 2 tab, 5 ref. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Stone fruits, *Aeration, *Aerated lagoons, *Treatment facilities, Biological treatment, Pilot plants, Biochemical oxygen demand, Industrial wastes, Sewerage, Waste water treatment.

Treatibility of brined cherry waste water by aerobic biological processes was investigated in a bench-scale study at Aqua Tech Laboratories, Incorporated, in Portland, Oregon. Three 4-liter units were charged with diluted spent cherry brine, seeded with raw sewage, and aerated. The conversion of free and combined sulfur dioxide to sulfate was essentially complete after 5 days of aeration. A 7000-gal pilot plant at the Dalles Cherry Growers, Incorporated, the Dalles, Oregon, was operated as an aerated lagoon for 4 mos, then for 3 wks in an extended aeration mode with complete sludge recycling. The waste water from brined cherry pitting was amenable to aerobic biological treatment. The effluent contained virtually no sulfur dioxide, and had a pH near 7.0 without chemical treatment. The most important problem was in maintaining good sludge settling characteristics. The optimum retention time in aerated lagoons was about 10 days. When a spill increased the influent BOD to the aerated lagoon by approximately 1.5 times, the sludge volume index increased from 270 to over 600. Hydraulic and chlorite shock loadings did not cause upsets in the treatment process. (See also W78-04417) (Snyder-FIRL)
W78-04426

CHARACTERIZATION AND POTENTIAL METHODS FOR REDUCING WASTEWATER FROM IN-PLANT HOG SLAUGHTERING OPERATIONS,
Mayer (Oscar) and Co., Madison, WI.
D. O. Dencker, D. L. Grothman, P. M. Berthouex, L. J. P. Scully, and J. E. Kerrigan.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 343-367, 3 fig, 4 tab, 4 ref. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Hogs, *Pollutant identification, *Water conservation, *Water consumption, Water reuse, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Organic wastes, Cattle, Industrial wastes, Waste water treatment.

The quantitative and qualitative characteristics of hog slaughtering wastes were examined at three slaughterhouses operated by Oscar Mayer of Madison, Wisconsin. The plants slaughtered 750-1,000 hogs per hour and also had meat processing facilities. Samples collected at 14 stations throughout the hog slaughtering process were analyzed for total solids, total volatile solids, suspended solids, suspended volatile solids, total Kjeldahl nitrogen, total organic carbon, BOD, and COD. Important pollutant sources were identified in a study which examined the potential for overall reductions in waste loads from various processing stages. Various process modifications were recommended to reduce waste loads. Redesign of the blood receiver to accomodate periodic surges was suggested. The use of recycled water instead of potable water was considered feasible for dehairing operations. A vacuum cleaner was recommended for separating dilute waste water from floor scraps and bone dust. Additional modifications in equipment design to reduce waste loads were also discussed. (See also W78-04417) (Snyder-FIRL)
W78-04427

EGG PROCESSING WASTE RECOVERY,
British Columbia Univ., Vancouver. Dept. of Agricultural Engineering.
N. R. Bulley.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 368-379, 2 fig, 4 tab, 3 ref. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Coagulation, *Organic wastes, *Electrochemistry, *Drying, Organic matter, Biochemical oxygen demand, Solid wastes, Byproducts, Industrial wastes, Waste water(Pollution), Waste water treatment.

Preliminary studies on the treatment of egg processing wastes indicated that the egg albumen and yolk in the waste water could be removed by chemical precipitation, to allow recovery of a portion of this high protein waste. Studies were conducted to investigate the feasibility of pretreating processing waste water for the removal of egg solids. The potential of drying the egg shells, with their associated albumen, was examined with respect to the production of a saleable product as a feed additive for poultry. Experiments with chemical coagulation indicated that the addition of 200 ppm alum at pH 5.1 could remove at least 50% of the egg solids. Electrocoagulation was examined in light of the colloidal nature of the egg processing wastes. The effects of time, temperature, electrode surface area, electrode separation, pH, and waste concentration on floc formation and settling were investigated with a laboratory-scale electrocoagulation system. The system removed 60-70% of the effluent solids within 15 min. Favorable results in studies on forced-air drying of egg shells indicated that the process deserves further attention by egg processors. (See also W78-04417) (Schulz-FIRL)
W78-04428

ROTATING BIOLOGICAL SURFACE TREATMENT OF VEGETABLE CANNING PROCESS WASTEWATER,
Rieke, Carroll, Muller Associates, Inc., Hopkins, MN.
R. F. Roskopf, F. D. Osborn, D. A. Watson, and G. E. Flann.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 380-406, 13 fig, 1 tab. Report EPA-600/2-76-224.

Descriptors: *Canneries, *Vegetable crops, *Biological treatment, *Treatment facilities, *Food processing industry, Surfaces, Dissolved oxygen, Biochemical oxygen demand, Industrial wastes, Waste water treatment, Waste water(Pollution).

A pilot study was conducted at the Owatonna Canning Company in Owatonna, Minnesota, to evaluate the rotating biological surface (RBS) process for the treatment of vegetable canning wastewater. The facility cans asparagus, peas, beans, corn, pumpkin, and beef stew. Three RBS pilot plants, each using a semicylindrical tank 4.23 ft long and 4.0 ft in diameter as a flow-through chamber, were operated. They were designated as polyplant-1, polyplant-2, and lagplant. The polyplants treated screened waste water. The lagplant treated effluent from an anerobic lagoon, the first stage of the plant's waste water treatment system. Biological growth on the first stage of the plant's waste water treatment system. Biological growth on the RBS units became darker and more fibrous as its thickness increased. Dissolved oxygen (DO) levels from the polyplants ranged from 0.5-7 mg/liter higher than the influent levels; a decrease in flow rates increased the difference in DO levels. BOD in influent to the polyplants ranged 240-1800 mg/liter; effluent BOD ranged 6-1385 mg/liter. Most of the Kjeldahl nitrogen removed by the RBS units was associated with settleable solids. DO levels in the lagplant effluent were 3-7 mg/liter higher than influent levels. The lagplant removed a smaller percentage of suspended solids than did the polyplants, possible because the lagplant influent contained lower concentrations of suspended solids. (See also W78-04417) (Snyder-FIRL)
W78-04429

A PRELIMINARY REPORT ON STUDIES TO DEVELOP ALTERNATIVE METHODS OF REMOVING POLLUTANTS FROM TUNA (ALBACORE) PROCESS WASTEWATERS,
National Marine Fisheries Service, WA. Pacific Utilization Research Center.
H. J. Barnett, and R. W. Nelson.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 407-417, 4 fig, 2 tab, 9 ref. Report EPA-600/2-76-224.

Descriptors: *Fish handling facilities, *Canneries, *Marine fish, *Flotation, *Treatment facilities, Food processing industry, Screens, Centrifugation, Coagulation, Pilot plants, Aeration, Industrial wastes, Waste water treatment.

Pilot studies at a seafood cannery evaluated a modified air flotation system for treating tuna processing waste water. The relatively inexpensive, modified air flotation-double screening technique used an 18 inches Bauer Hydrasieve tangential screen and a Sweco 12' centrifugal waste water concentrator. Without coagulant addition, suspended solids reductions were not significantly improved by the addition of dispersed air flotation after double screening. Coagulant concentrations of 20 ppm alum and 150 ppm lime produced the best results with double screening and dispersed air flotation. The aeration produced by centrifugal screening and dispersed air addition further facilitated the formation of the sludge blanked in the flotation cell. (See also W78-04417) (Snyder-FIRL)
W78-04430

EFFLUENT VARIABILITY IN THE MEAT-PACKING AND POULTRY PROCESSING INDUSTRIES,
Industrial Environmental Research Lab.-Cincinnati, Corvallis, OR. Corvallis Field Station.
J. F. Scaief.
In: Proceedings of the Sixth National Symposium on Food Processing Wastes, April 9-11, 1975. 1976, p 418-456, 16 fig, 11 tab, 4 ref, 1 append. Report EPA-600/2-76-224.

Descriptors: *Food processing industry, *Poultry, *Biochemical oxygen demand, *Suspended solids, *Standards, Regulation, Effluents, Biological treatment, Treatment facilities, Organic wastes, Activated sludge, Aerated lagoons, Industrial wastes, Waste water treatment.

The efficiencies of various combinations of in-plant controls and waste water treatment processes were evaluated at six meat processing plants and four poultry processing plants. Water consumption at the meat processing plants ranged 525-1,870 gal/1,000 lbs. Waste water at the poultry processing plants was generated at a rate of 24.7-26.0 liters/bird. Reductions in water consumption reduced waste water treatment requirements. The meat packing plants achieved 1977 standards for BOD in effluents. A duck processing plant achieved 1983 standards for BOD and suspended solids. For both types of plants, abnormal weather conditions produced high pollutant loads in the effluent. Poultry processing plants having aerated lagoon or activated sludge systems were more capable of meeting effluent standards than plants using other types of waste water treatment. A plant which exceeded daily effluent standards was also likely to exceed weekly and monthly limitations. This suggested that daily BOD discharges had to be below the 30-day average for compliance with monthly BOD limitations. (See also W78-04417) (Snyder-FIRL)
W78-04431

INDUSTRIAL WASTEWATER RECLAMATION WITH A 400,000-GALLON-PER-DAY VERTICAL TUBE EVAPORATOR,
General Tire and Rubber Co., Akron, OH.
W. C. Lang, J. H. Crozier, F. P. Drace, and K. H. Pearson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 361, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-76-260, October 1976. 98 p, 15 fig, 16 tab, 5 ref, append.

Descriptors: *Industrial wastes, *Synthetic rubber, *Evaporators, *Reclaimed water, *Treatment facilities, Reclamation, Evaporation, Impaired water quality, Corrosion, Fouling, Waste water(Pollution), Waste water treatment, Waste water disposal.

The General Tire and Rubber Company's synthetic rubber plant at Odessa, Texas, has a nominal rated capacity of 40,000 tons per year of butadiene-styrene type synthetic rubber (GRS). Waste water flow rates at the plant are as high as 750,000 gpd. A 14-effect vertical tube evaporator was built for recovering water from a waste water stream containing 3500 ppm dissolved solids, mostly chlorides and sulfates, and organics in excess of 100 ppm. Water having almost no organics and a very low dissolved solids level was recovered for use in the manufacturing process. An attempt was made to determine the ratio of the quantities of recovered water to waste water, the amount of reclaimed water per unit of thermal energy applied, and the plant performance at various feed rates. Corrosion resistance, the rate of scaling or fouling on the heat exchange surfaces, and utility requirements were also examined. Engineering data to improve the design of future plants, concentrations of organics and dissolved solids in waste water and reclaimed water, and costs for water reclamation were presented. Over short periods, performance exceeded design expectations. Corrosion of the heat exchange surfaces which made continuous operation for long periods impossible was attributed to the presence of 2-5 ppm of sulfides in the feed water. Retubing the copper alloy unit with titanium eliminated corrosion, but not fouling. Pretreating the waste water did not reduce fouling. Direct operating costs ranged $0.80-8.44/1,000 gal of recovered water. (Snyder-FIRL)
W78-04432

EFFECTIVENESS OF SURFACE MINE SEDIMENTATION PONDS,
Hittman Associates, Inc., Columbia, MD.
D. V. Kathuria, M. A. Nawrocki, and B. C. Becker.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 917, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-76-117, August 1976. 100 p, 34 fig, 7 tab, 9 ref, 3 append.

Descriptors: *Coal mine wastes, *Settling basins, *Suspended solids, *Surface runoff, *Rainfall, Efficiencies, Treatment facilities, Sediment control, Sediments, Kentucky, West Virginia, Pennsylvania, Industrial wastes, Waste water treatment.

Nine sedimentation ponds at surface coal mining operations in Pennsylvania, West Virginia, and Kentucky were evaluated for reducing suspended solids in storm runoff. The ponds included: a 34.5 m by 16.2 m primary pond and 30.5 m by 16.5 m secondary pond; a 13.1 m-diam secondary pond, combined with a somewhat larger primary pond; two primary impoundments, combined with a secondary impoundment 200 m downstream; an impoundment averaging under 0.7 m deep near the riser pipe; a pond of approximately 200 ft by 60 ft; three ponds created by 6.1 m-high embankments; and a 125 ft by 35 ft pond. The ponds were sampled during baseline and rainfall events. Theoretical and actual suspended solids removal efficiencies were compared. Major problems resulted from poor construction and inadequate maintenance. Suspended solid removal efficiencies were generally much lower during a storm. Theoretical predictions of efficiency were essentially correct under baseline condtions. Generally, theoretical removal efficiencies were much higher than actual efficiencies during rainfall. (Snyder-FIRL)
W78-04433

OZONE OXIDATION OF METAL PLATING CYANIDE WASTEWATER,
CPAC Inc., Leicester, NY.
D. A. Johnston.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 003, Price codes: A05 in paper copy, A01 in microfiche. Final Report AFCEC-TR-76-13, September, 1976. 72 p, 21 fig, 7 tab, 10 ref, append.

Descriptors: *Cyanide wastewater, *Oxidation, *Ozone, *Metals, *Nitrogen compounds, *Treatment facilities, Iron compounds, Nickel, Cadmium, Maintenance, Industrial wastes, Water pollution sources, Waste water(Pollution), Waste water treatment.

Electroplating associated with maintenance of aircraft engines produces cyanide-bearing waste water. A process developed by the Houston Research Corporation uses ozone to oxidize the cyanides. A plant was designed and installed at Tinker Air Force Base in Oklahoma for treating 3000 gal/mo of nickel strip waste at total cyanide concentrations as high as 50,000 mg/liter. Ozone was very effective and economically competitive for destroying simple cyanides and most metal complexes. Destruction of the iron complex was very difficult to achieve, even under ultraviolet light and at 150 F. A plant using this treatment process can be automated and can perform continuously for several weeks. Levels of cyanide, nickel, and cadmium in effluent from the treatment process are reportedly below detection limits. (Snyder-FIRL)
W78-04435

TREATMENT OF ELECTROPLATING WASTES BY REVERSE OSMOSIS,
American Electroplaters' Society, East Orange, NJ.
R. G. Donnelly, R. L. Goldsmith, K. J. McNulty, D. C. Grant, and M. Tan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 393, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-76-261, September 1976. 95 p, 50 fig, 16 tab, 11 ref.

Descriptors: *Electroplating wastes, *Chemical wastes, *Reverse osmosis, *Semipermeable membranes, *Industrial water, *Polymers, Nickel, Copper compounds, Zinc, Chlorides, Feasibility, Impaired water quality, Industrial wastes, Waste water treatment.

Wastes from nine different electroplating systems were treated with reverse osmosis (RO) in pilot studies conducted to provide data for estimating the feasibility of RO for a specific plating waste. The plating wastes were obtained from Whyco Chromium Company, Honeywell, Hempden Colors and Chemicals, General Electric, and American Electroplating Company. Technical feasibility was demonstrated for Wattstype nickel, nickel sulfamate, copper pyrophosphate, nickel fluroborate, zinc chloride, copper cyanide, zinc cyanide, and cadmium cyanide systems. Cellulose acetate membranes were recommended for waste water having a pH of 2.5-2.0; polyamide membranes were suggested for a pH range of 4-16. The data indicated that the extent to which RO would concentrate recycled plating chemicals in commercial-scale installations was dependent on the particular situation. The effect of buildup of impurities in closed-loop operation also differed for each bath. The selective removal of certain components in plating baths by RO systems led to the need for chemical addition prior to reuse. (Snyder-FIRL)
W78-04437

BIOLOGICAL TREATMENT OF CONCENTRATED SUGAR BEET WASTES,
Beet Sugar Development Foundation, Fort Collins, CO.
J. H. Fischer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 123, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-660/2-74-028, June 1974. 100 p, 13 fig, 11 tab, 38 ref, 3 append.

Descriptors: *Food processing industry, *Sugar beets, *Water reuse, *Pollutant identification, *Treatment facilities, Reclaimed water, Neutralization, Screens, Industrial wastes, Waste water disposal, Waste water treatment.

A study was undertaken to develop a closed-loop waste water treatment system for flume water used for conveying and washing in a sugar beet factory operated by the Great Western Sugar Co. at Longmont, Colorado. The factory processed an average of 3,307 tons of beets daily. Recirculation of flume waters was shown to be possible. An estimated 30-50 tons of wet material was removed daily by screening; lime was added continuously prior to sedimentation. Primary settling was accomplished with two ponds used alternately. The effluent was further treated by secondary settling before being returned to the conveying and washing operations. An anerobic pond, designed to degrade the remaining solids in 100 gpm of surplus water, effectively treated the total flume water after each operating cycle. Floating surface aerators were used to reduce odors during final polishing. Biological and nutritional data were collected. Although the treated product water also met discharge standards, it was reused in the system. (Snyder-FIRL)
W78-04438

WASTE TREATMENT AND DISPOSAL METHODS FOR THE PHARMACEUTICAL INDUSTRY,
National Field Investigations Center-Denver, CO.
E. J. Struzeski, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 582, Price codes: A13 in paper copy, A01 in microfiche. Report EPA/330/1-75-001, March 1975. 282 p, 5 fig, 58 tab, 120 ref, append.

Descriptors: *Chemical wastes, *Activated sludge, *Trickling filters, *Treatment facilities, *Biochemical oxygen demand, Chemical oxygen demand, Biological treatment, Industrial wastes, Pollution abatement, Waste water treatment, Waste water disposal.

A survey of 39 pharmaceutical plants and a literature review were conducted to provide data which was used to establish effluent limitations. Five categories of pharmaceutical plants were studied, including those using fermentation, organic synthesis, or combinations of the two, those producing vaccines and antitoxins, and those producing the final form of pharmaceutical preparations. The study of fermentation included fermentation media, vitamin manufacture, citric acid manufacture, antibiotics manufacture, and enzymes production. The study of organic synthesis encompassed vitamin maufacture, a synthetic antibiotic sulfa drugs, steroids, and prostaglandins. Wastes from synthesized chemical production were strong, variable, difficult to treat, and often toxic to biological treatment systems. Important parameters in pharmaceutical wastes included short and long-term BOD, COD, total organic carbon (TOC), solids, pH, trace metals an other ions, unoxidized nitrogen, phosphorus, color, odor, temperature, and toxicity. Waste treatment and disposal methods included activated sludge, trickling filtration, anaerobic filters, spray irrigation, oxidation ponds, sludge stabilization, and deep well injection. The more sophisticated treatment facilities generally used multi-stage activated sludge or trickling filtration processes. (Snyder-FIRL)
W78-04440

TREATING METAL FINISHING WASTES, PART 2,
New Jersey Inst. of Tech., Newark.
P. N. Cheremisinoff, A. J. Perna, and J. Ciancia.
Industrial Wastes, Vol. 23, No. 1, p 32-34, January/February, 1976.

Descriptors: *Metals, *Evaporation, *Electrolysis, *Ozone, *Industrial wastes, Sludge treatment, Water reuse, Oxidation, Reverse osmosis, Costs, Chemical wastes, Waste water treatment, Waste treatment.

The treatment of wastes from the metal finishing industry was explored. Chromium, cyanide and other rinse waters have been treated by single and multiple stage evaporation. This process is economical only for concentrated rinses and requires segregation of wastes by compatible types, the use of various means for excluding or removing impurities, and careful rinsing and water use by the metal finisher. Chemical dragout is concentrated in the rinse water to process bath strength and returned to the process tanks. Evaporated water is returned to the rinsing system. An integrated system segregates and treats rinse water waste at the source by simultaneous removal and treatment of the liquid film of processing solution adhering to the part removed from the metal finishing bath. A chemical wash tank is substituted for the first rinse tank following the metal finishing operation. Electrolytic decomposition of cyanide in an alkaline solution, of less toxic cyanide complexes such as ferro and ferricyanide has been used to dispose of cyanide-bearing waste waters. Ozone has been found suitable for cyanide oxidation, with the final reaction yielding mostly cyanate. Permanganate treatment of cyanide and hydrogen peroxide destruction of cyanide are other treatment methods. Electrodialysis and reverse osmosis as well as the biological degradation of cyanide have also been investigated. Sludge treatment can eliminate potential ground and surface water contamination by toxic metals; and recovery of valuable metals from sludge can offset costs. (Collins-FIRL)
W78-04442

DEVELOPING A METHODOLOGY FOR DESIGN OF EQUALIZATION BASINS,
Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
E. A. R. Ouano.
Water and Sewage Works, Vol 124, No 11, p 48-52, November, 1977. 7 fig, 1 tab, 8 ref.

Descriptors: Analytical techniques, *Treatment facilities, *Methodology, *Design criteria, *Basins, Design, Mathematical studies, Resistance, Fluctuations, Variability, Water quality, Waste water(Pollution), Waste water treatment, *Equalization basins, Sewage lagoons.

Rational design criteria and methods are needed for equalization basins. Equalization basin design criteria are dependent on the tolerance to shock loads of the waste water treatment process used after equalization, the fluctuations of waste water quality and quantity, and the mixing pattern in the equalization basin. A three-dimensional diffusion equation is given for a shallow, rectangular equalization tank. Plug flow conditions should be avoided in equalization basins, because no equalization takes place under these conditions. A mass balance relationship is used to establish the governing equation for a completely mixed system. The equalization basin should be large enough for the maximum required volume, plus a safety factor. For flow patterns between completely mixed and plug flow, a dispersion number over 0.2 is a good compromise between maximizing mixing and preventing short-circuiting. An equalization basin's design efficiency also depends on the biochemical or chemical reactions occurring in the basin. These reactions, the tolerance to shock loads, the waste water fluctuations, and the mixing pattern can be easily incorporated into equalization basin design with a computer program for complete mixing. A tracer study on a model equalization basin could be used to estimate the correction for non-ideal flow. (Snyder-FIRL)
W78-04469

TANNERY POLLUTION UP-DATE,
T. Thorstensen.
The Leather Manufacturer, Vol 94, No 12, p 28-30, December, 1977. 4 fig.

Descriptors: *Tannery wastes, *Industrial wastes, *Suspended solids, *Chromium, *Sulfides, Hydrogen ion concentration, Oil wastes, Waste water treatment.

Recent advances in the field of tannery pollution control are presented. Differentiation is made between direct and indirect dischargers of pollutants. Waste water parameters of significance to a tannery include: flow, suspended solids, BOD, sulfides, chromium, oil and grease, and pH. One of the more significant advances in BOD reduction has been the development of the TNO unhairing process, which involves soaking the hides in calcium chloride before unhairing with caustic soda and sodium sulfide. Lime is not required and water consumption is kept to a minimum. Acidification of the TNO unhairing waste water causes the protein materials to coagulate, thereby clarifying the waste water to remove 95% of the suspended solids and 80% of the BOD. Recycling, chemical oxidation, and acidification are currently used to remove sulfides from tannery wastes. (Baker-FIRL)
W78-04470

MECHANICAL DEWATERING ALTERNATIVES FOR WASTE ACTIVATED SLUDGE--A PILOT STUDY,
National Council for Air and Stream Improvement, Kalamazoo, MI.
R. A. Miner, D. W. Marshall, and I. Gellman.
TAPPI, Vol 60, No 12, p 102-105, December, 1977. 2 tab, 4 ref.

Descriptors: *Dewatering, *Sludge treatment, *Filters, *Pulp wastes, *Pulp and paper industry, Industrial wastes, Filtration, Separation techniques, Equipment, waste water treatment.

A pilot study was conducted to evaluate biological sludge thickening and dewatering alternatives for the pulp and paper industry. Pressure filtration, precoat vacuum filtration, centrifugation, and ultrafiltration were tested with waste activated sludge resulting from waste water treatment at an integrated bleached kraft-fine paper mill. Three levels of dewatering efficiency based on cake consistency were observed. Pressure filtration and precoat vacuum filtration generated the driest cakes; filter belt pressing yielded intermediate cake consistencies; and gravity filtration, centrifugation, and ultrafiltration resulted in relatively low cake consistencies. Changes in the feed sludge consistency, the amount of sludge conditioning, and the sludge's specific resistance to filtration had a large effect on the quality of final product. The type and amount of sludge conditioning required varied with the dewatering technique employed, the desired level of performance, and the consistency and nature of the sludge. (Baker-FIRL)
W78-04471

STUDIES ON THE TREATMENT OF PULP WASTE WATERS BY REVERSE OSMOSIS AND OTHER TECHNIQUES (GYAKUHINTO HO NADO NI YORU PARUPU HAISUI SHORI GIJUTSU NI KANSURU KENKYU),
Agency for Industrial Science and Technology, Tokyo (Japan). National Chemical Lab. for Industry.
J. Kato, H. Masuda, T. Nakane, C. Kamizawa, and M. Matsuda.
Tsusansho Kogyogijutsuin Sangyo Kogai Kenkyu Choseikyoku 51 Nendo Kogaitokubetsu Kenkyu Hokoku, (Report of 1976 Pollution Special Res. by Industrial Pollution Res. Coordinative Bureau), p 441-446, July, 1977. 3 fig, 2 tab, 16 ref.

Descriptors: *Pulp and paper industry, *Reverse osmosis, *Membranes, *Pulp wastes, *Industrial wastes, Waste water treatment, Separation techniques, Lignins, Water treatment.

Reverse osmosis was evaluated for the treatment of waste water from the electroplating and pulp and paper industries. The recovery of solutes such as carboxylic acid, amino acid, surfactants, and heavy metals from pulp and plating rinse waste waters was investigated using cellulose acetate membranes. Treatment of pulp waste water yielded organic and inorganic solids concentrations of 5% by wt. Reusable water was also obtained. Continuous testing revealed that cellulose acetate membranes lasted at least three months in the treatment of chromic plating rinsing waters. A cartridge module designed for easy membrane replacement was developed to treat both the pulping waste and the plating rinse. Solvent extraction techniques for recovery of hemicelluloses, lignosulfonates, and saccharides from spent pulping liquors were devised. After modification with demetoxylation, the lignosulfonates were used as coagulants to improve sludge dewatering. A synthetic inorganic adsorbent was developed to remove 98% of the color, 90% of the lignin and 83% of the COD from kraft pulp bleaching liquor. (Lisk-FIRL)
W78-04472

REMOVAL OF ZN OR CD AND CYANIDE FROM CYANIDE ELECTROPLATING WASTES,
Energy Research and Development Administration, Washington, DC.
F. L. Moore.
Available from the National Technical Information Service, Springfield, VA 22161 as PAT-APPL.-556 353, Price codes: A02 in paper copy, A01 in microfiche. Patent Application, Serial Number 556 353, March 7, 1975. 8 p, 1 fig, 3 tab.

Descriptors: *Cyanide, *Chemical wastes, *Solvent extractions, *Zinc, *Cadmium, *Nitrogen compounds, Liquid wastes, Aqueous solutions, Patents, Ammonium compounds, Organic compounds, Industrial wastes, Effluents, Waste water treatment.

A method of liquid-liquid solvent extraction was patented for recovering Zn or Cd and cyanide from electroplating waste water. The process can be used to treat aqueous effluents such as spent electroplating solutions or rinse waters. The method efficiently strips Zn or Cd from stable quaternary amide and cyanide complexes. A solution of an alkali metal hydroxide is used to quantitatively strip the metal and cyanide content from a saturated extract of the quaternary ammonium complex and to regenerate a quaternary ammonium hydroxide salt which can then be used in subsequent extractions. Zinc is very efficiently extracted over a wide range of sodium hydroxide concentrations. Zinc-cyanide feed solutions containing 50 ppm cyanide can be extracted to produce an aqueous raffinate containing less than 2 ppm cyanide. (Snyder-FIRL)
W78-04473

EFFECT OF GREASE ON WASTEWATER TREATMENT UNIT PROCESSES,
Missouri Univ., Columbia. Dept. of Civil Engineering.
S. K. Banerji.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 049, Price codes: A02 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, January 1978. 15 p, 4 fig, 4 tab, 14 ref. OWRT A-100-MO(1). 14-34-0001-7054.

Descriptors: *Grease, *Oil, *Waste water treatment, *Settling basins, *Sludge thickening, Missouri, Treatment facilities, *Sewage treatment, *Flocculation(Settling).

The objective was to determine the levels of grease and oil in raw sewage that affect the settling characteristics of suspended solids in raw sewage and sludge thickening. Raw sewage from City of Columbia, Mo., Trickling Filter plant was used to determine settling behavior of suspended solids in raw sewage in presence of various levels of grease and oils. The settling tests were performed in 7 1/2 inch diameter and about 3' long plexiglas columns. The procedure used to determine the settleability of these flocculant suspensions was to measure the suspended solids concentration at various depth at different times after the quiescent settling was started. Sludge for the thickening experiment was obtained from City of Columbia, Mo., Activated Sludge Plant. The activated sludge was allowed to settle in a 4 inch diameter settling column. The zone settling velocity of the sludge-water interface was determined in presence of varying concentration of grease and oil. For settling tests at elevated grease levels, additional grease in the form of 1:1 mixture of cooking corn oil and commercial motor oil was added to the sludge and sewage under test. The conclusions are: (1) Levels of grease higher than about 50 mg/l may interfere with flocculant settling of raw sewage solids and reduce the efficiency of primary clarification. However, at levels of grease higher than 120 mg/l the solids removal efficiency is restored and these high grease levels do not interfere with raw sewage particle flocculant settling. (2) Presence of high levels of grease (> 100 mg/l) actually promotes activated sludge thickening. However at these high levels of grease the sludge bulks initially and clarification is poor. The presence of grease up to 100 mg/l does not appear to have any negative effects on clarification behavior of sludge.
W78-04492

ACCUMULATION OF SLIME IN DRAINAGE PIPES AND THEIR EFFECT ON FLOW RESISTANCE,
Clay Pipe Development Association Ltd., London (England).
For primary bibliographic entry see Field 8B.
W78-04506

THE SIGNIFICANCE OF STORMWATER RUNOFF IN AN URBANIZING WATERSHED,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 5B.
W78-04512

STORM SEWAGE OVERFLOWS,
Liverpool City Council (England). Dept. of the City Engineer.
For primary bibliographic entry see Field 8C.
W78-04550

WORKING PARTY ON THE HYDRAULIC DESIGN OF STORM SEWERS.
For primary bibliographic entry see Field 8B.
W78-04551

BEST MANAGEMENT PRACTICE FOR URBAN STORM AND COMBINED SEWER POLLUTION CONTROL,
For primary bibliographic entry see Field 5G.
W78-04552

HIGH WATER DISCHARGING OR RAIN BASINS (HOCHWASSERENTLASTUNGEN ODOR REGENBECKEN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
W. Munz.
Gas-Wasser-Abwasser, Vol. 57, No. 12, p 861-868, 1977. 5 fig, 2 tab, 8 ref.

Descriptors: *Storage capacity, *Overflow, *Runoff, *Waste water treatment, *Storage tanks, Storm water, Storm runoff, Flood flow, Waste water disposal, Treatment facilities, Switzerland.

Criteria used in Switzerland for the selection of storm water storage tanks and combined sewer overflow facilities are discussed. Although the installation of stand-by storage tanks is not required for facilities whose capacities are only exceeded during intense storms, stand-by storage facilities are recommended for reducing the load on the treatment plant during wet weather. The effects of the volume of storm water storage tanks and the maximum flow rate towards the treatment plant are evaluated with respect to the magnitude of the combined sewer overflow. Several storm water and treatment configurations currently in use in Swizterland are reviewed. A formula which considers the degree of protection required for receiving waters is presented for the selection of design capacities and storage volumes for storm water treatment facilities. (Lisk-FIRL)
W78-04553

EVALUATION OF STORM WATER ROUTEING MODELS,
MacLaren (James F.) Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5G.
W78-04554

$4.7 BILLION FOR SAO PAULO SEWERS MARKS INVESTMENT SHIFT BY BRAZIL.
For primary bibliographic entry see Field 5G.
W78-04555

FIXED-GRID CHARACTERISTIC FOR PIPELINE TRANSIENTS,
Michigan State Univ., East Lansing. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-04559

SEWERAGE IN RURAL AREAS,
G. Bishop, and T. H. Kirby.
Journal of the Institute of Water Pollution Control, Vol. 76, No. 4, p 423-436, 1977. 5 fig, 2 tab, 7 ref.

Descriptors: *Sewerage, *Treatment facilities, *Sewage treatment, *Drainage systems, *Regional development, Rural areas, Sewers, Manholes, Overflow, Waste water treatment, Municipal wastes.

Guidelines for the selection and installation of sewage systems in rural areas are presented. The study emphasizes the need to consider the geographical location and the type of usage a sewage system will encounter. Sewers are usually installed to accomodate both the natural fall of the land and the best route to an outfall or treatment plant. The study suggests that, in rural areas, lines should also be placed beneath the roads whenever possible. Consideration of depth of sewer lines and the number of pumping stations is recommended in flat areas. In order to prevent the growth of bacterial slime in the pipe, it is suggested that pipe size be selected to provide a minimum flow velocity of 0.75 m/sec. Automatic and reliable pumping stations are recommended for fewer repairs and lower maintainence requirements. A submersible pumping plant, where feasible, can be economically attractive. Rising mains with a minimum velocity of 0.75 m/sec are recommended for pumping sewage. Methods to prevent hydrogen sulfide production in rising mains are also discussed. (Lisk-FIRL)
W78-04560

NEW PORTOBELLO OUTFALL, BRIGHTON.
For primary bibliographic entry see Field 5E.
W78-04561

PURIFICATION OF WASTE WATER.
Australian Patent 485,192. Issued August 4, 1977. The Australian Official Journal of Patents, Trademarks, and Designs, Vol. 47, No. 28, p 2569, August, 1977.

Descriptors: *Separation techniques, *Heat treatment, *Patents, Equipment, Flocculation, Immiscibility, Liquid wastes, Waste water treatment, *Gravity separation(Wastes).

A patent has been issued for a separation technique to be used with waste water containing a water-insoluble liquid with a specific gravity lower than water and a water-insoluble liquid with a specific gravity higher than water. The method utilizes a gravity separator with a tilted-plate, laminated assembly. Waste water in the form of a colloid or finely dispensed state is introduced into the separator. Warm water is added to the waste water to provide sufficient heat to compensate for the temperature loss in the waste water while in the separation assembly. Floc precipitation is thereby prevented at least until the waste water leaves the assembly. (Schulz-FIRL)
W78-04562

DEEP SHAFT BIOLOGICAL PURIFICATION OF WASTE WATER--WITH CIRCULATORY DRIVING FORCE GAS TAILORED TO POLLUTION INTENSITY.
Netherlands Patent NL 7705-308. Issued November 16, 1977. Derwent Netherlands Patents Report, Vol. Y, No. 48, p 4, January, 1978.

Descriptors: *Waste water treatment, *Deep wells, *Biochemical oxygen demand, *Oxygenation, *Circulation, *Patents, Equipment, Design data, Municipal wastes, Sewage treatment.

A method of deep shaft waste water treatment using forced air or gas circulation has been patented. The liquid is circulated by air that is driven through a riser passage which is larger in diameter at its lower end than at its upper end. The velocity of the liquid through the upper area of the riser passage should be about 1.2-1.5 m/sec. In the lower section of the downflow passage, oxygen-bearing gas is forced into waste water which moves at about 1.3-2.0 m/sec. The liquid passes through the lower part of the riser passage at a rate of at least 0.6 m/sec. The rate of oxygenation can be adjusted according to the waste strength. The addition of more oxygen to control the BOD in waste water with low pollutant levels is unnecessary because of the greater degree of circulation acheived by the design of the passage cross-sections. (Lisk-FIRL)
W78-04563

SEWAGE WASTE BIOLOGICAL TREATMENT DEVICE--HAS HORIZONTAL ROTOR WITH SPOKED ARMS TO CONTROL DISCHARGE OF SOLID WASTE.
German Patent DS 2500-031. Issued November 17, 1977. Derwent German Patents Abstracts, Vol. Y, No. 47, p 4, January, 1978

Descriptors: *Waste water treatment, *Patents, *Solid wastes, Bearings, *Design data, Separation techniques, Municipal wastes, Waste water disposal, *Biological treatment, Sewage treatment.

A patent has been issued for a device to control solid waste discharge during biological sewage treatment by composting. Waste material enters the vertical compartment of a compost preparation tank through an inlet at the top. The discharge system, located at the bottom of the composter, contains one or more radial shafts mounted on a pivot. Radial discharge bolts which are located along the length of the shaft's periphery extend into the discharge mechanism. Support struts, which form the sides of the discharge hole, are located between the shafts, with the inner ends secured to the shaft butt. A bearing ring which joins the outer ends of the support struts is attached to a gear rim. A hydraulic drive ratchet, connected to the gear rim, operates the frame. (Lisk-FIRL)
W78-04564

DIFFUSING GAS INTO LIQUIDS, ESPECIALLY AERATING WASTE WATER--WITH SYNERGISTIC REDUCTION IN ENERGY REQUIRED FOR MASS TRANSFER OPERATION.
Belgian Patent BE-854-872. Issued November 21, 1977. Derwent Belgian Patents Abstracts, Vol. Y, No. 47, p 4, January, 1978.

Descriptors: *Aeration, *Mass transfer, *Activated sludge, *Biological treatment, *Patents, Equipment, Design data, Air-water interfaces, Shear drag, Waste water treatment, Municipal wastes.

A waste water aeration system displaying a snyergistic reduction in the quantity of energy required for mass transfer has been patented. The system includes a hollow bell which rotates on a vertical axis at the lower end of a coaxial shaft attached at the apex of the bell. The angle of the bell's apex is at least 130 degrees; the symmetrical base angles are at least 60 degrees. Outlets located around the circumference of the bell's base discharge gas. Waste water is pumped along the gas outlets along the sides, creating a shearing effect through interfacial turbulence between the gas and liquid. This shearing action reduces the contacting resistance of the interfacial films. The process is effective in aeration during biological waste water treatment, especially for the activated sludge process. (Lisk-FIRL)

W78-04565

THE BANGOR PROJECT.
For primary bibliographic entry see Field 5E.
W78-04566

COMPOSTING RAW SLUDGE,
Agricultural Research Service, Beltsville, MD.
Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5E.
W78-04567

CENTRIFUGE FOR CONCENTRATING ACTIVATED SLUDGE, (CONCENTRATION CENTRIFUGE DES BOUES ACTIVEES).
La Technique Moderne, Vol. 69, No. 1, p 34, January, 1977. 2 fig.

Descriptors: *Centrifugation, *Activated sludge, *Sludge treatment, *Dewatering, *Separation techniques, Anaerobic digestion, Screens, Equipment, Waste water treatment.

Advantages of centrifugal thickening of activated sludges include no surcharging of primary clarifiers, reduced water recycling between anaerobic digesters and the treatment plant, better gas production during digestion, and lower energy needs. Screening devices in mechanical thickeners have presented problems. The Celleco Microsorter solves these problems by eliminating all solid particulates at the pre-screening stage. The main components of the system are a self-cleaning screen, the Microsorter, and the FESX 412/512 disk separator, which continuously discharges the concentrate through the nozzles. Gravity separation removes the solids from the apparatus after collection. The system can handle 20-30 cu m/hr of a feed solution containing up to 2% dry solids. (Blits-FIRL)
W78-04568

NEW WASTE TREATMENT SYSTEM.
Consulting Engineer, Vol. 49, No. 4, p 122, 124, October, 1977.

Descriptors: Biological treatment, *Treatment facilities, *Solid contact processes, *Trickling filters, Municipal wastes, Filters, Biodegradation, Waste water treatment.

Kramer, Chin and Mayo, Inc. of Seattle, Washington, have designed a $2,220,000 waste water treatment system for the city of Monroe, Washington. The projects objectives were to increase Monroe's sewage disposal capacity and quality while providing for anticipated population increases and annexations. The rotating biological contactor system which was supplied by Atuotrol Corporation of Milwaukee, Wisconsin, provides both primary and secondary treatment. Three fine screens eliminate setteable solids during primary treatment. In the secondary treatment phase, the screened waste water passes to four 11 in-diam biological contactors. Hundreds of polyethylene discs are attached to the steel shaft of each contactor to provide a suitable medium for bacterial growth. The shaft rotates to provide continuous contact between the bacterial growth and the waste water nutrients for conversion of the organic matter into carbon dioxide and water. (Schulz-FIRL)
W78-04569

SLUDGE TOXICITY REDUCED.
Consulting Engineer, Vol. 49, No. 4, p 146, 148, October, 1977.

Descriptors: *Oxidation, *Chemical wastes, Sewers, *Toxicity, *Sewage treatment, Organic compounds, Incineration, *Sludge treatment, Dewatering, Municipal wastes, Waste water treatment.

Zimpro Inc. of Rothschild, Wisconsin, was contracted by the United States EPA and the City of Louisville, Kentucky, for detoxification of a municipal sewer system which had been accidentally contaminated with hexachlorocyclopentadiene and octachlorocyclopentadiene. Preliminary tests by Zimpro indicated that low-pressure wet-air oxidation was capable of producing a 93% reduction in the chemicals. The oxidized sludge was then dewatered and incinerated in a multiple-hearth furnace. Concentrations of hexachlorobenzene, a more stable toxicant, were also reduced substantially by the Zimpro treatment process. Approximately 6 million gallons of contaminated sludge has already been treated in trial runs with Zimpro equipment at the Morris Forman waste water treatment plant in Louisville. (Schulz-FIRL)
W78-04570

SEWAGE TREATMENT IN THE 1980S,
W. J. Stuart.
Water Services, Vol. 81, No. 978, p 483, 486, August, 1977.

Descriptors: *Aeration, *Construction materials, *Sludge treatment, Equipment, *Sewage treatment, Waste water treatment, Design data, Tertiary treatment, Concrete technology.

The Spiral 'S' aeration system has been developed by the Inka Division of A Johnson Construction Ltd. The system includes a series of internal concentric tanks which are arranged to provide plug flow conditions through the aeration zone. The concentric channels also eliminate problems associated with surface screw and short circuiting of inlet plug flows. Inlet screening, grit removal, aerobic waste sludge treatment, internal settling tanks, and flocculation tanks can be incorporated into the system. The precast concrete tank construction and the process design result in a low overall cost for the system. Spiral 'S' aeration tanks are available in sizes for a population range of 4,000-40,000 and can be arranged in parallel according to desired size and loading capacity. The tank elements can be equipped with automatic monitoring devices and can be constructed at the site. (Schulz-FIRL)
W78-04571

WASTEWATER TREATMENT FOR TEMPORARY CONSTRUCTION CAMPS IN REMOTE LOCATIONS,
C. L. Eggener, and B. G. Tomlinson.
Water and Sewage Works, Vol. 124, No. 11, p 81-83, November, 1977.

Descriptors: *Treatment facilities, *Sewage treatment, *Clarification, *Coagulation, *Equipment, Activated carbon, Incineration, Centrifugation, Sludge treatment, Waste water treatment.

Stricter regulations on waste water treatment for temporary construction camps, resorts, and other seasonal facilities have led to the design of a variety of 'packaged' physical-chemical waste water treatment systems. The operation, modification, and maintenance of 36 of these system are reviewed. Waste water treatment needs for construction camps are largely dependent upon the size of the resident population and the work schedule. Typical waste water flows and characteristics are presented. Waste water normally passes via gravity sewers to rotary screens or comminutors and then to an aerated equalization tank where coarse bubble aeration provides complete mixing. Packaged physical-chemical treatment plants generally employ either powdered or granular activated carbon. Waste water flows are usually coagulated with alum and flocculated with an anionic polymer. Rough clarification, multimedia filtration, and chlorination are used to further treat the waste water before it passes to an effluent percolation lagoon. Gravity thickeners and basket centrifuges are used to dewater the remaining sludge prior to incineration. Various modifications which have been made to packaged waste water treatment systems since their inception are described. (Schulz-FIRL)
W78-04572

CHEMICAL TREATMENT AS A COST-EFFECTIVE ALTERNATIVE FOR WASTEWATER TREATMENT: OPERATING VS. CAPITAL COSTS,
Dow Chemical U. S. A., Midland, MI.
S. L. Daniels, L. N. Carmouche, and E. D. Driscoll.
AIChE Symposium Series, Vol. 73, No. 166, p 333-343, 1977. 4 fig, 6 tab, 22 ref.

Descriptors: *Costs, *Cost comparisons, *Flocculation, *Coagulation, *Capital costs, Treatment facilities, Aeration, Clarification, Sewage treatment, Municipal wastes, Economics, Waste water treatment, *Chemical treatment.

A summary of the technology, availability, environmental impact, and costs of chemical treatment as an alternative to capital expansion is presented for four secondary treatment configurations. The alternatives include: clarification (25% hydraulic overload); clarification and aeration (25% hydraulic overload and 20% organic overload); chemical treatment (flocculation); and chemical treatment (coagulation and flocculation). Since chemical treatment can be integrated with existing facilities to increase plant capacities, it has been suggested as a less costly alternative to the construction of new facilities for compliance with Public Law 92-500. Chemical treatment can also be implemented in 3-12 mos as opposed to the 36-60 mos normally required for capital expansion. However, since most costs associated with chemical treatment are incurred with daily operation and are not covered under federal funds, plant expansion has generally been favored by municipalities. Environmental impact, sludge handling, economics, capital costs, and operating costs are discussed with respect to benefits derived from chemical treatment. Chemical treatment is also described as a means of 'interim treatment' for those plants which must go to capital expansion. (Schulz-FIRL)
W78-04573

POST TREATMENT OF MOST HOSPITAL WASTEWATERS BY OZONATION FOR REUSE,
Abcor, Inc., Cambridge, MA. Walden Research Div.
K. J. McNulty, R. L. Goldsmith, and A. Z. Gollan.
AIChE Symposium Series, Vol. 73, No. 166, p 252-264, 1977. 10 fig, 2 tab, 18 ref.

Descriptors: *Ozonation, *Ozone, *Hospitals, *Water reuse, *Treatment facilities, *Reverse osmosis, *Tertiary treatment, Disinfection, Hydrogen ion concentration, Ultraviolet radiation, Filtration, Pilot plants, Sewage treatment, Design criteria, Waste water treatment.

Laboratory and pilot studies are being used to develop an advanced waste water treatment system for a mobile army field hospital. Design criteria outlined by the U. S. Army Medical Research and Development Command specified that the output capacity of the system by 4,000 gpd. Additional criteria included a waste water recovery capacity in excess of 85%, equipment which fit into two 11.5 ft x 6.5 ft x 6.75 ft containers, a weight not in excess of 6,000 lbs per container, power consumption not in excess of 30 kw, and the capability of treating all types of hospital wastes. A three-step treatment process which included ultrafiltration, reverse osmosis, and ozonation was chosen. Ozonation studies were conducted on reverse osmosis permeates of hospital composite and laboratory wastes. The studies concluded that ozonation of reverse osmosis permeates was required to insure compliance with water quality standards of 5 mg/liter TOC and 10

mg/liter COD. The ozonation reaction rate was at its maximum at intermediate temperatures of 40-50C for both hospital composite and laboratory waste. The rate of reaction was also more rapid at high pH's. The rate of reaction of ozone with dissolved organics was increased by irradiation with ultraviolet light. The free radical mechanism of ozonation was cited as the cause of these reaction rate effects. (Schulz-FIRL)
W78-04574

PYROLYZING SEWAGE SLUDGE ALONE MOVES SLOWLY TOWARD MARKET.
For primary bibliographic entry see Field 5E.
W78-04575

NEW SEWAGE TREATMENT PLANT INSTALLED.
World Dredging and Marine Construction, Vol 13, No 12, p 41, November, 1977. 1 fig.

Descriptors: *Activated carbon, *Flocculation, *Sewage treatment, *Treatment facilities, Chlorination, Organic wastes, Coagulation, Waste water treatment, *Japan.

The new physical-chemical sewage treatment system at the Nippon Kokan Tsurumi shipyard in Japan was developed by Zurn Industries, Inc., of Houston, Texas. The system is designed for the treatment of domestic sewage and is available in standard capacities of 200, 400, and 600 cu m/day. When the sewage in a wet well reaches a certain level, it is pumped to a contact chamber where activated carbon is added to absorb the organic wastes. Flocculation with sulfuric acid and polymer and separation of the solid material in a settling tank comprise the next stage of treatment. The supernatant water is chlorinated and then passed through an upflow filter before recirculation or discharge. The BOD and COD at this point in the treatment process are both less than 10 mg/liter. Although operating costs are approximately 20% higher than those of the conventional activated sludge systems, construction costs are about one-third lower and the system is not dependent upon the needs of microorganisms. (Schulz-FIRL)
W78-04576

LAGOONS GET SECONDARY TREATMENT OK.
The American City and County, Vol. 92, No. 12, p 41-42, December, 1977. 1 fig, 1 tab.

Descriptors: *Biological treatment, *Lagoons, *Operation and maintenance, *Sewage treatment, *Treatment facilities, Ambient light, Algae, Aerobic bacteria, Municipal wastes, Waste water treatment, Waste water disposal, *Sewage lagoons.

The two main problems encountered in operating waste water treatment lagoons are short-circuiting and hydraulic or organic overloading. Insufficient sunlight will kill the oxygen-producing algae, thus limiting the growth of aerobic bacteria that degrade the organic wastes. The lower part of the ponds should be sealed to prevent water from leaking out through the surrounding soil. Covering the earth berms around the lagoons with asphalt is the preferred method of preventing erosion; vegetation is usually unsuitable. The piping system should allow the operator to control flow and depth in each pond. Such a system makes it possible to rest an overloaded pond, switch between parallel and series operation, recirculate part of the effluent, control weeds, and retain all effluent during the winter. (Snyder-FIRL)
W78-04577

STATE OF THE ART IN WATER TREATMENT DESIGN, INSTRUMENTATION, AND ANALYSIS,
Kennedy Engineers Inc., San Francisco, CA.
For primary bibliographic entry see Field 5F.
W78-04578

BREATHING NEW LIFE INTO POLLUTED WATERS.
For primary bibliographic entry see Field 5G.
W78-04580

DECOMPOSITION OF SEWAGE SLUDGE COMPOST IN SOIL: I. CARBON AND NITROGEN TRANSFORMATION,
Agricultural Research Service, Beltsville, MD.
For primary bibliographic entry see Field 5E.
W78-04581

ALTERNATIVES TO DISINFECTION,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
P. E. Budde, P. Nehm, and W. C. Boyle.
Journal Water Pollution Control Federation, Vol. 49, No. 10, p 2144-2156, October, 1977. 11 fig, 6 tab, 22 ref.

Descriptors: *Disinfection alternatives, *Chlorination, *Ozone, *Iodine, *Sewage bacteria, Coliforms, Costs, Pilot plants, Nitrification, Activated sludge, Sewage treatment, Filtration, Waste water treatment.

A continuous-flow pilot study was conducted for the City of Madison, Wisconsin, to compare the bactericidal effectiveness of three alternate disinfectants on secondary and more highly polished waste water effluents. The dose required to reach a target level kill of 200 fecal coliforms/100 ml was used to assess the bactericidal efficiencies of chlorine, ozone, and iodine. Cost data were prepared with respect to target level and effluent waste water quality. The waste streams tested included nitrified activated sludge, nitrified rotating film effluents, non-nitrified activated sludge, and non-limited dual-media filter effluents. Disinfectant sensitivities based on changes in turbidity were 03>I2>Cl2 for nitrified effluents and 03>Cl2>I2 for non-nitrified effluents. Chlorination was less expensive than ozonation as long as dechlorination was not required. Chlorination was adversely affected by the absence of ammonia when the turbidity exceeded 1 JTU. (Schulz-FIRL)
W78-04582

PILOT PLANT STUDY OF PHYSICAL-CHEMICAL TREATMENT,
Los Angeles County Sanitation Districts, CA.
L. S. Directo, C-L. Chen, and I. J. Kugelman.
Journal Water Pollution Control Federation, Vol. 49, No. 10, p 2081-2098, October, 1977. 12 fig, 11 tab, 11 ref.

Descriptors: *Pilot plants, *Activated carbon, *Clarification, *Hydrogen sulfide, *Polymers, Treatment facilities, Organic wastes, Adsorption, Tertiary treatment, Municipal wastes, Waste water treatment, *Physical-chemical treatment.

Pilot plant studies were used to evaluate the large-scale regeneration of granular activated carbon exhausted on chemically clarified waste water. The performance of a chemical clarification system using alum and polymer was examined. Granular activated carbon was evaluated for the removal of soluble organic matter from chemically treated waste water. Techniques of hydrogen sulfide control and thermal regeneration of activated carbon were also treated. The pilot plant included a chemical clarification system followed by a single-stage, packed bed, downflow granular activated carbon column. Carbon-treated effluents during the 27-month study averaged at 13.5 mg/liter COD, 6.7 mg/liter suspended solids, 6.3 JTU turbidity, and 7.8 color units. Losses during carbon regeneration ranged 2.5-6.0%. Continuous sodium nitrate addition to the column was more effective than oxygen addition, chlorination, or air-water backwash for hydrogen sulfide control. Costs for a 10 mgd physical-chemical treatment system, designed to produce an effluent with an average total COD of 25 mg/liter, dissolved COD of 16 mg/liter, and suspended solids of 8 mg/liter, were projected at $0.07/cu m with the use of alum and polymer. (Schulz-FIRL)
W78-04583

EFFECT OF EXOCELLULAR POLYMER PRODUCTION ON THICKENING AND DEWATERING CHARACTERISTICS OF ACTIVATED SLUDGE,
V. Gulas, M. Bond, and L. Benefield.
Water and Sewage Works, Vol. 124, No. 11, p 83, November, 1977.

Descriptors: *Polymers, *Activated sludge, *Dewatering, *Microorganisms, *Sludge treatment, Flocculation, Sewage bacteria, Waste water treatment.

The bioflocculation of bacterial cells in activated sludge can affect sludge thickening and dewatering characteristics which ultimately control sludge handling requirements. The agglutination of cellular organic material produces readily settleable aggregates and also aids in overcoming biomass shearing during sludge pumping and processing. This phenomenon allows removal of the organic matter which has been oxidized by the bacterial cells. Investigations were conducted to describe the quantitative production of exocellular polymers in activated sludge during continuous operation. The mode of release of this polymeric material was also examined. Exocellular polymer concentrations were compared with the degree of thickening observed during dissolved air flotation of the sludge. The influence of naturally produced polymers on the dewatering behavior of activated sludge was evaluated. (Schulz-FIRL)
W78-04584

SYKES HANDLE PUMPEX SUBMERSIBLES.
For primary bibliographic entry see Field 8C.
W78-04587

LAND APPLICATION GUIDELINES FOR SLUDGES CONTAMINATED WITH TOXIC ELEMENTS,
Northern Virginia Community Coll., Woodbridge. Div. of Environmental and Natural Sciences.
For primary bibliographic entry see Field 5E.
W78-04588

IMPROVING SLUDGE INCINERATION AND VACUUM FILTRATION WITH PULVERIZED COAL,
Municipal Environmental Research Lab., Cincinnati, OH. Wastewater Research Lab.
S. W. Hathaway, and R. A. Olexsey.
Journal Water Pollution Control Federation, Vol. 49, No. 12, p 2419-2430, December, 1977. 8 fig, 8 tab, 6 ref.

Descriptors: *Sludge disposal, *Coal, *Incineration, *Dewatering, *Filtration, Fuels, Activated sludge, Waste water treatment, Vacuum drying, Treatment facilities, Sludge treatment.

More efficient methods of filtration and combustion of primary sludge which involve the addition of pulverized coal before the dewatering process were tested. Autogenous incineration of the sludge was calculated as occurring at a 25.9% cake solids content with a stack gas temperature of 427C. Sludge is normally incinerated with the aid of supplementary fuels such as natural gas of fuel oil. The effects of adding coal to the sludge before and after dewatering were examined. Mixing coal and sludge before filtration yielded a higher solids concentration in the filter cake. Experiments with pulverized coal additions in the range of 0.1-0.4 kg/kg dry sludge solids determined that au-

togenous combustion could be achieved with the addition of 0.11 kg coal/kg dry sludge solids. For dewatering with a vacuum filter, the addition of the pulverized coal to the sludge increased filter yield or throughput. (Lisk-FIRL)
W78-04589

ENERGY FROM SLUDGE DIGESTION - A DEVELOPING RESOURCE,
Thames Water Authority, London (England).
L. Thompson.
Process Engineering, August, 1977. 2 fig, 2 tab, 6 ref.

Descriptors: *Sludge treatment, *Methane, *Sludge digestion, *Resources development, *Electric power, Treatment facilities, Municipal wastes, Carbon dioxide, Ammonia, Organic compounds, Waste water treatment.

Methane gas produced during sludge digestion in municipal waste water treatment is proposed as an alternate energy source. Methane is generated, along with carbon dioxide, ammonia, and water, as a by-product of the breakdown of complex organic compounds. This breakdown enhances dewaterability and reduces the quantity of organic solids and pathogenic organisms. Waste water treatment plants in England serving a population of more than 100,000 accelerate sludge digestion by raising the temperature in the storage tanks to 30-35C. This temperature increase improves gas production and shortens the time required for the digestion process. The methane produced by this process can be used to generate heat and electricity for treatment plant operations. Other uses have included heating of offices and greenhouses, substitutes for gasoline, refrigerating agents, incendiary bombs, and various purposes. (Lisk-FIRL)
W78-04590

IMPACT OF COMMUNITY PLANNING ON QUALITY OF LIFE IN THE NORTH,
Department of National Health and Welfare, Edmonton (Alberta). Medical Services.
For primary bibliographic entry see Field 5E.
W78-04591

PRECIPITATED WASTE WATER PHOSPHORUS FERTILIZERS (ABWASSERPHOSPHATE ALS DUENGEMITTEL),
Institut fuer Agrikulturchemie, Goettingen (West Germany).
L. Cervenka, and F. Timmermann.
Deutsche Gewaesserkundliche Mitteilungen, Vol. 21, No. 1, p 6-7, 1977. 9 ref.

Descriptors: *Phosphorus, *Fertilizers, *Chemical precipitation, *Biological treatment, *Nutrient removal, Soil-water-plant relationships, Waste water treatment, Municipal wastes, Lime.

The use of phosphorus precipitated from municipal waste water as a fertilizer was investigated. The precipitation of phosphorus using mechanical and biological methods resulted in only 30% removal. A 95% removal of phosphorus was realized through chemical treatment using ferric and aluminic salts or lime. These phosphorus precipitates were tested for their solubility and yielding properties. The tests were performed to gain a better understanding of the effectiveness of phosphorus precipitates from waste water as a fertilizer. Phosphorus is contributed to water through soil erosion, drainage, excrement, both animal and human, and detergents. The amount of phosphorus contributed by municipal waste water is calculated at 3-4 g/person. (Lisk-FIRL)
W78-04592

TREATMENT: NOT A THING OF THE PAST.
Water and Wastes Engineering, Vol. 14, No. 12, p 21, December, 1977.

Descriptors: *Waste water treatment, *Sewage disposal, *Municipal waste, *Treatment facilities, *North Carolina, Water pollution control, Watersheds(Basins), Pumping stations, Sludge treatment.

Waste water treatment and collection facilities, having a capacity of 30 mgd with provisions for expansion to 100 mgd, were completed in 1976 for Raleigh, North Carolina. The system was designed to serve the waste collection needs of the city through the year 2020. In 1886, Raleigh's sewer system discharged untreated waste water into the Walnut Creek and Crabtree Creek, tributaries to the Neuse River. A suit was filed against the city of Raleigh by a town whose water supply came from the Neuse River. Although the 1930's suit was dismissed, after World War II Raleigh was forced to construct sewage treatment facilities. The plant, completed in 1956, employed primary treatment, filters with secondary clarifiers, anaerobic digestors, sludge thickening and dewatering, and chlorination. Plans for the new waste water treatment facilities began in 1969 when the original system became overloaded. The treatment system, which cost over $26 million, has three sewer interceptors, two sewage lift pump stations, and a waste water treatment plant. (Lisk-FIRL)
W78-04593

SACRAMENTO REGION MOVES FAST ON WASTEWATER CLEANUP.
Engineering News-Record, Vol. 200, No. 3, p 52, January, 1978.

Descriptors: *Treatment facilities, *California, *Sewage treatment, *Projects, *Sewerage, Grants, Bond issues, Human population, Municipal wastes, Waste water treatment.

The Sacramento County Regional Sanitation District's $395-million secondary waste water treatment system is scheduled to become operational late in 1980. The federal funds for the project comprised the largest waste water treatment project grant awarded at the time. In the early 1970's, the 21 separate waste water collection and treatment systems in the Sacramento area were under pressure from the state of California to improve their treatment facilities. By late 1973, agreements were signed to construct a central plant. A $75-million bond issue was approved by a 75.5% vote in June, 1974, for a plant to serve a population of 70,000 in the 1980's. Property tax rates were immediately raised to pay off the separate agencies' $25 million in debts. Sewerage costs were also increased, and will be further increased, when the system is fully operative, to about $7 monthly for residential users. (Snyder-FIRL)
W78-04594

WATER RECLAMATION--QUALITY TARGETS AND ECONOMIC CONSIDERATIONS,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5G.
W78-04597

THE EFFICACY OF INCLINED TUBE AND PLATE MODULES IN A HIGH LIME CLARIFICATION PROCESS,
National Inst. for Water Research, Pretoria (South Africa).
B. M. van Vliet.
Water Research, Vol. 11, No. 9, p 783-788, 1977. 6 fig, 5 ref.

Descriptors: *Treatment facilities, *Coagulation, *Effluents, *Tubes, *Equipment, Lime, Hydraulics, Overflow, Water reuse, Sludge, Municipal wastes, Waste water treatment.

A study was performed to ascertain whether tube and plate systems would improve the performance of a clarifier in a high lime coagulation/clarification process. The study was performed at the Stander water reclamation plant, which uses the high lime process for chemical coagulation of biofilter humus tank effluent. Sludge is produced at a rate of approximately 2000 kg dry solids per day. The use of inclined tube and plate modules in the upper part of the high lime clarifier improved the quality of the overflow. Hydraulic loading, pH, and temperature, within defined limits, had relatively little effect on the modules' performance. Flocculant dosage and clarifier turbidity strongly influenced the performance of the modules. At clarifier turbidities over three Jackson turbidity units, the modules reduced carry-over of suspended material by more than 50%. Although the modules were essentially self-cleaning, hosing and brushing down were required approximately every 3 mos. Annual acid washes were aso recommended to ensure continuous satisfactory operation. (Snyder-FIRL)
W78-04601

AUTOMATION OF WASTE WATER TREATMENT PLANTS: CONCLUSION--EXPERIENCES AND USE,
Anglian Water Authority, Norwich (England). Norwich Sewage Div.
P. Cotton.
Effluent and Water Treatment Journal, Vol. 17, No. 9, p 461-465, September, 1977. 9 ref.

Descriptors: *Activated sludge, *Biological treatment, *Sewage treatment, *Automation, *Monitoring, Treatment facilities, Municipal wastes, Europe, Equipment, Waste water treatment.

The Whitlingham works of the Norwich Sewage Division of the Anglian Water Authority have recently been extended to handle a design daily waste water flow of 55,000 cu m/day. The Whitlingham plant serves Norwich, England, and the surrounding area. Since late 1973, new plant and automatic control sequences gradually came into use. Initial problems involved preliminary treatment, primary sedimentation, the activated sludge plant, sludge pumping, sludge digestion, filter pressing, and motorized valves and penstocks. A problem with foaming in the digesters was alleviated by adjustments in operating temperature, frequency and duration of mixer operation, and frequency of feeding. Automatic control helped remedy problems associated with a dissolved oxygen deficiency and sludge bulking in the activated sludge plant. Twnety-two workers operate the automated facility, as compared with 20 before the plant capacity was doubled and automatic control sequences were installed. The power costs of preliminary and storm water treatment have also been reduced. (Snyder-FIRL)
W78-04602

SERVO CONTROLLED OPTIMIZATION OF NITRIFICATION-DENITRIFICATION OF WASTE WATER IN SOIL,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5E.
W78-04603

'USED' WATER USED AGAIN FOR IRRIGATION.
For primary bibliographic entry see Field 5G.
W78-04605

FULL-SCALE USE OF PHYSICAL/CHEMICAL TREATMENT OF DOMESTIC WASTEWATER AT ROCKY RIVER, OHIO,
Schade (Willard F.) and Associates, Inc., Cleveland, OH.
W. H. Moss, R. E. Schade, S. J. Sebesta, K. A. Scheutzow, and P. V. Beck.

Journal Water Pollution Control Federation, Vol. 49, No. 11, p 2249-2254, November, 1977. 3 fig, 5 tab, 3 ref.

Descriptors: *Treatment facilities, *Coagulation, *Adsorption, *Physical control, *Sewerage, Domestic wastes, Pollutant identification, Sewage treatment, Biochemical oxygen demand, Chemical oxygen demand, Municipal wastes, Waste water treatment.

The municipal waste water treatment plant in Rocky River, Ohio, processes an average daily waste water flow of 37,850 cu m, using chemical coagulation and carbon adsorption. Operating data for an initial six-month period were used to evaluate performance of the chemical treatment and carbon treatment systems. Samples of influent, primary clarified effluent, and final plant effluent were analyzed for biochemical oxygen demand (BOD), chemical oxygen demand (COD), suspended solids, and phosphorus. Samples of primary raw sludge, thickened sludge, and thickener overflow were analyzed for percent solids. The effluent complied with NPDES permit standards for secondary treatment and phosphorus removal. Digested alum sludge production averaged 9.8 kg/sq m hr; raw alum sludge yield averaged 12.2 kg/sq m hr. Problems with increased chlorine demand and odor were attributed to anaerobic biological growth within the carbon columns. Sodium nitrate addition and daily backwashing with air scour were used to control hydrogen sulfide production. Operating problems included separation of the rubber lining from the walls of the column, physical deterioration of the air scour diffusers, and loss of over 20% of the total carbon volume during filtration. The operating cost was approximately $0.079/cu m. (Snyder-FIRL)
W78-04607

REVIVING THE SEPTIC TANK,
Bell Construction Co., Matteson, IL.
For primary bibliographic entry see Field 5E.
W78-04610

EFFECTS OF PH AND MIXING ON POLYMER CONDITIONING OF CHEMICAL SLUDGE,
Du Pont de Nemours and Co., Inc., Wilmington, DE.
For primary bibliographic entry see Field 5F.
W78-04611

SLUDGE TREATMENT PROCESS OFFERS FLEXIBILITY, LOW COST,
Dorr-Oliver, Inc., Stamford, CT.
R. R. Evans.
Chemical Engineering, Vol. 84, No. 26, p 86-88, December, 1977. 2 fig, 2 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Activated sludge, *Treatment facilities, *Sludge treatment, Costs, Sludge, Sewage treatment, Municipal wastes, Capital costs, Centrifugation.

Split-stream thickening, in which primary and waste activated sludges are separated and concentrated independently before further processing, can result in a savings of about 15% on the capital cost of conventional sludge thickening. Primary sludge is formed when influent is detained in settling tanks; microorganisms, using the dissolved organics as an energy supply, clump together to form activated sludge in a secondary treatment step. It is difficult to accurately predict the amounts of primary and biological sludges that a given facility will produce. When primary and activated sludges are combined at various ratios, operating results will deviate significantly from the design calculations. Dewatering of primary sludge in a conventional gravity thickener and activated sludge with a high capacity centrifuge alleviates these problems. The capital and operating costs for the split-stream process are site-specific, so it is difficult to give meaningful economic data. (Snyder-FIRL)
W78-04612

APPLICATION OF SEWAGE SLUDGE TO GARDEN PLOTS,
Vermont Univ., Burlington. Dept. of Microbiology and Biochemistry.
For primary bibliographic entry see Field 5E.
W78-04613

DISINFECTION OF DRINKING WATER, SWIMMING-POOL WATER AND TREATED SEWAGE EFFLUENTS,
Health Effects Research Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5F.
W78-04614

IMPROVED DETERMINATION OF SPECIFIC RESISTANCE TO FILTRATION (DETERMINATION AMELIOREE DE LA RESISTANCE SPECIFIQUE A LA FILTRATION),
Institut Federal pour L'Amenagement, l'Epuration et la Protection des Eaux, Zurich (Switzerland).
K. A. Wuhrmann.
Techniques et Sciences Municipales-L'Eau, Vol. 72, No. 2, p 59-60, February, 1977. 3 fig, 1 tab, 2 ref.

Descriptors: *Filtration, *Filters, *Analytical techniques, *Sludge treatment, *Flow measurement, Automation, Water analysis, Waste water treatment.

The validity of using specific resistance as a descriptive parameter for filtration of waste sludges has been questioned because of the dispersion coefficient inherent to the method. The method could be improved by calculating the mean value from a multitude of parallel determinations. Equations are given for measurement techniques, stressing the importance of the flow gradient. Automatic measuring devices are recommended as the most accurate means of determining specific resistance to filtration. Optimization of filtration analysis has been accomplished by an instrument which can be used for filtration as well as for recording resistance data. (Blits-FIRL)
W78-04615

OPERATION AND MAINTENANCE OF POLLUTION CONTROL EQUIPMENT,
For primary bibliographic entry see Field 5G.
W78-04618

A SIMPLE SOIL PERCOLATION TEST DEVICE FOR FIELD ENVIRONMENTALISTS,
Summit County Dept. of Environmental Health, Frisco, CO.
For primary bibliographic entry see Field 5A.
W78-04619

DISCOVERY OF AN AGENT IN WASTEWATER SLUDGE THAT REDUCES THE HEAT REQUIRED TO INACTIVATE REOVIRUS,
Sandia Lab. Albuquerque, NM.
R. L. Ward, and C. S. Ashley.
Applied and Environmental Microbiology, Vol. 34, No. 6, p 681-688, December, 1977. 4 fig, 6 tab, 25 ref.

Descriptors: *Sludge treatment, *Viruses, *Ammonia, *Sludge digestion, *Anaerobic digestion, Sludge disposal, Microorganisms, Treatment facilities, Laboratory tests, Waste water treatment, *Reoviruses.

A viricidal agent contained in both raw sludge and anaerobically digested sludge was discovered and analyzed. The agent was shown to inactivate reovirus, a genus of enteric viruses found in human waste. The viricidal agent was not isolated or identified, but several of its properties were discovered through laboratory experiments. The agent was associated with waste solids but could be washed from the sludge solids with water. Viricidal activity in the sludge increased at pH 8-10 but was not observed at a pH lower than 6. The antivirus agent was assumed to be insoluble in acidic solution. Temperatures greater than 35C increased the rate of reovirus inactivation by the agent. The viricidal agent was inactivated at a temperature of 350C sustained for 30 minutes, indicating its organic nature. The antiviral qualities of the agent significantly increased in the temperature range of 45C. Heat inactivation of reovirus occurred more frequently in anaerobically digested sludge than in raw sludge. The alkaline properties of the anaerobically digested sludge were considered more conducive to the activation of the viricidal agent than the acidic nature of raw sludge. Ammonia, a compound which retards the activity of poliovirus, did not appear to be the viricidal agent as reovirus was unaffected by ammonia at 47C. The agent did not inactivate polivirus and may be the sludge component which protects poliovirus from heat inactivation. (Lisk-FIRL)
W78-04622

THE EFFECT OF TOXIC LOADS ON EFFLUENT PURIFICATION SYSTEMS,
National Inst. for Water Research, Pretoria (South Africa).
G. G. Cillie, T. R. Davies, O. O. Hart, and A. J. Hassett.
Water SA, Vol. 3, No. 2, p 83-89, April, 1977. 12 fig, 3 tab, 4 ref.

Descriptors: *Biological treatment, *Toxicity, *Sewage treatment, *Treatment facilities, *Pollutant identification, Activated sludge, Nitrification, Chemical oxygen demand, Filtration, Africa, Sewerage, Municipal wastes, Waste water treatment, Waste water disposal.

An attempt was made to correlate performance data from the Stander Water Reclamation Plant and various biological treatment plants and pilot plants at the Daspoort Sewage Works in Pretoria, South Africa, for a period in 1975 when efficiency was reduced. The deterioration in performance was attributed to the presence of toxic substances in the sewage. Unusually high concentrations of mercury, phenol, chromium, and an organophosphorus compound were detected. Any of these substances or a combination of them might have caused the reduced efficiency. Reactors which employed attached biological growth were affected more than the extended aeration activated sludge processes. Biofilter effluents had high bacterial counts due to encystation by peritrichous ciliates. Nitrification, which declined rapidly during late July and early August, was still not recovered completely by the middle of October. The effect on COD removal was more limited. Biological treatment following lime flotation was unaffected, suggesting that prior lime addition protected the biological processes. The high quality of the water from the Stander Water Reclamation Plant remained the same, even when the quality of influent from the biological treatment facilities was not substantially improved over that of settled sewage. (Snyder-FIRL)
W78-04623

INVESTIGATION OF FILL AND BATCH PERIODS OF SEQUENCING BATCH BIOLOGICAL REACTORS,
Notre Dame Univ., IN. Dept. of Civil Engineering.
R. L. Irvine, T. P. Fox, and R. O. Richter.
Water Research, Vol. 11, No. 8, p 713-717, 1977. 5 fig, 1 tab, 5 ref.

Descriptors: *Biological treatment, *Organic wastes, *Treatment facilities, *Flow control, *Sedimentation, Operations, Volume, Continuous flow, Municipal wastes, Waste water treatment.

Operational difficulties with sequencing batch biological reactors have led to the more widespread use of continuous flow, constant volume treatment systems. Improvements in process control and the need for more reliable and consistent treatment have led to the need for a re-evaluation of biological treatment practices. Sequencing batch reactors provide equalization of flow and concentration, treatment of organics, and quiescent sedimentation. Reductions in volume are also expected from plug flow systems. Laboratory studies were performed to study waste removal, organism growth, and oxygen supply during the fill and batch phases of biological treatment. A mathematical model was derived for calculation of the waste and organism concentration and oxygen uptake rate with respect to time. Measured and predicted values agreed well. These results suggested that fill and draw reactors may provide a visible alternative to continuous flow treatment schemes. (Snyder-FIRL)
W78-04625

INTERACTIVE COMPUTER DESIGN OF WASTEWATER PLANTS,
Herkenhoff (Grodon) and Associates, Inc., Albuquerque, NM.
For primary bibliographic entry see Field 7C.
W78-04626

A MODEL FOR THE SIMULATION OF RAINWATER RUNOFF IN SEWERS (EIN MODELL ZUR SIMULATION DES REGENABFLUSSES IN KANALISATIONSNETZEN),
Balzari Blaser Schudel, Ingenieure und Planer, Bern (Switzerland).
For primary bibliographic entry see Field 5B.
W78-04627

THE MODELING OF ACTIVATED CARBON ADSORBERS IN THE PRESENCE OF BIO-OXIDATION,
McMaster Univ., Hamilton (Ontario).
R. Peel, and A. Benedek.
AIChE Symposium Series, Vol. 73, No. 166, p 25-35, 1977. 13 fig, 13 ref.

Descriptors: *Activated carbon, *Biodegradation, *Adsorption, *Model studies, *Sewage treatment, Sewage bacteria, Pilot plants, Treatment facilities, Clarification, Municipal wastes, Organic loading, Porous media, Waste water treatment.

An activated carbon adsorption model which considers the effects of biological activity within the column is presented. The fact that substances introduced to the column may or may not be biodegradable and/or adsorbable has been considered. Input parameters required for the model include: bulk liquid and bacterial film diffusivities, particle diffusion coefficient, liquid phase mass transfer coefficient, bacterial film thickness, bacterial reaction rate, and the estimation of residual yield factor. Pilot plant data on physical-chemical treatment at the Dundas Water Pollution Control Center in Ontario, Canada, the Ewing-Lawrence Sewage Authority plant in New Jersey, and the Los Angeles County Sanitation Districts Advanced Waste Treatment Research Facility in Pomona, California, were simulated to test the model's validity. The specific biological reaction rates calculated for the three plants had a mean of 1.59 x 10 to the minus tenth g TOC/sq cm-sq with a standard deviation of 1.53 x 10 to the minus tenth g TOC/sq cm-sec. (Schulz-FIRL)
W78-04628

PHYSICAL AND MATHEMATICAL MODEL OF MASS TRANSFER AND REACTION KINETICS OF OZONATION,
Anderson-Nichols and Co., Boston, MA.
A. B. Majumdar, W. H. Ceckler, and O. J. Sproul.
AIChE Symposium Series, Vol. 73, No. 166, p 188-205, 1977. 7 fig, 7 tab, 11 ref.

Descriptors: *Ozonation, *Mathematical models, *Ozone, *Oxidation, *Model studies, *Kinetics, Transfer, Chemical reactions, Waste water treatment.

Since the exact mechanism of ozonation has not yet been established, a discussion is presented to delineate the fundamentals of ozonation with respect to mass transfer and reaction kinetics. A theoretical model which is presented assumes a first order relationship between the rate of mass transfer and the difference in the bulk phase concentration of ozone. A two-step process is assumed for the model. Ozone is first transferred from gas to liquid by a mass transfer process which is not dependent upon chemical reaction. The chemical reaction between ozone and the waste material then proceeds without regard to mass transfer. Expressions for mass transfer of ozone from the gas phase to the liquid phase are derived with respect to a counter-current bubble column. The reaction rate constant and the order of the reaction are defined for the reaction of ozone with the dissolved and suspended substances in waste water. Results of kinetic studies on primary and secondary waste waters are presented. Bubble size, interfacial area, and residual ozone concentrations were determined in the studies. (Schulz-FIRL)
W78-04629

ACTIVATED SLUDGE-UNIFIED SYSTEM DESIGN AND OPERATION,
Clemson Univ., SC. Dept. of Environmental Systems Engineering.
T. M. Keinath, M. D. Ryckman, C. H. Dana, and D. A. Hofer.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE5, p 829-849, October, 1977. 11 fig, 2 tab, 19 ref, 1 append.

Descriptors: *Activated sludge, *Analytical techniques, *Sedimentation rates, *Treatment facilities, *Design, Biological treatment, Operation and maintenance, Evaluation, Aeration, Waste water treatment.

The settling flux approach can be adapted for evaluating economic tradeoffs between alternative designs for waste water treatment systems. The design basis for the aerator incorporates solids residence time and hydraulic residence time. The design basis for the clarifier incorporates the clarification constraint, and a recycle rate constraint. This methodology can be used for evaluating the economic aspects of an activated sludge system consisting of an aeration basin, clarifier, and sludge processing equipment. The settling flux approach can also be used in operations monitoring of an activated sludge system. This approach indicates that increased hydraulic flow rates would only cause solids to enter the effluent at certain critically located state points near the settling flux curve. For decreased hydraulic flow rates, the recycle rate could be reduced to the point of critical loading. The settling flux approach indicates that flow proportional recycle controls can estimate the required flow fairly accurately. It does not, however, provide the precise recycle rate required to maintain the clarifier in a critically loaded condition. This approach can also establish the hydraulic surge that a system could accommodate without indiscriminate solids wasting. This approach can only be used for operations monitoring and control if current settling flux curves are available. Changes in the operational set-point of solids residence time can be accomodated by changes in the solids wasting program. (Snyder-FIRL)
W78-04630

EFFECTS OF EXTERNAL MASS TRANSFER AND INTRAPARTICLE DIFFUSION ON ADSORPTION RATES IN SLURRY REACTORS,
Williams and Works, Grand Rapids, MI.
A. P. Mathews, and W. J. Weber, Jr.
AIChE Symposium Series, Vol. 73, No. 166, p 91-98, 1977. 13 fig, 6 ref.

Descriptors: *Activated carbon, *Adsorption, *Model studies, *Mass transfer, *Diffusion, Equilibrium, Chemical reactions, Separation techniques, Water treatment, Waste water treatment, Slurries.

Studies were conducted to evaluate the relative effects of liquid and solid phase transport rates on the overall adsorption rate of carbon in slurry reactors. The effects of external mass transfer, unsteady state surface diffusion in the particle, and nonlinear adsorption isotherms were considered. The results of the study indicated that, in general, film diffusion controls the solute uptake rate in the initial stages, followed by particle diffusion in the latter stages. The initial uptake rates predicted by an adsorption model were compared with those of film diffusion-controlled adsorption. Negligable intraparticle diffusion resistance was considered a valid assumption for the initial adsorption period, in the case of solutes having large solid-to-liquid phase equilibrium solute distribution. However, the errors were considered substantial beyond the first few minutes, especially at a high agitation power input. The effect of variation in the external mass transfer resistance on the concentration/time profile was examined for four solutes. At the same agitation speed, solutes having a high solid-to-liquid phase equilibrium solute distribution appeared to be more sensitive to the external mass transfer resistance. Substantial deviations in profiles were illustrated for variations of 20-30% in the mass transfer coefficient. (Baker-FIRL)
W78-04631

MODELS FOR BATCH MIXING IN AIR AGITATED TANKS,
Windsor Univ., (Ontario). Dept. of Chemical Engineering.
W. Akhtar, and G. P. Mathur.
AIChE Symposium Series, Vol. 73, No. 167, p 6-14, 1977. 8 fig, 14 ref.

Descriptors: *Aeration, *Diffusion, *Mixing, *Circulation, *Model studies, Design criteria, Testing, Waste water treatment.

Efforts to develop a mathematical model to describe mixing in a batch aerated rectangular tank are described. Variations in the air flow rate and tank dimensions were used to test the model. The model for batch mixing is based on a two-dimensional description of the mixing phenomenon. Results of 17 experimental runs indicate that the vortex model for predicting mixing characteristics of an air-agitated tank provides an extension to computer models used for mixer design. Measurements of surface and bottom velocities at the mid-length of the tank are required by the model for estimation of the necessary velocities and diffusion coefficients. Extension of the approach to geometries other than the rectangular one used in the study is suggested. (Baker-FIRL)
W78-04632

MAPPING THE LAG PHASE AND BOUNDING THE GROWTH PHASE IN FERMENTATION REACTIONS,
Vanderbilt Univ., Nashville, TN.
R. D. Tanner, A. C. Loo, J. L. Shisler, M. W. Reed, and R. D. Rowlett.
AIChE Symposium Series, Vol. 73, No. 167, p 55-65, 1977. 8 fig, 19 ref, 4 append.

Descriptors: *Fermentation, *Model studies, *Mathematical models, *Microorganisms, *Growth rate, Biological treatment, Enzymes, Equations, Waste water treatment.

An analytical expression has been derived for the initial transient domain (lag phase) of fermentation reactions, such as those which occur in the sludge fermentors used for liquid waste treatment.

Parameters for gluconic acid fermentation were estimated to a first approximation. A fermentation was applied to mixed culture fermentation in liquid waste treatment. Used in conjunction with in vitro enz yme data for the glucose-gluconolactone-gluconic acid network, the approximation procedure was suggested as an efficient and feasible method of identifying a substrate-limited fermentation model. Examination of the complementary logarithmic-growth phase, typically described by a hyperbolic equation relating substrate concentration to specific cell growth rate, indicated that the lower bound for a simplified mass action fermentation kinetic model was defined by the Monod equation. The upper bound was defined by a hyperbolic quasi-equilibrium counterpart of the Monod equation. These boundaries are analogous to the Briggs-Haldane and Michaelis-Menten relationships, respectively, for the single intermediate enzyme reaction. (Baker-FIRL)
W78-04633

A DYNAMIC KINETIC MODEL OF THE ACTIVATED SLUDGE PROCESS,
Measurex Corp., Cupertino, CA.
L. M. Chase.
Biotechnology and Bioengineering, Vol. 19, No. 10, p 1431-1447, October, 1977. 7 fig, 11 ref.

Descriptors: *Mathematical models, *Activated sludge, *Enzymes, *Model studies, Sludge treatment, *Biological treatment, Kinetics, Sewage bacteria, Waste water treatment.

A kinetic model for the activated sludge process based on the assumption that the rate of metabolism is primarily controlled by the enzyme concentration in the biological mass is presented. Four hypotheses for substrate utilization are described. A differential equation for the substrate concentration is derived and equilibrium conditions are defined. Solutions to the equations are presented for three feed functions which define a step decrease, a step increase, and an instantaneous change in the feed rate. Laboratory experiments with activated sludge were conducted to test the theoretical model's ability to predict substrate utilization in terms or CO2 production. Correspondence between the experimental results and the model calculations was favorable with respect to a yield factor. (Schulz-FIRL)
W78-04634

ABSORPTION AND DECOMPOSITION OF OZONE IN AQUEOUS SOLUTIONS,
Mississippi State Univ., Mississippi State.
C. H. Kuo, K. Y. Li, C. P. Wen, and J. L. Weeks, Jr.
AIChE Symposium Series, Vol. 73, No. 166, p 230-241, 1977. 10 fig, 22 ref.

Descriptors: *Waste water treatment, Analytical techniques, *Absorption, *Chemical reactions, *Ozone, Aqueous solutions, Municipal wastes, Kinetics, Hydrogen ion concentration, Equations, *Decomposition.

A stopped-flow spectrophotometer system was used to study kinetics of the decomposition of ozone in aqueous solutions. Experiments were conducted at 15, 25, and 35C over a pH range of 2.2-11.0. The kinetics of ozone decomposition were found to follow a three-halves order relationship with respect to ozone concentration. The decomposition rate increased with the pH of the aqueous solutions. Differential equations governing molecular diffusion and decomposition in the ozone absorption process were solved by finite difference techniques. Absorption experiments were conducted utilizing a gas-liquid contacting reactor equipped with a gas disperser. The experimental data and theoretical results agreed in predicting build-up of absorbed ozone in an aqueous solution. They also indicated that it might be difficult to achieve a saturation concentration of absorbed ozone in an aqueous solution because of ozone depletion by decomposition during absorption. Ozone absorption under acidic conditions and at a moderate-to-fast gas flow rate was recommended for a high degree of ozone utilization. (Snyder-FIRL)
W78-04636

MASS TRANSFER COEFFICIENTS FOR THE OZONE-WATER SYSTEM,
Louisville Univ., KY.
D. A. Richards, M. Fleischman, and L. P. Ebersold.
AIChE Symposium Series, Vol. 73, No. 166, p 213-224, 1977. 5 fig, 7 tab, 8 ref.

Descriptors: *Model studies, *Ozone, *Mass transfer, *Absorption, *Mathematical models, Municipal wastes, Oxidation, Treatment facilities, Effluents, Waste water treatment.

An 0.75 in-diam static mixer with 42 elements was used in studies on the ozonation of secondary effluents. Within 2-7 sec, the static mixer reduced COD and bacteria to the same extent as a Welsbach reactor could in 22 min. This suggested that ozonation of waste water was controlled by mass transfer. To examine the mass transfer characteristics in the absence of chemical reaction, a 2-4% by weight ozone-oxygen gas mixture was contacted with water in a 0.25 in-diam static mixer having 21 elements housed in a horizontal glass tube. The ozone balance between the two phases was measured according to the quantity of ozone absorbed in water. The mass transfer coefficient for static mixing was at least twice that obtained without mixing for all combinations of flow rates tested. Overall mass transfer coefficients were related to the void fraction and Reynolds number. At low liquid flow rates, significant power loss was produced as a result of an increase in gas flow rate, although the mass transfer coefficient was relatively unchanged. Liquid phase resistance was found to be greater than gas phase resistance. (Synder-FIRL)
W78-04637

DYNAMIC SIMULATION OF CONTINUOUS SEDIMENTATION,
Diamond Shamrock Co., Painesville, OH.
U. Attir, M. M. Denn, and C. A. Petty.
AIChE Symposium Series, Vol. 73, No. 167, p 49-54, 1977. 3 fig, 1 tab, 9 ref.

Descriptors: *Waste water treatment, Analytical techniques, *Treatment facilities, *Model studies, *Simulation analysis, *Sedimentation, Municipal wastes, Mathematical models, Entropy, Equations.

The assumption that only discrete layers of constant concentration and underflow rate exist in continuous sedimentation may not always be valid. The Chi-Howell model for settler dynamics in extended to account for continuous concentration variations with height in place of unallowable discontinuities. Discontinuous, layered solutions must sometimes be excluded because of Lax's generalized entropy condition, the generalized entropy condition for the partial differential equations describing the dynamics of the process. When this happens, a series of discrete layers which span the concentration range is inserted. The removal of unallowable concentration discontinuities can have a major effect on the simulated process dynamics and the dynamics and control system design for the integrated waste water treatment process. (Snyder-FIRL)
W78-04638

RECYCLING SEWAGE THROUGH PLANT COMMUNITIES,
Marine Biological Lab., Woods Hole, MA.
For primary bibliographic entry see Field 5E.
W78-04639

MAINE WASTEWATER TREATMENT PLANT OPTS FOR SOLAR HEATING,
Water and Sewage Works, Vol. 124, No. 11, p 72, November, 1977.

Descriptors: *Design, *Treatment facilities, *Heating, *Solar radiation, *Cooling, Equipment, Temperature control, Construction materials, Structural design, Waste water treatment, *Maine

The design for the rook and parts of the walls of the waste water treatment plant in Ellsworth, Maine, includes passive solar collector panels constructed of aluminum and translucent fiberglass. The ten sliding roof panels allow solar heat and light to enter the building and also provide natural ventilation during the summer months. Land costs, the effect of the location on construction and operating costs, topography, soils, environmental impact, influence on property values, and multiple site utilization were all considered before the plant's location was finalized. A town-owned, waterfront parcel in a residential area was selected for the plant. Because of the plant's compact design a recreational area will also be situated at the site. Heating costs are being minimized by the use of a system which differentially supplies heat to areas occupied only by mechanical equipment and those occupied by plant personnel. The solar collector panels were manufactured by the Kalwall Corporation of Manchester, New Hampshire. (Schulz-FIRL)
W78-04640

BALANCE IN TRAINING FOR LATIN AMERICAN WATER AND WASTEWATER UTILITIES,
Pan American Health Organization, Lima (Peru).
For primary bibliographic entry see Field 5F.
W78-04641

EVALUATING WASTEWATER FACILITY STAFFING NEEDS,
Culp, Wesner, Culp-Clean Water Consultants, El Dorado Hills, CA.
For primary bibliographic entry see Field 5G.
W78-04642

ENVIRONMENTAL PROBLEMS OF INDIA AND THEIR POSSIBLE TRENDS IN FUTURE,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 5G.
W78-04643

SEWERAGE COSTS RISING AT A FASTER PACE.
For primary bibliographic entry see Field 5G.
W78-04644

COMMUNITY ACTION ON WATER POLLUTION,
Cook Coll., New Brunswick, NJ. Dept. of Human Ecology.
For primary bibliographic entry see Field 5G.
W78-04645

PHOSPHATE PROBLEMS COME TO THE UNITED KINGDOM,
F. W. Roberts.
Effluent and Water Treatment Journal, Vol. 17, No. 11, p 599-600, November, 1977.

Descriptors: *Phosphates, *Sewage treatment, *Coagulation, *Sewage effluents, *Nuisance algae, Detergents, Biological treatment, Nitrogen, Phosphorus, Europe, Municipal wastes, Waste water treatment, Waste water disposal, *United Kingdom.

Nitrogen and phosphorus in effluents will stimulate plant growth, causing eutrophication of

receiving waters. There is also a possibility of adverse health effects due to nitrates. Since plant growth requires a number of nutrients, limiting the supply of one element will limit algal proliferation. Limiting phosphate is considered the most economical option because most phosphate can be traced to sewage effluent, while much of the nitrate is contributed by drainage from agricultural land. The Anglian Water Authority reported severe algal growth, attributed to high phosphate levels, in one of their reservoirs. Nitrilo-triacetic acid (NTA) could be used as a substitute for tripoliphosphate in detergents. Because of health objections to NTA, chemical coagulation will probably be used to remove phosphates from sewage. The coagulants can be added during primary sedimentation, during biological treatment, or during tertiary treatment. Ferrous sulfate added during biological treatment will be oxidized to ferric sulfate, which has superior properties in phosphate removal. (Snyder-FIRL)
W78-04647

CALIFORNIA TAKES HALTING LEAD ON SEWAGE PLANT CM.
For primary bibliographic entry see Field 5G.
W78-04648

EPA HALTS AWARD.
For primary bibliographic entry see Field 5G.
W78-04650

SEWER USE CHARGE SURVEY REVEALS WIDELY DIVERGENT POLICIES,
Charlotte/Meklenburg Utility Dept. Charlotte, NC.
For primary bibliographic entry see Field 5G.
W78-04651

REGIONAL WATER QUALITY PLANNING: A VIEW FROM SOUTHEAST MICHIGAN,
For primary bibliographic entry see Field 5G.
W78-04652

EPOXY COATED GRATING RESISTS CORROSION IN SEWAGE PLANT APPLICATION,
For primary bibliographic entry see Field 8G.
W78-04654

KANSAS TREATMENT PLANT USES SUBSURFACE INJECTION OF SLUDGE,
Black and Ventch, Consulting Engineers, Kansas City, MO.
R. E. Strain.
Water and Sewage Works, Vol 124, No 11, p 42-44, November, 1977. 2 fig, 1 tab, 1 ref.

Descriptors: *Waste water treatment, *Municipal wastes, *Sewage treatment, *Sewerage, *Treatment facilities, *Kansas, Injection, Sludge, Sludge disposal, Land use.

Design features of the Manhattan, Kansas, municipal waste water treatment plant include subsurface injection of sludge on farmland, preloading of the poorly consolidated soils, no primary sedimentation, and duplication of power supply and treatment components. The fill material excavated during construction of underground structures at the sludge injection site was used in levees for the storm water lagoon. The activated sludge plant and an interceptor sewer were constructed near a flood control levee on the Kansas River. Wet weather flows in excess of the design maximum dry weather flow are pumped to a storm-water settling basin. After excess flows subside, the storm water is returned to the plant for treatment. The treatment system includes an aerated grit removal basin, two comminutors, two aeration basions, two final sedimentation basions, and two chlorine contact basins. Waste sludge is piped to the center of each 16-acre sludge disposal tract at the 120-acre site. A hose carries the sludge to the tractor-pulled subsurface injector. Construction costs of the treatment plant and sludge handling and injection equipment were approximately $7,220,000. (Snyder-FIRL)
W78-04655

POLLUTED WATER PURIFICATION,
Phillips Petroleum Co., Bartlesville, OK. (Assignee).
E. O. Box, Jr., and F. Farha, Jr.
United States Patent 4,062,772. Issued December 13, 1977. Official Gazette of the United States Patent Office, Vol. 965, No. 2, p 637, December, 1977.

Descriptors: *Organic wastes, *Aeration, *Manganese, *Bismuth, *Patents, Oxidation, Water reuse, Chemical reactions, Catalysts, Waste water treatment.

A patent has been issued for a treatment process to be used with waste water containing dissolved and suspended organic material. The waste water in contacted with an oxygen-containing gas and a catalyst, at temperatures and oxygen levels suitable for the oxidation of the organic materials. The catalyst is in the form of a solid copper manganite spinel structure promoted with bismuth. The Cu:Mn atomic ratio is in the range of 0.25:1-4:1; the Bi:Mn ratio ranges 0.003:1-0.5:1. the process converts the organic wastes into innocuous materials and yields a potable aqueous product which can be safely discarded or reused. (Schulz-FIRL)
W78-04700

5E. Ultimate Disposal Of Wastes

LEACHATE PRODUCTION AT SANITARY LANDFILL SITES,
Ayres (Owen) and Associates, Inc., Eau Claire, WI.
For primary bibliographic entry see Field 5B.
W78-04201

GEOCHEMICAL EFFECTS OF RECHARGING THE MAGOTHY AQUIFER, BAY PARK, NEW YORK, WITH TERTIARY-TREATED SEWAGE,
Geological Survey, Mineola, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-04261

REPORT OF THE LAND DISPOSAL OF SLUDGE SUBCOMMITTEE PROJECTS CONDUCTED 1971 - 1978,
Canada-Ontario Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, Research Report No. 70, 1977. 62 p.

Descriptors: *Sewage, Sewage sludge, *Sewage disposal, *Heavy metals, *Agricultural chemicals, Land, Disposal, Chemicals, Chemical wastes, Lysimeters, Sampling, Parasites, Polychlorinated biphenyls, Canada, *Enteroviruses, *Sewage sludge utilization, *Sludge handling and disposal.

This report is an account of the Land Disposal of Sludge Subcommittee between 1971 and 1978, one of the subcommittees of the Canada-Ontario Agreement Research Program for the Abatement of Municipal Pollution. The report contains project summaries on the following: (1) Examination of sewage and sewage sludge for enteroviruses; (2) heavy metals in agricultural lands receiving chemical sewage sludges; (3) land disposal of sewage sludge; (4) chemical sewage sludge disposal on land - lysimeters; (5) sewage sludge interactions with soil materials; (6) biochemical characteristics of digested chemical sewage sludges; (7) Land application of sewage sludge under adverse conditions; (8) development of an efficient sampling strategy to characterize digested sludges; (9) investigation of parasites in sewage sludge sludge; (10) survey of Ontario sludge disposal practices; (11) determination of existing levels of PCB's and heavy metals at selected sludge disposal sites in Ontario. (WATDOC)
W78-04351

REUSE OF WASTE S02 AND PHOSPHATE SEWAGE SLUDGES BY SOLIDIFICATION WITH LIME AND FLY ASH.
Acres Consulting Services Ltd., Niagara Falls (Ontario).
For primary bibliographic entry see Field 5D.
W78-04360

CHEMICAL SEWAGE SLUDGE DISPOSAL ON LAND (LYSIMETER STUDIES) VOLUME 1,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
V. K. Chawla, D. N. Bryant, D. Liu, and D. B. Cohen.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 67, 1977. 98 p, 5 fig, 62 tab, 35 ref, 2 append.

Descriptors: *Lysimeters, *Sewage sludge, *Sewage disposal, *Chemicals, *Chemical wastes, Agriculture, Soils, Soil chemistry, Soil analysis, Testing, Crop production, Crop response, Orchardgrass, Plant tissues, Leachate, Microbiology, Analysis, Bacteria, Metals, Nitrogen, Potassium, Methodology, *Chemical sludge, Experimental design, Experimental facilities.

A lysimeter project using two typical Ontario agricultural soils was initiated in October, 1972 at the Wastewater Technology Centre, Burlington. The experiment was designed as a randomized block of 22 treatments (11 fertility treatments to each soil). These 22 treatments were replicated three times for a total of 66 lysimeters. The 11 fertility treatments consisted of three chemical sludge types (alum, iron and lime) each at three application rates, plus two controls (with and without NPK fertilizer). Cumulative sludge application rates at the end of 1974 were 700, 1400, and 2100 kg TKN per ha. Orchard grass was planted in the lysimeters in May, 1973 with subsequent grass harvests monitored for total dry matter yield, plant tissue chemical concentrations and uptakes. Leachate volumes, chemical constituents, and losses were determined, as were microbial concentrations in sludge, leachate, and soil. Chemical constituent material balances were calculated for each treatment. Increasing rates of sludge application up to a cumulative loading of 2100 kg TKN per ha produced increased yields. The highest grass yields in both 1973 and 1974 were obtained from the iron sludge at the highest application rate. Potassium concentrations in plants grown on 1974 in loamy sand were deficient (less than 1.0 percent K) at the higher sludge loading rates. Concentrations of N, P, Ca, and Mg were adequate, while Zn, Cu, Ni, Cr, Pb, and Cd concentrations were within their respective normal ranges. Of those leachate chemical constituents for which standards are available, Ca, Mg, Fe, Cu and Zn were within acceptable drinking water limits. (WATDOC)
W78-04361

LAND DISPOSAL OF CHEMICAL SLUDGE,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
J. T. Novak, and D. M. Sievers.
Available from the National Technical Information Service, Springfield VA 22161 as PB-277 989, Price codes: A04 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, July 30, 1977. 60 p, 22 fig, 7 tab, 21 ref. OWRT B-113-MO(3), 14-34-0001-6093.

Descriptors: *Waste disposal, *Land disposal, *Waste water disposal, Sludge, Lime sludge, Land utilization, Waste utilization, Soil properties, Alum sludge, Powerplant sludge, Fly ash, Slurries, *Sludge disposal, Water treatment, Soil treatment, Application rates.

Land disposal of chemical slurries generated from water treatment and power generation was investigated. Tests were conducted using soil columns of varying sizes and sludge was applied at several application rates. Most sludges cause no detrimental effects on soil structural properties. Most sludges were beneficial to soils, raising the pH and making the soils more workable. Only alum sludge was detrimental and only slightly so. Lime sludge from water treatment was an acceptable substitute for agricultural limestone.
W78-04371

PACKAGE PLANT FOR SLUDGE DISPOSAL.
Journal of the Institution of Engineers, Australia, p 25, October 9, 1977.

Descriptors: *Sludge disposal, *Asbestos cement, *Industrial wastes, *Waste water treatment, *Recirculated water, Cellulose, Silica, Cements, Separation techniques, Sludge treatment, Filtration, Centrifugation, Evaporation, Australia.

A system for the treatment and disposal of waste produced by an asbestos cement factory is described. The treatment plant, designed by Warman International, Ltd. of Australia, removes asbestos fiber, cellulose, ground silica, and cement from water which is eventually reused. Water is removed by a center shaft thickner which has an underflow discharge design. The thickener underflow is then dewatered by vacuum filtration, centrifugation, or evaporation. Vacuum filters are used when the waste contains fibrous or granular materials; clay-sized particles are removed through centrifugation or in evaporation ponds. After the solid filter cake produced by the filter is discharged, the filtrate is returned to the thickener. The system has a capacity of 41-273 cu m/day of effluent containing 0.1- 5.0% solids by weight. (Lisk-FIRL)
W78-04384

THE 'FIRE' NEXT TIME.
Environmental Science and Technology, Vol 12, No 2, p 134-136, February, 1978.

Descriptors: *Incineration, *Chemical wastes, *Chemical industry, *Oil industry, *Toxins, Waste water treatment, Municipal wastes, Industrial wastes, Treatment facilities, Pesticides.

A survey of liquid waste incinerator manufacturers focused on the current and future incinerator market, incinerator technology, and the long-range effects of pollution control regulations. Liquid waste incinerators, used in the disposal of toxic and hazardous wastes, are primarily purchased by chemical and petrochemical industries, municipal and federal treatment facilities, and industries producing toxic sludge or slurries. Companies which were surveyed anticipated combinations of existing incinerator designs for more effective and refined waste disposal rather than technological innovations. Incineration was considered the more durable method of reducing toxic waste to noxious material as pollution regulations become stricter. Experimental projects conducted by incinerator manufacturers showed that 100% destruction of Kepone pesticide residues and vapors could eventually be achieved at temperatures of 1000 F and 1900 F, respectively. The possibility of using wastes of one type in the treatment of other wastes or as an energy source for incineration was suggested. (Lisk-FIRL)
W78-04385

EFFLUENT TREATMENT IN MEAT AND POULTRY PROCESSING INDUSTRIES,
Alwatech Ltd., High Wycombe (England)
For primary bibliographic entry see Field 5D.
W78-04393

FOOD FROM WASTE.
Effluent and Water Treatment Journal, Vol 17, No 11, p 571, November, 1977.

Descriptors: *Food processing, *Effluents, *Fermentation, *Recycling, *Biochemical oxygen demand, Carbohydrates, Nutrient removal, Proteins, Industrial wastes, Waste water treatment.

A contract was awarded by a leading confectioner in England to Farrow Effluent Engineering Ltd. of Spalding, England, to design, supply, and construct a system for the treatment of waste water produced during their manufacturing process. The Farrow process is designed to produce a valuble byproduct, in the form of a single cell protein, from effluents containing a high concentration of carbohydrates. This protein byproduct can be used as a supplement in animal feeds. The process includes equalization, nutrient addition, pasteurization, and sterilization as required, prior to the injection of a yeast culture. A selected culture fermentation process is used to reduce the COD of the effluent under controlled pH and temperature conditions. Spray drying of the treated effluent is expected to yield 300-400 tons/yr of the protein byproduct. (Baker-FIRL)
W78-04394

RECOVERY OF WATER FOR RE-USE.
For primary bibliographic entry see Field 5D.
W78-04395

POLYETHYLENE PIPELINE CARRIES TREATED BALLAST FOR UNDERWATER DISCHARGE.
World Dredging and Marine Construction, Vol. 13, No. 13, p 32-34, December, 1977. 1 fig.

Descriptors: *Oil pollution, *Alaska, *Pipelines, *Discharge lines, *Plastic pipes, Oil pollution, Oily water, Waste water treatment, Industrial wastes, Earthquakes, Seismic waves, Structural stability, Settling basins, Construction materials.

The treatment and discharge of seawater ballast from oil tankers is described. The ballast is carried by the tankers that come into Port Valdez, Alaska, for oil shipments. The seawater ballast is pumped onshore into storage tanks where the water settles and oil residues are skimmed. The ballast is then cleaned and transferred to holding ponds. A 48 indiam polyethylene pipe was laid along the floor of the harbor in 60-ft lengths connected by butt-fuse joints and steel flanges. The treated ballast is pumped through the pipe and discharged at a point about 1,000 ft offshore and 242 ft below the surface. The polyethylene pipeline is designed to withstand earthquakes, seismic sea waves, low temperatures and chemical corrosion. The pipeline transports up to 33.6 mgd of treated ballast. (Lisk-FIRL)
W78-04402

PULP AND PAPER MILL SLUDGE IN FIBRE BOARD,
Norwegian Pulp and Paper Research Inst., Oslo.
G. Rodland, and K. Helge.
Norsk Skogindustri, Vol. 31, No. 10, p 258-263, 1977. 9 fig, 3 tab, 5 ref.

Descriptors: *Pulp wastes, *Pulp and paper industry, *Recycling, *Sludge disposal, *Construction materials, Fibers(Plant), Industrial wastes, Sludge treatment, Waste water disposal.

Laboratory- and full-scale experiments at the Norwegian Pulp and Paper Research Institute examined the use of waste fibers from pulp and paper mills for the production of fiber board. The results of these studies indicated that the fibrous sludge could be used to supplement raw material for different kinds of fiber boards. Sludge addition did not significantly affect the fiber board quality. Although sludge addition did not increase waste water treatment requirements, process modifications were required in some instances. When clay-containing sludge was added, some alterations were required in the suction and press parts of the forming machine. Without a reinforced middle layer, the hot pressing time had to be increased for the manufacture of 12 mm semihardboard containing 6-7% sludge. Pitch-containing sludge from a sulfite mill seemed to be well suited as additional pulp for insulating board. Good surface properties were obtained when sulfide sludge comprised 50% of the insulating board's surface layer. (Baker-FIRL)
W78-04404

INCINERATION OF TANNERY WASTE,
Jones and Beach Engineers, Inc., Stratham, NH.
B. H. Jones.
The Leather Manufacturer, Vol. 94, No. 12, p 26-27, December, 1977. 1 tab.

Descriptors: *Incineration, *Chromium, *Tanneries, *Metals, *Adsorption, *Treatment facilities, *Industrial wastes, Sludge treatment, Sludge disposal, Recycling, Waste water treatment, Waste treatment.

An incineration process which recovers chromium in a totally hexavalent state from chromium hydroxide treatment plant sludges and/or leather tannery solid wastes is described. The process does not volatilize the nitrogen compounds, thus avoiding corrosion problems that have occurred with other recovery processes. This process includes: the controlled incineration of all chromium bearing waste from a tannery, both liquid and solid; conversion of virtually all the chromium into a hexavalent form; and solvent extraction of the hexavalent chromium from the ash. Substantial quantities of solid tannery waste are burned in a furnace at a relatively low, controlled temperature between 800 and 1200F. Sufficient alkali is introduced to oxidize the majority of the chromium in the ash to hexavalent chromium; the gases are subjected to further oxidation. The ash contains 10-30% hexavalent chromium which is soluble in both water and acid solutions. The resulting chromate ore produced may be easily handled by chemical companies experienced in chromium processing. Experience with the process at the Newburyport Tanning Company in Newburyport, Massachusetts, and at the Saco Tanning Company in Saco, Maine, are presented. (Baker-FIRL)
W78-04409

VALDEZ OUTFALL LINE IS EARTHQUAKE-PROOF.
Sea Technology, Vol. 18, No. 10, p 24-25, October, 1977.

Descriptors: *Oil pollution, *Alaska, *Pipelines, *Discharge lines, *Plastic pipes, Oil pollution, Oily water, Waste water treatment, Industrial wastes, Earthquakes, Seismic waves, Structural stability.

The discharge of treated ballast into Port Valdez harbor in Alaska through the world's largest polyethylene pipe is discussed. The pipeline, which transports treated seawater ballast from oil tankers from the onshore treatment site to a point 1,000 feet offshore was laid 242 feet below the sea surface. The outfall line, which discharges up to 33.6 mgd of effluent with less than 8 ppm of oil, is designed to adhere to strict guidelines for underwater and surface construction established by environmental authorities. The polyethylene pipeline is 48 inches in diameter with walls 1.5

inches thick and is capable of withstanding an earthquake measuring up to 8.5 on the Richter Scale. The flexible, high density pipe is designed to endure low temperatures and large seismic waves. Butt-fusion joints, which are leakproof, connect the 60-foot lengths of pipe. (Lisk-FIRL)
W78-04413

PROCEEDINGS OF THE SIXTH NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES, APRIL 9-11, 1975.
For primary bibliographic entry see Field 5D.
W78-04417

UTILIZATION OF CHITOSAN FOR RECOVERY OF COAGULATED BY-PRODUCTS FROM FOOD PROCESSING WASTES AND TREATMENT SYSTEMS,
Georgia Univ., Experiment. Dept. of Food Science.
For primary bibliographic entry see Field 5D.
W78-04419

EVALUATION OF WASTE DISPOSAL PRACTICES OF ALASKA SEAFOOD PROCESSORS.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 626, Price codes: A15 in paper copy, A01 in microfiche. Report EPA/330/2-75/001, December 1974. 338 p, 61 fig, 56 tab, 6 ref, 5 append.

Descriptors: *Food processing industry, *Fish handling facilities, *Canneries, *Freezing, *Pollutant identification, Salmon, Crabs, Shrimp, Treatment facilities, Industrial wastes, Waste water treatment.

Waste disposal practices and treatment needs were evaluated at 26 facilities for freezing and canning salmon, crab, and shrimp in Alaska. Water quality was studied at 15 of the facilities in Bristol Bay, the Alaska Peninsula, and Southeast Alaska. Waste disposal methods were compared; effects of waste discharges on the aquatic environmrnt were studied; and solid waste distribution patterns were determined. The degree of treatment required to protect receiving waters was also examined. Scouring and tidal dispersion determined the level of treatment required. Dispersion prevented deposition of discharged solids when the outfalls were located in areas subject to fast-moving tides and lower than low water, and only wastes that have been ground were discharged. The discharge of unground wastes into tidal areas resulted in bottom deposition and water quality problems. This also occurred when ground or unground wastes were discharged to beaches or quiescent or shallow waters. Dissolved oxygen monitoring was considered unnecessary because of the area's large tidal volume and degree of mixing. (Snyder-FIRL)
W78-04439

MECHANICAL DEWATERING ALTERNATIVES FOR WASTE ACTIVATED SLUDGE--A PILOT STUDY,
National Council for Air and Stream Improvement, Kalamazoo, MI.
For primary bibliographic entry see Field 5D.
W78-04471

STATE-OF-THE-ART SURVEY AND EVALUATION OF OPEN-WATER DREDGED MATERIAL PLACEMENT METHODOLOGY,
JBF Scientific Corp., Wilmington, MA.
E. E. Johanson, S. P. Bowen, and G. Henry.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 024, Price codes: A09 in paper copy, A01 in microfiche. Contract Report D-76-3, Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, April 1976. 196 p, 20 fig, 12 tab, 56 ref, 2 append. DACW39-74-C-0087.

Descriptors: *Dredging, *Sediments, *Reviews, Sediment control, Water, Oceans, Barges, Disposal, Borrow pits, Evaluation, *Dredged material, *Placement methodology, Open-water dredging, Hoppers, Dump size, Open-water disposal, Scows, Hopper dredges.

The dumping of dredged material into a borrow pit is feasible using hopper dredges provided that an auxiliary navigation capability such as an instrumented buoy at the center of the borrow pit or an electronic precision navigation system is available. Borrow pit dumping is undertaken less easily with barges and tug boats because of the inability to control accurately the position of the barges. Borrow pits have to be several acres in size and have dimensions sufficient to allow radial spreading of several hundred feet. No estimate of the long-term fate of dredged material placed in a borrow pit can be made. The concept of covering polluted dredged material was not considered efficient unless undertaken immediately after disposal. It was concluded that field and laboratory studies should be initiated to identify and to quantify the physical membranes associated with open-water disposal operations and that field and laboratory studies should be initiated to identify and to quantify the physical mechanisms associated with open-water disposal operations and that field demonstration and an evaluation of the horizontal pump-down concept should be developed. (Roberts-ISWS)
W78-04533

DREDGED MATERIAL RESEARCH PROGRAM, THIRD ANNUAL REPORT.
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 300, Price codes: A05 in paper copy, A01 in microfiche. January 1976. 78 p, 34 fig.

Descriptors: *Environmental effects, *Dredging, *Environmental engineering, Environment, Research facilities, Water, On-site investigations, Wetlands, Marsh management, Research priorities, Projects, Disposal, Effects, Water quality, Habitats, Marsh development.

The objectives of the Dredged Material Research Program (DMRP) are to provide through research definitive information on the environmental impact of dredging and dredged material disposal operations and to develop technically satisfactory, environmentally compatible, and economically feasible dredging and disposal alternatives, including consideration of dredged material as a manageable resource. Specific goals of the DMRP are to determine the effects of open water, land, and wetland disposal on water quality and organisms; to test and to evaluate concepts of marsh development and land and water habitat development as environmentally beneficial disposal alternatives; to improve and to enhance the acceptance of confined land disposal as an alternative; to consider regulation of the dredging disposal operation as an environmental control measure; to develop and to test concepts for using disposal sites for productive purposes; and to consider the use of dredged material as a natural resource. Presented in the report was detailed information on the status of the DMRP up to January 1, 1976. Highlights of 1975 were accented, objectives of the field studies were emphasized and illustrated, and attention was given to results achieved or anticipated. (Roberts-ISWS)
W78-04534

NEW PORTOBELLO OUTFALL, BRIGHTON.
Water Services, Vol. 81, No. 982, p 764-766, December, 1977. 2 fig.

Descriptors: *Outfall sewers, *Pumping plants, *Discharge(Water), *Flow system, Tides, Oceans, Waste water treatment, *Waste water disposal, Treatment facilities, Sewers, Municipal wastes, Brighton(England).

A new outfall tunnel for the discharge of sewage effluents into the ocean has been constructed for the boroughs of Brighton and Hove in England. The outfall, whose construction began in 1971, was commissioned as a replacement for an outfall constructed in 1928 that had an average daily flow of 680 liters/sec. The new system has a daily flow capacity of 6800 liters/sec with an internal diameter of 2.13 meters. The outfall tunnel, which is 1830 meters long, is fitted with a diffuser system containing nine shafts, each with a four-part diffuser head. A new pumping station was completed in 1975 to treat the influent. Solids are removed from the influent by coarse raked bar screens and fine mesh cup screens. Grit is removed before the effluent passes to the automatically controlled pump sets. Screened solids are dewatered, checked for magnetic content, and processed by a twin-screw press where the moisture content is reduced to 50-55%. The pumping system is capable of discharging effluent during all tidal stages, with the outfall designed to act as a pressure main. The treatment and outflow plant was built near chalk cliffs which were below the water table. Construction problems were overcome by the installation of a system of sand/cement grout curtain walls and a base plug to solidify the fissured chalk and control the water inflow. (Lisk-FIRL)
W78-04561

THE BANGOR PROJECT.
Building Systems Design, Vol. 74, No. 6, p 10-14, October/November, 1977. 1 fig.

Descriptors: *Fertilizers, *Sludge digestion, *Treatment facilities, *Biodegradation, *Pilot plants, Soil amendments, Municipal wastes, Sludge treatment, Waste water treatment, *Bangor(Maine), Composting(Sludge).

Details of a sludge composting project being conducted in Bangor, Maine, by the Office of Solid Waste Management Programs of the United States EPA are presented. Objectives of the Bangor project were to evaluate the effects of bulking agents on sludge, to examine the use of suction aeration for control of odors and pathogens in sludge composting, to survey public opinion on sludge composting, and to identify potential uses for the final product. The approximately 50 cu yds of sludge generated each week in Bangor is hauled to the composting site and mixed with bark waste at a ratio of 3 parts bark to one part sludge. The four 200-cu yd, active aerated compost piles which receive the sludge/bark mixture are equipped with a piping network for suction aeration to provide the necessary oxygen for microbial degradation and stabilization of the sludge. The compost piles are monitored daily for temperature and oxygen content to insure that microorganism requirements are met. Heavy metals, primary nutrients, fecal coliform, Salmonella, and pH are measured quarterly in the sludge and compost. Application of the screened compost is currently limited to non-food chain crops. (Schulz-FIRL)
W78-04566

COMPOSTING RAW SLUDGE,
Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
E. Epstein, and G. B. Willson.
Building Systems Design, Vol. 74, No. 6, p 14-19, October/November, 1977. 3 fig, 2 tab, 8 ref.

Descriptors: *Composting(Sludge), *Sludge treatment, *Fertilizers, *Treatment facilities, *Pilot plants, Biodegradation, Sludge disposal, Municipal wastes, Waste water treatment, Aeration, Equipment, Soil amendments.

The Agricultural Research Service in Beltsville, Maryland, has developed a composting system for primary and secondary undigested sludge. Earlier unsatisfactory experiences with the windrow system of composting led to the development of the forced aeration system. The raw sludge is first

mixed with bark or woodchips to provide bulk. Air is vacuum drawn through the pile while a cover of finely screened compost from previous compost operations prevents odoriferous gases from escaping into the atmosphere. Air suction is applied for a period of 10-14 days and then the cycle is reversed to conduct air into the pile for a period of 7-10 days. The compost is removed from the pile after 21 days and then moved to a stockpile for a 4-week curing period. The woodchips are recovered for reuse when the cured compost is screened. The compost pile is monitored to maintain temperatures of more than 45C and oxygen levels of 5-15%. Equipment requirements for the forced aeration system are detailed. Pilot studies on composting of sludge obtained at the Blue Plains Waste Water Treatment Plant in Washington, District of Columbia, are described. (Schulz-FIRL)
W78-04567

PYROLYZING SEWAGE SLUDGE ALONE MOVES SLOWLY TOWARD MARKET.
Engineering News-Record, Vol. 199, No. 14, p 76, 80, 83, October, 1977.

Descriptors: *Pyrolysis, *Incineration, *Fuels, *Sludge disposal, *Sewage disposal, *Costs, Municipal wastes, Equipment, Waste water disposal, Sludge treatment, Activated carbon, Waste water treatment.

The pyrolysis of sewage sludge, alone or in combination with refuse-derived fuel, has been investigated because of greater energy recovery and less air pollution than from conventional systems. Nichols Engineering and Research Corporation of Belle Mead, New Jersey, has proposed a plan for the pyrolysis of some 7,500 tons per day of wet sludge from New York City and the adjacent northern New Jersey area. The operation should produce an energy equivalent of $22 million per year of fuel oil at current prices. The need for alternative means of sludge disposal other than offshore dumping and the prohibitive costs of land disposal led to the selection of on-site disposal. Pyrolysis was chosen over conventional incineration because it would produce less air pollution and could be carried out on a smaller, decentralized basis. Various test programs were conducted on sludges from several New York City plants. A small pyrolysis plant has been installed in Deep Water, New Jersey for the pyrolysis of 21 tons per day of wet sludge in a partial mode. The Deep Water facility was also designed to regenerate activated carbon for use in the treatment process. (Schulz-FIRL)
W78-04575

HEAVY METALS IN SEWAGE SLUDGE MAY MAKE IT UNSAFE FERTILIZER.
Farm Chemicals, Vol. 140, No. 11, p 98, November, 1977.

Descriptors: *Soil-water-plant relationships, *Cadmium, *Heavy metals, *Sludge disposal, Fertilizers, Soil chemical properties, Waste water disposal.

Sewage sludge may contain too much cadmium, zinc, and copper to allow safe, application of the sludge as fertilizer on farm lands. Although crop growth can be enhanced by nutrients in sewage sludge, the levels of heavy metals in the edible parts of corn, potatoes, soybeans, wheat, and sorghum crops should be monitored. During recent tests in which 20 tons of sewage sludge per acre were applied to the soil, a significant increase in cadmium and other heavy metals was observed in corn, potatoes, and wheat planted the following year. Levels of cadmium were increased by 22 times in corn, 27 times in wheat grain, and 4.3 times in potatoes. The average diet presently contains about 80% of the safe level of cadmium. Therefore it is suggested that cadmium levels not be increased in soil through the application of heavy metal-rich sludges. (Baker-FIRL)
W78-04579

DECOMPOSITION OF SEWAGE SLUDGE COMPOST IN SOIL: I. CARBON AND NITROGEN TRANSFORMATION,
Agricultural Research Service, Beltsville, MD.
C. F. Tester, L. J. Sikora, J. M. Taylor, and J. F. Parr.
Journal of Environmental Quality, Vol. 6, No. 4, p 459-463, October-December, 1977. 3 fig, 2 tab, 32 ref.

Descriptors: *Carbon, *Nitrogen, *Sludge disposal, *Soil chemical properties, *Mineralogy, Soil physical properties, Ammonia, Waste water disposal.

The rate and extent of decomposition of sewage sludge compost in soil was studied in laboratory-scale incubation experiments. Freeze-dried compost made from undigested sewage sludge was added to a loamy sand, a slit loam, a silty clay, and a sand at rates of 0, 2, 4, and 6% of the dry weight. The soil-compost mixtures were incubated at 22C in a constant CO2 atmosphere under NH3-free conditions. Mineralization and decomposition rates were measured according to CO2 and NH3 evolution and changes in the organic and inorganic fractions of C and N with time. The cumulative CO2 evaluation was linearly related to the sludge compost application rate. About 16% of the compost C evolved in 54 days of incubation. N mineralization was lowest in the silt-loam compost mixture. In the sand-compost mixture, mineral N was immobilized during incubation, Evolution of NH3 may have occurred in the silt loam and silty clay soils. The study demonstrated that the application of sewage compost to different soils can result in different degrees of mineralization, despite the linear relationship between decomposition and sludge application rate. (Baker-FIRL)
W78-04581

UTILIZATION OF WASTEWATER RESIDUES TO RECLAIM DREDGED EMBANKMENTS,
T. Lee Go, N. C. Vasuki, and P. S. Canzano.
Water and Sewage Works, Vol. 124, No. 11, p 83-84, November, 1977.

Descriptors: *Sludge disposal, *Land reclamation, *Canals, *Dredging, *Channel improvement, Spoil banks, Waste water disposal, Municipal wastes, Environmental effects, Sampling, Fertilizers, Soil-water-plant relationships, Heavy metals, Plant growth.

Problems associated with the disposal of municipal waste water sludge containing higher than normal heavy metal concentrations have resulted in a study by the City of Wilmington, Delaware, on the utilization of wastewater residues for the reclamation of dredged embankments. The federally owned land along the banks of the Chesapeake and Delaware Canal was selected as the sludge disposal test site. Advantages afforded by the site included: protection of the water table aquifer by the mound of dredged materials, little potential for harvesting of food crops, and the need for stabilization of the dredge spoils. Studies were conducted to compare dredge spoil reclamation with digested sludge and commercial fertilizer. Digested sludge from the Wilmington sewage treatment plant was applied to the 16-acre test site at a rate of 45 tons per acre. The area was then seeded with a K-31 tall fescue. Soil core samples taken before and after sludge application were analyzed for metal and anions. The pH of the soil water extract was also measured. Experiences with the sludge application were favorable, as the low pH of the dredge spoil was raised from 3 to 4. The growth and regrowth responses of grasses in the sludge-treated area were also improved. Sludge application reduced the leaching of heavy metals from the dredge spoils. (Schulz-FIRL)
W78-04585

LAND APPLICATION GUIDELINES FOR SLUDGES CONTAMINATED WITH TOXIC ELEMENTS,
Northern Virginia Community Coll., Woodbridge. Div. of Environmental and Natural Sciences.
G. A. Garngan
Journal Water Pollution Control Federation, Vol. 49, No. 2, p 2380-2389, December, 1977. 5 tab, 25 ref.

Descriptors: *Sludge, *Toxins, *Federal Water Pollution Control Act, *Soil contamination, *Sludge disposal, *Nitrogen, Copper, Zinc, Nickel, Cadmium, Nutrients, Human pathology, Animal pathology, Vegetation effects.

Guidelines proposed for regulating the land application of municipal sludge containing toxic elements are reviewed. The first guideline limits sludge application on the basis of maximum concentrations of toxic elements in the sludge or the maximum ratio of ammonium nitrogen to toxic element concentrations. The major toxic elements discussed are zinc, copper, nickel, boron, and cadmium. The second guideline proposes maximum allowable concentrations of zinc, copper, and nickel in sludge destined for application to soils having no previous history of sludge application. This guideline would be modified to set limits for toxic elements in soil already having received sludge. The toxicity of cadmium to animals and humans is the concern of another guideline. An optimum nitrogen, or nutrient, loading rate to soil is suggested in the last guideline. (Lisk-FIRL)
W78-04588

IMPACT OF COMMUNITY PLANNING ON QUALITY OF LIFE IN THE NORTH,
Department of National Health and Welfare, Edmonton (Alberta). Medical Services.
J. Grainge.
Canadian Journal of Civil Engineering, Vol. 4, No. 4, p 436-444, December, 1977. 4 fig.

Descriptors: *Community development, *Environmental engineering, *Waste disposal, *Water conveyance, *Solid wastes, Recreation facilities, Long-term planning, Sewage lagoons, Permafrost, Ice fog, Canada, Arctic.

Environmental planning is necessary in northern Canadian communities to alleviate unsanitary living conditions and to protect the environment. Long range environmental engineering must conform with the severe climatic conditions in northern Canada. The climate and the isolated nature of the area also contribute to high construction costs and failure of conventional waste disposal and water supply methods. Settlement sites, road layout, recreational facilities and parks are considered important in planning. Consolidation of communities could provide the solution to problems such as ice fogs, high costs of long lengths of pipe needed for sewerage and water distribution systems, and road maintainance and building. Examples of well-planned communities in Finland, Greenland, and Iceland are cited as evidence that environmental problems can be overcome with advanced planning. Suggestions for insulated sewage and water pipes, waste disposal, and community planning are given. (Lisk-FIRL)
W78-04591

PRECIPITATED WASTE WATER PHOSPHORUS FERTILIZERS (ABWASSERPHOSPHATE ALS DUENGEMITTEL),
Institut fuer Agrikulturchemie, Goettingen (West Germany).
For primary bibliographic entry see Field 5D.
W78-04592

DISPOSAL OF SEWAGE SLUDGE ON LAND.
Water Services, Vol. 81, No. 979, p 539, September, 1977. 1 ref.

Descriptors: *Sludge disposal, *Sewage sludge, *Land use, *Standards, *Soil amendments, Optimization, Europe, Environmental effects, Hazards, Nutrients, Municipal wastes.

The beneficial effects of sewage sludge disposal by land application can outweigh hazards if recommended guidelines are observed. The interim guidelines for sludge application should optimize nutrient use and minimize any hazard to humans, animals, crops, the soil, or the environment. The guidelines published in a report by England's Department of the Environment and National Water Council provisionally recommended application rates for numerous elements, including nitrogen. The guidelines are not mandatory, but are interim targets pending publication of more scientific criteria. Comments on the guidelines are being solicited by the Department of the Environment in London, England. England's Standing Committee on the Disposal of Sewage Sludge was set up by the Department of the Environment and the National Water Council in 1975. The Committee is responsible for reviewing land disposal of sewage sludge and drafting a code of standard for sludge disposal. (Snyder-FIRL)
W78-04600

SERVO CONTROLLED OPTIMIZATION OF NITRIFICATION-DENITRIFICATION OF WASTE WATER IN SOIL,
Robert S. Kerr Environmental Research Lab., Ada, OK.
C. G. Enfield.
Journal of Environmental Quality, Vol. 6, No. 4, p 456-458, October-December, 1977. 5 fig, 1 tab, 9 ref.

Descriptors: *Infiltration, *Nitrification, *Denitrification, *Sewage treatment, *Municipal wastes, Chemical reactions, Sludge, Soil amendments, Treatment facilities, Electrical properties, Waste water disposal, Waste water treatment.

Studies were conducted to develop a servo control system which adjusts the rate of waste water application to land to ensure nitrification-denitrification. Operation of the control system is based on the potentials of five platinum electrodes used in conjunction with a Calomel reference electrode. A servo controller was used to regulate application of municipal trickling filter final effluent to four gravelly loam soil columns. The controller adjusted the frequency of waste water application with respect to the Pt electrode potential 6 cm under the soil surface. The duration of each application was regulated according to a target potential measured 30 cm beneath the surface, optimizing denitrification. Three soil columns received 7.5 metric tons (carbon) of digested municipal sludge/ha in the upper 30 cm of the profile. Waste water application was continuously allowed by the servo controller for the column that contained no sludge. Essentially all total Kjeldahl nitrogen-nitrogen was converted to nitrate-nitrogen in the upper 3 cm of this column. About 45% of the dissolved nitrogen disappeared in this column. Addition of sludge increased apparent denitrification, so that total nitrogen removal exceeded 90%. (Snyder-FIRL)
W78-04603

PUBLIC HEALTH ASPECTS OF LAND UTILIZATION OF WASTEWATER EFFLUENTS AND SLUDGES,
Johns Hopkins Univ., Baltimore, MD.
A. Wolman.
Journal Water Pollution Control Federation, Vol. 49, No. 11, p 2211-2218, November, 1977. 2 tab, 17 ref.

Descriptors: *Sludge disposal, *Land use, *Effluents, *Public health, *Pollutant identification, Land management, Sludge, Soil amendments, Fertilizers, Sludge treatment, Sludge digestion, Municipal wastes, Waste water disposal, Waste water treatment.

The history and development of land-application of waste water and sludges are presented. In 1922, Baltimore authorities were permitted to use wet waste water sludge for fertilizer so long as certain conditions were met. The sludge had to be digested for a least 10 days, transported in water-tight vehicles, and applied before crops were planted. Soil accumulation of heavy metals contained in sludge had been considered to pose a hazard under certain circumstances. Although land disposal must be accompanied by cautious pesticide use, the latter cannot be considered as a primary constraint. Land disposal experiences over more than 100 years have indicated that application of waste water or its derivatives to land is practicable, provided it is carefully, efficiently, and continuously managed. A site with appropriate soil permeability and porosity must be available. Provisions must be made for storage in wet weather. Waste water should not be used to fertilize crops which are eaten raw. A monitoring program to protect groundwater quality should be instituted. Potential hygienic risks must be detected and controlled. Land application as a means of sewage disposal is limited in the United States by regional variations in geology, hydrology, meteorology, and topography. The process may not always be cost-effective. (Snyder-FIRL)
W78-04604

JURY ON LAND DISPOSAL OF WASTEWATER STILL OUT, MR. COSTLE,
For primary bibliographic entry see Field 5G.
W78-04606

SLUDGE IMPROVES SANDY SOIL, INCREASES YIELDS WITHOUT POLLUTING.
Crops and Soils Magazine, Vol. 30, No. 3, p 23-24, December, 1977.

Descriptors: *Sewage sludge, *Soil amendments, *Crop production, *Fertilizers, *Fertilization, Soil management, Soil-water-plant relationships, Pollutant identification, Municipal wastes, Soil properties, Soils, Waste water treatment.

The use of sewage sludge as a fertilizer can improve crop yields and increase the level of organic matter in sandy soil. Application at crop fertilization rates should not result in nitrogen pollution of groundwater. Anaerobically digested sludge decomposes and releases nitrogen in the soil at a slower rate than other varieties of sludge. Sludge from three waste water treatment plants was applied to sandy soil over a 4-year period at rates of 13, 26, and 52 tons/acre/yr. The highest application rate, representing a normal 15-20 year addition rate, was 210 tons/acre of total dry solids. Corn yields increased by an average of 60 bushels/acre at the high application rates. A control plot which received commercial fertilizer produced 120 bushels/acre. Nitrate levels in soil water below the corn root zone in plots treated with 13 tons of sludge/acre/yr were comparable to those in control plots fertilized with 250 lbs nitrogen/acre. Anaerobic sludge addition raised the organic matter level of the soil surface from 2.1 to 7.5%. Sewage sludge application should be limited to 5-10 tons/acre/yr to maintain high crop yields and low nitrate levels in soil percolates. (Snyder-FIRL)
W78-04608

A FIELD STUDY OF THE AGRICULTURAL USE OF SEWAGE SLUDGE: I. EFFECT ON CROP YIELD AND UPTAKE OF N AND P,
Ball State Univ., Muncie, IN. Dept. of Natural Resources.
K. A. Kelling, A. E. Peterson, L. M. Walsh, J. A. Ryan, and D. R. Keeney.
Journal of Environmental Quality, Vol. 6, No. 4, p 339-345, October-December, 1977. 6 tab, 29 ref.

Descriptors: *Sewage sludge, *Sludge disposal, *Fertilization, *Cultivated lands, *Crop production, Absorption, Nitrogen, Phosphorus, Municipal wastes, Waste water treatment.

The effects of sludge application at rates based on typical fertilizer N applications to high sludge disposal loading rates were examined with respect to crop yields, the residual fertility of the sludge, and the amounts of sludge-applied N and P recovered by the crops. Anaerobically digested liquid sludge was applied to field plots at rates of 0, 3.75, 7.5, 15, 30, and 60 metric tons of dry solids/ha on a sandy loam and a salt loam. Rye or sorghum-sudan was planted in the plots, followed by one to 3 seasons of corn. The first crop after sludge application showed significantly increased yields for application rates up to 7.5 metric ton/ha on silt loam soil and up to 15 metric tons/ha on sandy loam soil. Application of 30 and 60 metric tons/ha occasionally depressed yields of the first crop, possibly due to the presence of large quantities of soluble salts. There were residual benefits from the sludge for 3 years or more at the higher application rates. Generally, an increase in sludge application rate yielded higher concentrations of N and P in plant tissue. Total nutrient recovery averaged about 50% for available N and 7% for P and a low application rate, and about 14% for N and 3% for P at the highest rate of sludge addition. (Snyder-FIRL)
W78-04609

REVIVING THE SEPTIC TANK,
Bell Construction Co., Matteson, IL.
H. F. Bell.
Civil Engineering-ASCE, Vol. 47, No. 12, p 83-84, December, 1977.

Descriptors: *Waste water treatment, *Waste water disposal, *Sewage treatment, *Biological treatment, *Sewerage, Treatment facilities, Municipal wastes, Septic tanks, Sewage disposal, Size.

Approximately 25% of the United States population depends on individual sewage disposal systems. The septic tank for a single family house in Illinois is required to have a capacity of 500 gallons for each bedroom in the house. Percolation tests during a summer dry spell are used to determine the necessary trench area. Local requirements, which may call for distribution and drop boxes at strategic locations, influence field design. Septic failures in spring are typically caused by saturated soil and exceptionally high load; summer and fall failures usually involve line stoppage. A series of recommendations for improving septic sewage disposal are presented. Only organic wastes should be disposed of in a septic tank. The sludge level should be checked periodically; sludge and scum should be removed when the stored volume approaches total capacity. (Snyder-FIRL)
W78-04610

SLUDGE TREATMENT PROCESS OFFERS FLEXIBILITY, LOW COST,
Dorr-Oliver, Inc., Stamford, CT.
For primary bibliographic entry see Field 5D.
W78-04612

APPLICATION OF SEWAGE SLUDGE TO GARDEN PLOTS,
Vermont Univ., Burlington. Dept. of Microbiology and Biochemistry.
R. E. Sjogren.
Compost Science, Vol. 18, No. 5, p 26-32, September/October, 1977. 6 fig, 3 tab, 20 ref.

Descriptors: *Fertilizers, *Soil amendments, *Soil-water-plant relationships, *Plant growth, *Nutrient removal, *Sludge disposal, Soil contamination effects, Sewage bacteria, Vegetable crops, Environmental effects, Waste water disposal.

Studies with corn, tomato, and beet crops were used to assess the response of garden crops to two levels of high-temperature, anaerobically-digested

lime-amended sludge and one level of fertilizer. The effects of field addition of sewage sludge and fertilizer on plant yields and tissue elemental content were evaluated under local environmental conditions. Sludge application rates were based on the assumption that half of the nitrogen present in the sludge would be available to the plant. A double application of sludge was used to observe possible toxic effects metal ions. Results of elemental analyses of anaerobically digested sludge and sludge-grown plants are presented. Corn plant yields from plots receiving the inorganic fertilizer were essentially the same at all sludge application rates. For those plots which did not receive the inorganic fertilizer, yields were greatest with the double application of sludge. Gross yields of tomato plots were largest in terms of the number of fruit from the plot which received a double application of sludge and the inorganic fertilizer. The average weight per tomato was greatest from the plot which received the inorganic fertilizer but no sludge. Beet plant weight was much higher from those plots which received the inorganic fertilizer, irregardless on the amount of sludge applied. Iron and potassium deficiencies were exhibited by plants from some of the sludge-amended corn plots. Although tests for bacterial and viral pathogens in the amended sludge were negative, some transmission of soil bacteria by splashing onto corn stalks was observed. (Schulz-FIRL)
W78-04613

THE COMPARISON OF SLUDGE EXTRACTS AND CHU 10 IN CULTIVATING CHLORELLA PYRENOIDOSA,
Chinese Univ. of Hong Kong. Dept. of Biology.
M-H. Wong, and S-K. Ho.
Chemosphere, Vol. 6, No. 9, p 581-588, 1977. 3 fig, 1 tab, 14 ref.

Descriptors: *Ultimate disposal, *Nutrient removal, *Chlorophyta, *Chlorella, *Algae, Heavy metals, Chlorophyll, Proteins, Growth rates, Microorganisms, Feeds, Sludge disposal, Waste water treatment, Waste water disposal.

Increasing demands on the world's food supplies have led to various studies on the culturing of green algae as a source of protein. Experiments were conducted at the Chinese University in Hong Kong to evaluate the use of sewage sludge extracts as opposed to the Chu 10 medium for cultivating Chlorella pyrenoidosa green algae. Samples of sewage sludge were obtained from the University's treatment plant and extracts were prepared in concentrations of 1, 2, and 3%. Cell counts, chlorophyll, protein, and heavy metals were measured in Chlorella cultures. The growth rate in 1% sludge was higher than at other sludge concentrations and was also higher than in Chu 10. The cells cultivated in the 2% sludge extract had the highest chlorophyll content. The protein content in Chlorella cells fluctuated with time, regardless of the medium. Heavy metal concentrations were higher in the sludge-grown cells than in the Chu 10 variety. Since from 10 to 15% of the heavy metals in the sludge extracts were removed during culturing, the use of Chlorella pyrenoidosa is suggested as a possible means of waste water purification. (Schulz-FIRL)
W78-04616

METHODS FOR MEASURING THE DEGREE OF STABILITY OF AEROBIC STABILIZED SLUDGES,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5A.
W78-04620

OCCURRENCE OF ASPERGILLUS FUMIGATUS DURING COMPOSTING OF SEWAGE SLUDGE,
Agricultural Research Service, Beltsville, MD. Biological Waste Management Lab.; and Agricultural Research Service, Beltsville, MD. Soil Nitrogen Lab.
For primary bibliographic entry see Field 5C.
W78-04621

GROWTH OF LOBLOLLY PINE SEEDLINGS IN STRIP-MINED KAOLIN SPOIL AS INFLUENCED BY SEWAGE SLUDGE,
Southeastern Forest Experimental Station, Athens, GA. Inst. for Mycorrhizal Research and Development.
C. R. Berry, and D. H. Marx.
Journal of Environmental Quality, Vol. 6, No. 4, p 379-381, October-December, 1977. 2 tab, 11 ref.

Descriptors: *Sewage sludge, *Soil amendments, *Loblolly pine trees, *Spoil banks, *Plant growth, Growth rates, Reclamation, Municipal wastes, Organic wastes, Root development, Organic matter, Waste water treatment.

A study was carried out to determine whether adding sewage sludge to kaolin spoils would improve growth of loblolly pine seedlings. The minimum quantity of sludge addition needed to significantly increase growth and the maximum quantity that could be used without reducing growth were also determined. Loblolly pine seedlings were transplanted and grown for 6 mos in strip-mined kaolin spoil amended with different amounts of dry sludge. Seedlings on spoil amended with the equivalent of 34 metric tons of sludge/ha were 49% taller, 79% greater in stem diameter, and had a 126% greater fresh weight than seedlings grown without sludge. The percentage of short-roots having ectomycorrhizae was higher for seedlings grown with 34 and 69 metric tons of sludge/ha than for those grown in spoil which received 0, 138, or 275 metric tons/ha. Chemical analyses showed significantly greater amounts of residual organic matter and elements essential for plant growth in sludge-amended kaolin spoil than in non-amended spoil. Sewage sludge apparently is a very good organic amendment; even small amounts stimulate growth and mycorrhizal development of loblolly pine seedlings. (Snyder-FIRL)
W78-04624

RECYCLING SEWAGE THROUGH PLANT COMMUNITIES,
Marine Biological Lab., Woods Hole, MA.
G. M. Woodwell.
American Scientist, Vol. 65, No. 5, p 556-562, September-October, 1977. 6 fig, 13 ref.

Descriptors: *Soil-water-plant relationships, *Nutrient removal, *Water reuse, *Waste water disposal, *Path of pollutants, Hydrologic cycle, Municipal wastes, Industrial wastes, Plant growth, Sewage treatment, Waste water treatment.

Water is continuously taken up by municipal and industrial users and then discharged back to the natural environment where it undergoes purification. Although many sewage treatment plants have been constructed as means of pollution abatement, the toxins entering the environment still pose hazards to aquatic life and to subsequent users of the discharged waste water. The importance of natural vegetation has been considered with respect to the role that normal patterns of water and nutrient flows in nature play in the further purification of discharged sewage effluents. Various studies on the terrestrial absorption of sewage-borne nutrients are reviewed. The use of aquatic systems to purify waste water is discussed with respect to pilot studies involving meadows and a combination of marshes and ponds. (Schulz-FIRL)
W78-04639

TRANSPORT OF HEAVY METALS IN A SLUDGE-TREATED FORESTED AREA,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-04653

KANSAS TREATMENT PLANT USES SUBSURFACE INJECTION OF SLUDGE.
Black and Veatch, Consulting Engineer, Kansas City, MO.
For primary bibliographic entry see Field 5D.
W78-04655

WATER SUPPLY AND WASTE DISPOSAL SYSTEMS FOR ARCTIC COMMUNITIES.
Toronto Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W78-04669

5F. Water Treatment and Quality Alteration

WATER SUPPLY DISINFECTION WITH IODINE AND SILVER.
National Water Well Association, Worthington, OH.
T. E. Gass.
Water Well Journal, Vol. 32, No. 2, p 24-25, February, 1978.

Descriptors: *Disinfection, *Silver, *Iodine, Water purification, Chlorination, Water supply, *Water treatment.

Extensive use of chlorine as a disinfectant in U. S. water systems has stifled the growth of alternative methods of disinfection, including iodination and silver treatment systems. Iodine disinfection has been successfully practiced by various U. S. government agencies in specialized situations. Advantages of iodination include its applicability over a wider pH range than for chlorine, simplicity of treatment hardware, and the fact that iodine does not react with ammonia and nitrogenous substances. Unfortunately, iodine treatment is 20 times more expensive per unit of germicidal effectiveness than chlorine. Iodine can also impart taste and color to water, as well as contribute to thyroid dysfunction in endemic area of goiter. Although the cost of silver per pound is high, the minute amounts required for disinfection make it an economically viable alternative. Silver treatment units are compact and simple, and the treatment itself leaves no taste or odor. Because of problems associated with its use, especially from interference with other chemicals in water and necessity of long contact time, silver disinfection is not recommended for individual water systems. (Eberle-NWWA)
W78-04293

REVERSE OSMOSIS IS EFFECTIVE METHOD FOR DESALTING WATER,
Universal Oil Products, St. Paul, MN. Johnson Div.
For primary bibliographic entry see Field 3A.
W78-04297

HEALTH IMPLICATIONS OF WATER CONTAMINANTS IN MAN,
National Cancer Inst., Bethesda, MD.
For primary bibliographic entry see Field 5C.
W78-04302

GLOBAL DISTRIBUTION OF CARCINOGENIC POLLUTANTS IN WATER,
National Cancer Inst., Bethesda, MD.
For primary bibliographic entry see Field 5B.
W78-04304

THE INTERNATIONAL COOPERATION IN STUDYING THE HEALTH ASPECTS OF ORGANIC CONTAMINANTS IN INDIRECTLY REUSED WASTE WATER,
International Reference Center for Community Water Supply, Leidschendam (Netherlands).
For primary bibliographic entry see Field 5D.

W78-04305

METHOD AND APPARATUS FOR PURIFYING EMULSIONS AND CONTAMINATED WATER WITH ELECTROLYSIS,
For primary bibliographic entry see Field 5D.
W78-04307

WATER PURIFICATION APPARATUS AND METHOD,
For primary bibliographic entry see Field 5D.
W78-04318

ELECTROLYTIC CELL FOR TREATMENT OF WATER,
J. Miller.
U.S. Patent No. 4,048,030, 11 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 962, No 3, p 737, September 13, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Electrolysis, Cathodes, Anodes, Water softening, Equipment.

An electrolytic cell is described for the treatment of water, comprising a closed container with a lower inlet opening and an upper outlet opening for the water and a cathode and an anode. In the interior of the electrolytic cell particles are located whose density is higher than that of the water and which are prevented from leaving the electrolytic cell by gratings adjacent to the inlet and the outlet. The electrolytic cell can be used for the treatment of water, and more particularly for the purification and disinfection of small and large swimming pools, for preparing drinking water for towns and small consumers and also for softening water down to any desired degree of hardness. (Sinha-OEIS)
W78-04331

LAND DISPOSAL OF CHEMICAL SLUDGE,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5E.
W78-04371

ACCUMULATION OF SLIME IN DRAINAGE PIPES AND THEIR EFFECT ON FLOW RESISTANCE,
Clay Pipe Development Association Ltd., London (England).
For primary bibliographic entry see Field 8B.
W78-04506

STATE OF THE ART IN WATER TREATMENT DESIGN, INSTRUMENTATION, AND ANALYSIS,
Kennedy Engineers Inc., San Francisco, CA.
R. A. Ryder.
Journal of the American Water Works Association, Vol. 69, No. 11, p 612-620, November, 1977. 14 tab, 17 ref.

Descriptors: *Municipal wastes, *Treatment facilities, *Filtration, *Flocculation, *Disinfection, Instrumentation, Analysis, Design, Waste water treatment, Waste water disposal.

Sampling and analysis is recommended for the identification of water quality variations which may influence treatment choice. Water treatment methods include chemical addition, flocculation, sedimentation, filtration, taste and odor removal, corrosion and scale control, and disinfection. Waste water recovery has been practiced for many years in California. Waste water recovery ponds usually contain two basins. Pumps convey the waste water back into the treatment plant's rapid-mixing chamber. Alum-coagulant and iron-coagulant sludges are often very compressible, but only thicken naturally to about 10% solids. Precoats or chemical additives are often required to filter or centrifuge the sludge efficiently. Polyelectrolyte coagulants produce much smaller quantities of sludge, reducing sludge handling five to 10 times compared with alum sludge requirements. Sludge-disposal methods include: air drying followed by burial, spraying on land, and mechanical dewatering. Mechanical dewatering is often the only method available for concentrating sludge if the treatment plant site is restricted or too wet for air drying. Despite the availability of improved centrifuges and automated press-leaf filters, mechanical dewatering is still costly. Water treatment plants frequently monitor turbidity with a pilot filter to protect against coagulant chemical inadequacy. (Snyder-FIRL)
W78-04578

ALGAL CANCER AND ITS CAUSES: I. CARCINOGENIC POTENCIES OF WATER AND SUSPENDED SOLIDS DISCHARGED TO THE RIVER OHMUTA, (IN JAPANESE),
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
For primary bibliographic entry see Field 5C.
W78-04596

WATER RECLAMATION--QUALITY TARGETS AND ECONOMIC CONSIDERATIONS,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5G.
W78-04597

EFFECTS OF PH AND MIXING ON POLYMER CONDITIONING OF CHEMICAL SLUDGE,
Du Pont de Nemours and Co., Inc., Wilmington, DE.
J. J. O'Brien, and J. T. Novak.
Journal of the American Water Works Association, Vol. 69, No. 11, p 600-605, November, 1977. 13 fig, 2 tab, 13 ref.

Descriptors: *Municipal wastes, *Industrial wastes, *Hydrogen ion concentration, *Mixing, *Polymers, Sludge treatment, Sludge, Chemical wastes, Resistance, Dewatering.

Laboratory studies were conducted to evaluate polymer performance with respect to various sludge characteristics, including chemical composition, pH, specific resistance, and cake solids. Polymers were mixed with sludge samples in 300 ml beakers, and the amount of polymer needed to achieve a maximum decrease in specific resistance was determined. Organic polymers can be used to improve dewatering rates of inorganic sludges. The trail-and-error method usually used to select polymers can be greatly simplified when the polymer characteristics are provided. Cationic polymers are most efficient at pH of 7 or less. Nonionic polymers and the lower percent hydrolysis anionic polymers function effectively at pH 6.5-8.5. The effectiveness generally decreased as the pH increased. The 50% hydrolysis anionic polymer was most effective above pH 8.5. Too much or too little mixing can greatly reduce polymer effectiveness. The required degree of mixing depends on the solids concentration in the sludge. (Snyder-FIRL)
W78-04611

DISINFECTION OF DRINKING WATER, SWIMMING-POOL WATER AND TREATED SEWAGE EFFLUENTS,
Health Effects Research Lab., Cincinnati, OH.
N. A. Clarke, and W. F. Hill, Jr.
In: Disinfection, Sterilization, and Preservation, Block, S. S. (ed.), Lea and Febiger, Philadelphia, Pennsylvania, 1977. p 705-722, 2 fig, 100 ref.

Descriptors: *Waste water treatment, *Waste water disposal, *Municipal wastes, *Water treatment, *Disinfection, *Swimming pools, Sewage treatment, Biological treatment, Activated sludge, Pollutant identification, Analytical techniques.

In disinfecting water and treated effluents, infections microorganisms must be destroyed to prevent transmission of pathogens. Because it is difficult to measure some residual concentrations of disinfectants, coliform levels are often used. Whether this accurately measures biological safety has been questioned in view of the resistance of viruses to disinfection. Dosage, contact time, temperature, other organic and inorganic material in the water, and pH can affect disinfection efficiency. Chlorine, chlorine dioxide, bromine, iodine, ozone, silver, ultraviolet radiation, ionizing radiations, and heat have been used to disinfect drinking water. Chlorine and its compounds, iodine, bromine, and silver are used as swimming pool disinfectants. Copper sulfate is used to control algae in pool water. Chlorine and its derivatives are the most widely used disinfectants in sewage treatment. Flash mixing at pH 5.0 can provide disinfection equivalent to four times the normal chlorine dosage. The final product water from advanced waste treatment must be disinfected to prevent transmission of microbial pathogens. The activated sludge process, properly carried out, will eliminate most sugars and amino acids, which can interfere with disinfection. After filtration and adsorption in a carbon column, disinfection with chlorine is easily accomplished. Water must be chlorinated before reverse osmosis to prevent membrane plugging by microbiological growth; the chlorine also disinfects the effluent. (Snyder-FIRL)
W78-04614

BALANCE IN TRAINING FOR LATIN AMERICAN WATER AND WASTEWATER UTILITIES,
Pan American Health Organization, Lima (Peru).
N. F. Carefoot.
Journal of the American Water Works Association, Vol. 69, No. 12, p 641-643, December, 1977. 2 tab.

Descriptors: *Training, *South America, *Water works, *Sewerage, *Personnel, Manpower, Municipal wastes, Water treatment, Cities, Waste water treatment.

Training programs for supporting subprofessional, technical, and trade personnel in water and waste water treatment have fallen behind needs for trained personnel in Latin America. A manpower and training resources inventory was recently completed in Peru. An estimated 80% of current workers require training for their present jobs. An estimated 6,000 additional employees will be required by water and waste water utilities within 5 yrs. A 30% increase in the portion of city dwellers served by sewers has been adopted as a minimum goal by 28 countries in the western hemisphere. Various aspects recommended for a balanced training program include: a preparatory working group, inventories of human and training resources, review of personnel policies, establishment of training policies, preparation of training material and methodology, cooperation between training institutions, and an accountability system. (Snyder-FIRL)
W78-04641

METHOD DEVELOPMENT AND MONITORING OF POLYNUCLEAR AROMATIC HYDROCARBONS IN SELECTED U.S. WATERS,
Syracuse Research Corp., NY.
For primary bibliographic entry see Field 5A.
W78-04656

RELATIONSHIPS AMONG POLLUTION INDICATOR BACTERIA ISOLATED FROM RAW WATER AND DISTRIBUTION SYSTEMS BY THE PRESENCE-ABSENCE (P-A) TEST,
Ontario Ministry of the Environment, Rexdale.
For primary bibliographic entry see Field 5A.

W78-04664

WATER SUPPLY AND WASTE DISPOSAL SYSTEMS FOR ARCTIC COMMUNITIES,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
G. W. Heinke, and B. Deans.
Arctic. 26(2), p 149-159, 1973.

Descriptors: *Arctic communities, Bays, *Canada, *Frobisher Bay(NWT), *Waste disposal, *Water supply.

The special problems of providing adequate water supply and waste disposal systems for arctic settlements are examined at the community of Frobisher Bay, Northwest Territories. The 2 existing methods, a trucked and a piped system, are compared for adequacy, reliability and cost. A series of alternative improvements to upgrade community services is proposed. Any of the suggested alternatives up to the level of complete piped services are feasible for engineering and economic points of view.--Copyright 1974, Biological Abstracts, Inc.
W78-04669

5G. Water Quality Control

PHYSICAL AND CONCEPTUAL SIMULATION OF EFFLUENTS FROM DREDGED MATERIAL CONFINEMENT FACILITIES,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
J. A. FitzPatrick,, D. Atmatzidis, and R. J. Krizek.
Water Resources Bulletin, Vol. 13, No. 6, p 1107-1118, December 1977. 5 fig, 2 tab, 15 ref. Army DACW39-74-R-0007.

Descriptors: *Dredging, *Spoil banks, *Sedimentation, *Model studies, Laboratory tests, Mathematical models, Effluents, Suspended solids, Clays, Freshwater, Saline water, Filtration, *Separation techniques, Water quality control, Wastes, Sedimentology, *Confinement facilities.

Environmental protection dictates that effluents of desired quality should be discharged from dredged material confinement facilities. In general, this can be accomplished by supplementing the solid-liquid separation obtained by simple sedimentation with appropriate filter systems which provide additional clarification. A methodology to estimate the sedimentation required in a disposal area was developed on the basis of classical sedimentation theories and compared favorably with field data. A procedure then was advanced and documented whereby effluents from dredged material confinement facilities can be modeled successfully for laboratory filtration tests. For these purposes, inorganic suspended solids can be simulated reasonably well by adjusting the concentration of commerically available clays, and fresh or saline water environments can be simulated satisfactorily by tap water or sodium chloride solutions, respectively. (Sims-ISWS)
W78-04203

OIL SLICK RETAINING BOOM FOR OFF-SHORE OIL WELLS,
B. J. Sessions.
U.S. Patent No. 4,043,131, 4 p, 5 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 961, No 4, p 1496, August 23, 1977.

Descriptors: *Patents, *Oil pollution, *Water pollution sources, *Water quality control, Floats, Bodies of water, Equipment, Containment, Oil retaining boom.

An oil-retaining boom adapted particularly for use surrounding off-shore oil wells and drilling rigs to retain oil spillages and surface oil slicks within the boom has floats moveably interconnected in side-by-side relationship by connecting cables. The boom is adapted to float at or near the surface of the water and has a continuous sheet member attached to the floats so that the flat surface of the sheet is held perpendicular to the surface of the water, thereby enabling the sheet to retain oil on one side. The individual floats are buoyant and have an elongate structure, preferably hexagonal, with weights at one elongate end adapted to hold that end downward in the water to provide stability and an upright relationship of the float with the water surface. (Sinha-OEIS)
W78-04308

CRYOGENIC BEACH CLEANER,
R. F. Wendt, J. R. Acker, and N. R. Braton.
U.S. Patent No. 4,043,140, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 961, No 4, p 1499, August 23, 1977.

Descriptors: *Patents, *Oil pollution, *Water pollution control, Beaches, Oil spills, Cryogenics, Sands, Spraying, Equipment, Waste disposal, Liquid nitrogen.

The object of this invention is to provide an efficient and ecologically unharmful method and associated equipment for restoring sandy beaches which have been contaminated by an oil spill. The method includes spraying liquid nitrogen onto the contaminated area so as to solidify the oil and sand into a mixture which can be easily separated from the clean underlying sand. A cryogenic beach-cleaning apparatus or vehicle is provided which includes a spray-head positioned forward of the vehicle for spraying the contaminated area and shovel means for separating the solidified mixture from the underlying sand. Conveyors transport the separated mixture and deliver it to trailers or trucks which are used to transport the mixture to a treatment or disposal site. (Sinha-OEIS)
W78-04310

FLOATING BAG FOR POLLUTION STUDY,
Case Existological Labs., Ltd., Victoria (British Columbia). (Assignee).
For primary bibliographic entry see Field 5A.
W78-04323

METHOD FOR COLLECTING LIGHT-WEIGHT SUBSTANCE FLOATING ON A LIQUID SURFACE,
Ballast-Nedam Groep, N.V., Amstelveen (Netherlands). (Assignee).
E. Irons.
U.S. Patent No. 4,046,691, 5 p, 7 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 962, No 1, p 296, September 6, 1977.

Descriptors: *Patents, *Water pollution treatment, *Water pollution control, Oil pollution, Oil-water interface, Nozzles, Jets, Equipment, Containment, Collecting reservoirs.

Oil floating on the surface of a body of water is collected by providing an enclosure with an open bottom and side walls extending from a depth below the interface between the oil and water to above surface of the body of water. A nozzle is located above the surface of the body of water outside of a spaced from the side walls of the enclosure. It is directed downward to a location beneath the open bottom of the enclosure. A stream of water from the nozzle is directed through the oil on the surface of the body of water so that the oil is displaced to a location beneath the open bottom of the enclosure. It is then allowed to rise to the surface of the water within the enclosure. The oil is then removed from the enclosure. (Sinha-OEIS)
W78-04327

ELECTROLYTIC CELL FOR TREATMENT OF WATER,
For primary bibliographic entry see Field 5F.
W78-04331

FLOW PATTERN CONTROL BY ENTRAINMENT REGULATION,
Illinois Univ at Urbana-Champaign Dept of Civil Engineering.
W. H. C. Maxwell, and M. Demissie
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY10, Proceedings Paper 13271, p 1121-1134, October 1977. 12 fig, 10 ref, 2 append OWRT B-083-ILL(2), 14-31-0001-4079.

Descriptors: *Control structures, *Outlet works, *Fluid mechanics, *Laboratory tests, Hydraulic models, Model studies, Diffusion, Mixing, Entrainment, Outlets, Powerplants, Waste water(Pollution), Water pollution, Industrial wastes, Waste dilution, Hydraulics, Slot outlets.

A technique for controlling the flow to a vortex zone trapped between the top of a shallow submerged slot outlet, the free surface, and two lateral wing-walls was examined experimentally to show that it may be used to control the flow pattern near the slot outlet. The range of wing-wall crest elevations for which flow patterns may be controlled was shown to be a function of wing-wall length. The stability of the flow pattern also was examined experimentally and was found to depend, for a particular wing-wall spacing, on the submergence of the slot outlet and on a Froude number based on average outlet velocity and wall spacing. The flow pattern control technique may have value in back-fitting some existing outfalls on thermal power plant outlets where strict temperature control is required. (Sims-ISWS)
W78-04336

RELIABILITY OF NITRIFICATION SYSTEMS WITH INTEGRATED PHOSPHORUS PRECIPITATION,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
For primary bibliographic entry see Field 5D.
W78-04346

SURFACE WATER QUALITY IN CANADA - AN OVERVIEW.
Department of the Environment, Ottawa (Ontario). Water Quality Branch.
1977. 45 p, 15 fig, 2 tab, 17 ref, 2 append.

Descriptors: *Surface waters, *Quality control, *Canada, *Water quality control, *Chemical analysis, Phenolic pesticides, Phosphorus, Nitrilotriacetic acid, Pesticides, Polychlorinated biphenyl, Trace elements, Metals, Rivers, Fraser River, Mackenzie River, South Saskatchewan River, Red River, St. Lawrence River, Saint John River, Upper Humber River, Ottawa River, Grand River.

This report presents an overview of the quality of surface waters in Canada and makes comparisons with water quality prior to 1960 as described by Thomas. As such, it does not consider in depth, local quality concerns, but instead, offers a national perspective. Surface water quality in Canada is generally good when viewed in the light of water quality guidelines and criteria. The report underlines the dramatic regional differences which exist with respect to certain quality characteristics, for example, hardness; but it stresses that such differences are, for the most part, natural in origin. Specific high-profile parameters such as phosphorus, nitrilotriacetic acid (NTA), phenols, pesticides, polychlorinated biphenyls (PCBs), trace elements, and metals, are highlighted. The dynamic nature of water quality is also discussed. Trend analyses were conducted at selected locations on major rivers in Canada, and gradually changing conditions are indicated at a few locations. (WATDOC)
W78-04349

STORAGE FOR STORM WATER QUALITY CONTROL - MEADOWVALE TEST SITE STUDY,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
M. P. H. Murrey, and J. J. Ganczarczk.
Canada-Ontario Agreement on Great Lakes Water Quality, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada, Research Report No. 63, 1977. 65 p, 18 fig, 41 ref, 17 tab, append. 75-8-36.

Descriptors: *Storm water, *Quality control, *Storage, *Settling basins, *On-site tests, *Runoff, Watersheds(Basins), Flow measurement, Hydrologic data, Model studies, Urban runoff, Water pollution, *Canada, *Meadowvale Test Site Study(Ont), Mississauga(Ont).

Two computer models, the U.S. Environmental Protection Agency's SWMM and the U.S. Army Corps of Engineers' STORM were applied for simulation of urban runoff phenomena in a test catchment of the 'new town' of Meadowvale prior to development and after its completion. A special subroutine for the STORM model was developed to simulate the performance of an in-stream settling basin-reservoir system for storm water quality control. It was predicted that the uncontrolled urbanization of the Meadowvale catchment would lead to a deterioration of storm water quality. Expected increases in annual pollutant yields (compared with undeveloped conditions) would be: BOD from 4 to 26 lb per acre; SS from 34 to 171 lb per acre; nitrogen from 1 to 10 lb per acre, and, orthophosphate from 0.4 to 1 lb per acre. Hydrologically, peak flows might increase by a factor ranging from two to five depending on the storm frequency, while the total annual runoff would increase from 4.1 inches per annum to 8 inches per annum. The settling basin-reservoir system to be constructed at Meadowvale should significantly improve runoff characteristics. Predicted yields of pollutants passing through the system to the Credit River were: BOD - 1.1 lb per acre; SS - 11lb per acre; nitrogen - 7 lb per acre; and orthophosphate - 0.8 lb per acre. Peak flow rates would drop, the actual reduction in the flow rate depending on the size and temporal pattern of the storm. It was estimated that the system designed for Meadowvale would reduce peak flows to pre-urbanized levels or less for storms which return periods less than one year. The studied system of storm water quality control appears to be very attractive. (WATDOC)
W78-04357

WASTEWATER USER CHARGES AND INDUSTRIAL COST RECOVERY: GUIDELINES AND EXAMPLES,
Department of Fisheries and Environment, Ottawa (Ontario).
P. M. Ashton, and W. R. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 703, Price codes: A04 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 112, February 1978. 67 p, 20 tab, 2 append.

Descriptors: Treatment facilities, *Waste treatment charges, Waste water treatment, *Municipal wastewater charges, Pollution taxes(Charges), *User charges, Utility rates(Waste treatment), *Industrial cost recovery, Industrial charges, Industrial assessment.

Municipal applications for federal grants to construct wastewater treatment works require approval by the Environmental Protection Agency. Adoption of a system of user charges and industrial cost recovery procedures are two of the prime requisites in successful application. These systems must be designed to ensure that all users of federally financed treatment works share in both the capital and the operation and maintenance costs of the facility in a manner proportionate to the extent of their use. This study offers guidelines which, if followed, will enhance favorable review of a grant application by the EPA. It also presents industrial cost recovery procedures and user charge systems that were developed with the goals of providing equity of charge assessment among users and user classes, conformity with prevailing EPA rules and regulations, and simplicity from the viewpoint of those local officials administratively responsible for systems implementation.
W78-04364

EXCESS FISHPOND NUTRIENT REMOVAL AND UTILIZATION BY WATERCHESTNUT CULTURE,
Clemson Univ., SC. Dept. of Entomology and Economic Zoology.
H. A. Loyacano, Jr., and C. L. McCord, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 711, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Institute, Clemson University, Report No. 69, June 1977. 61 p, 5 fig, 27 tab, 18 ref, append. OWRT A-028-SC(1), 14-34-0001-6042.

Descriptors: *Chinese waterchestnuts, *Channel catfish, *Production, Water quality, *Phytoplankton, *Nutrient removal, Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Ponds, Water pollution control.

The effects of Chinese waterchestnut (Eleocharis dulcis) on production of channel catfish (Ictalurus punctatus) and resulting water quality were studied in 1974 and 1975 in .04-hectare earthen ponds at Clemson University. Ponds containing Chinese waterchestnut in 1975 had significantly lower levels of nitrate nitrogen and ammonia nitrogen and these lower nutrient levels appeared to have resulted in lower phytoplankton levels in these ponds. Data from both years indicated that this plant had no effect on channel catfish production. Large fluctuations in water level in 1974 and poor fish survival in 1975 may have prevented detection of any effect of Chinese waterchestnut on channel catfish production. Chinese waterchestnut plants removed nutrients from the pond water. Mean nutrient removal per hectare for the 201 day growing season in 1975 was 108.06 kilograms of nitrogen, 6.90 kilograms of phosphorus, 254.03 kilograms of potassium, 66.40 kilograms of calcium, and 37.46 kilograms of magnesium. These data indicate that Chinese waterchestnut should remove nutrients in sufficient quantities to improve water quality and allow increases in feeding rates and greater catfish production.
W78-04367

A SALINITY MANAGEMENT STRATEGY FOR STREAM-AQUIFER SYSTEMS,
California Univ., Davis. Dept. of Civil Engineering.
O. J. Helweg, and J. W. Labadie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 980, Price codes: A03 in paper copy, A01 in microfiche. Hydrology Papers, Colorado State University, No. 84, February 1976, 41 p, 38 fig, 11 tab, 25 ref. OWRT C-6301(5229)(3).

Descriptors: Salts, *Salinity, Irrigation, *Irrigation effects, Groundwater, Model studies, Simulation analysis, Optimization, Economics, *Surface-groundwater relationships, *Water management(Applied).

One of the pressing problems facing irrigation intensive areas is the increasing salinity of groundwater. Currently proposed solutions, such as agricultural sewering and desalinization, require large capital investment. There appear to be few available alternatives which are both low cost and effective in controlling aquifer degradation from irrigation drainage. The ultimate result in many areas may be abandonment of the groundwater resource and increasing dependence on more expensive imported water. Presented is a cost-effective salinity management technique which may be feasible for many stream-aquifer systems. The basic idea is to encourage application of pumped water downstream of the well from which it is pumped, rather than within its vicinity. In this way, a mechanism is established for accelerating the downstream transport of salts in the groundwater at a more rapid rate than would occur naturally through convection and dispersion, while still satisfying irrigation demands. The strategy is referred to as the Accelerated Salt TRANsport (ASTRAN) Method. Salt accumulation can be controlled in this manner, while taking care that salt problems are not simply transferred downstream. (See also W78-00442) (Skogerboe-Colorado State)
W78-04374

PUTTING ACTIVATED CARBON IN PERSPECTIVE TO 1983 GUIDELINES,
Engineering Science, Inc., Austin, TX.
D. L. Ford.
Industrial Water Engineering, Vol. 14, No. 3, p 20-27, May/June, 1977. 9 fig, 3 tab, 15 ref.

Descriptors: *Activated carbon, *Adsorption, *Separation techniques, *Industrial wastes, *Chemical wastes, Effluents, Operation and maintenance, Waste water treatment.

The feasibility of the activated carbon process for industrial wastewater treatment depends on the amenability of the dissolved waste water constituents to sorption, the presence of other substances which enhance or impede the sorption process, and operation and maintenance requirements of the system. This article presents a brief chronological history of the development of EPA guidelines for activated carbon. Some of the basic technological concepts and experiences in treating industrial waste water with activated carbon adsorption is given. Adsorption theory and the use of batch isotherm studies are discussed. As effluent quality requirements become more stringent under the 1983 Best Available Technology guidelines, activated carbon adsorption will come into more widespread use, primarily through the selective treatment of individual process streams or as an effluent polishing process. It is imperative, however, that its qualitative limitations be understood when considering its application. (Baker-FIRL)
W78-04378

A WASTE STREAM MANAGEMENT SYSTEM,
Dow Chemical Co., Pittsburgh, Pa.
P. Grover.
Chemical Engineering Progress, Vol 73, No 12, p 71-73, December, 1977. 3 fig.

Descriptors: *Water reuse, *Evaporators, *Industrial wastes, *Chemical wastes, Industrial water, Recycling, Waste water treatment, Waste water disposal, Equipment, Separation techniques, Solar radiation.

A waste stream management program adopted by the Dow Chemical plant in Pittsburg, California, is described. The first phase of the program identified sources, uses, and sinks of water in the plant. The next phase of the program attempted to define a balance between the three categories which would achieve the zero discharge goal for aqueous effluents. The water management plant in operation at the plant since 1975 utilizes three main water sub-systems, including a cooling water loop, a recycle water loop, and an aqueous chemical sewer. A series of solar evaporation ponds provide the primary means of waste water disposal at the plant. Waste chemicals passed to the ponds must be water-soluble, nonodorous, and not inhibit evaporation from the pond surface in any manner. Although the system is not considered technically feasible for areas of the country having lower annual evaporation rates, the waste manage-

ment system is recommended as a means of minimizing overall discharge volumes. (Baker-FIRL)
W78-04383

DIAMONDS ARE FOREVER, SAYS THE MAN WHO GIVES THEM NEW LIFE.
Materials Reclamation, Vol. 130, No. 17, p 28-29, October, 1977.

Descriptors: *Industrial wastes, *Calcium, *Copper, *Phosphorus compounds, *Suspended solids, Metals, Weirs, Chemical precipitation, Waste water treatment, Treatment facilities.

The control of polluting effluents from the diamond reclamation industry is discussed. Diamond Reclamation Services Ltd of Crawley, England, refurbishes industrial diamonds from wheels, saws, and other tools used by motor industries, engineering companies, and masonry operations. The industrial diamonds undergo reshaping, recrushing, and grading according to diamond dust quality. Waste materials produced in the reclamation process include calcium, copper, tungsten carbide, and phospor bronze, as well as foreign material such as tea leaves and cigarettes discarded in extraction units. Regulations established by England's Thames Water Authority limit the concentration of suspended metal solids, the major waste from diamond reclamation, in waste water to 10 ppm. Due to increased effluent removal charges by contractors, the Diamond Reclamation company built a waste treatment plant that meets control standards. The process involves the precipitation of suspended solids in effluent with a weir system and the neutralization of acids. The automatic treatment system installed by Diamond Reclamation Services Ltd is valued at 30,000 British pounds Sterling. (Lisk-FIRL)
W78-04386

CONTROLLING THE ENTRANCE OF TOXIC POLLUTANTS INTO U.S. WATERS,
Department of Commerce, Washington, DC. Office of Environmental Affairs.
B. R. Barrett.
Environmental Science and Technology, Vol. 12, No. 2, p 154-162, 1978. 1 fig.

Descriptors: *Federal Water Pollution Control Act, *Potable water, *Transportation, *Pesticides, *Navigable waters, Radioactive wastes, Sea water, Toxins, Insecticides, Fungicides, Rodenticides, Aldrin, Dieldrin, DDT, Endrin, Explosives, Channels, Oil wastes, Oil spills, Industrial wastes.

Nine federal laws which regulate or prevent the discharge of toxic wastes into waterways and maintain water quality standards are reviewed. An amendment to the Federal Water Pollution Control Act regulates six toxic chemicals, including four pesticides. Some amendments set standards for oil and hazardous substance liability; effluent treatment and control compliance schedules for municipalities and industries; identification and limitation of pollutants; and new point-source discharge controls. Other amendments establish pretreatment standards for pollutants, sewage sludges, and toxins; and disposal and discharge regulations for sludge, dredge and fill material, and toxic pollutants in navigable waters. The Marine Protection, Research, and Sanctuaries Act of 1972 controls the transport and discharge of materials into the ocean. The Safe Drinking Water Act of 1974 regulates the drinking water quality after treatment and set standards for contaminant levels, odors, and appearance. Treatment, storage, and disposal of hazardous wastes, excluding nuclear wastes and materials contained in waste water discharge, are mandated under the Resource Conservation and Recovery Act of 1976. Safety and combustible materials, poisons, disease-related substances and other materials, are established by the Hazardous Materials Transportation Act of 1974. Other acts discussed that control toxic substances in water are: the Ports and Waterways Safety Act of 1972; the Federal Insecticides, Fungicide, and Rodenticide Act of 1972; the Toxic Substances Control Act of 1976; and the Atomic Energy Act of 1954. (Lisk-FIRL)
W78-04389

OIL POLLUTION IN THE MEDITERRANEAN SEA,
Mediterranean Regional Oil Combating Center, Manoel Island (Malta).
P. Le Lourd.
Ambio, Vol. 6, No. 6, p 317-320, 1977. 4 fig, 1 tab, 11 ref.

Descriptors: *Oil pollution, *Oil industry, *Oceans, Ships, *Water pollution sources, Oil wastes, Oily water, Oil spills, Waste water treatment, Marine biology, *Mediterranean Sea.

A study of oil pollution in the Mediterranean Sea revealed that the major sources of oil pollution are ballast and bilge water, tank washwater, and refinery wastes. Most tankers employ a 'load on top' separation process for the removal of oil from ballast and bilge, but the 72-hr process is economically impractical for short voyages. Of the 17 loading terminals in the Mediterranean Sea, only about half have facilities for treating ballast from tankers. It is estimated 0.5-1.0 million tons of oil per year are released into the Mediterranean. Many coastal areas in the Mediterranean Sean have reported oil-related contamination and destruction of marine organisms. Oil pollution has been shown to upset the delicate balance of oxygen and nutrients in the seawater. Several conventions have adopted regulations limiting or prohibiting oil discharge in the Mediterranean, as well as measures for cleanup and treatment of oil wastes. (Lisk-FIRL)
W78-04403

THE COORDINATED MEDITERRANEAN POLLUTION MONITORING AND RESEARCH PROGRAM,
United Nations Environment Program, Geneva (Switzerland).
S. Keckes.
Ambio, Vol. 6, No. 6, p 327-328, 1977. 17 ref.

Descriptors: *Water pollution, *Marine biology, *Industrial wastes, *Monitoring, *Research facilities, On-site investigations, Data collections, Regulation, Oceans, Pollutants, Oil pollution, Water pollution sources.

A United Nations-sponsored Mediterranean research and monitoring program is outlined. The Mediterranean Pollution Monitoring and Research Program established seven pilot projects to analyze the effects of pollutants on marine organisms and populations, and on recreational facilities. Oil hydrocarbons, chlorinated hydrocarbons, metals, and the coastal transport of pollutants are also monitored. An eighth project monitors pollution in open waters. The program is part of a four-part Action Plan for the Protection of the Mediterranean Environment adopted in 1975 by the Intergovernmental Meeting in Barcelona. Future goals include the establishment of waste disposal regulations for the Mediterranean and surrounding countries, and a system for collection and processing of data. (Lisk-FIRL)
W78-04412

EFFECTIVENESS OF SURFACE MINE SEDIMENTATION PONDS,
Hittman Associates, Inc., Columbia, MD.
For primary bibliographic entry see Field 5D.
W78-04433

RIVER BASIN WATER QUALITY SAMPLING,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-04491

POPULATION OF BENTHIC MACROINVERTEBRATES IN HAM'S LAKE,
Oklahoma State Univ., Stillwater. School of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-04493

SALINITY MANAGEMENT STRATEGIES FOR THE LOWER SAN LUIS REY RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
J. W. Labadie, I. A. Khan, and O. J. Helweg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 030, Price codes: A09 in paper copy, A01 in microfiche Completion Report, September 1976. 168 p, 53 fig, 10 tab, 51 ref, append. OWRT C-6301(5229)(1)

Descriptors: *Groundwater, *Salinity, *Optimization, *Simulation analysis, *Planning, *Irrigation, *River basins, Mathematical models, Aquifer models, Pumping, Linear programming, Management, Groundwater quality, *Lower San Luis Rey River basin(Calif), California.

A salinity management study has been conducted on the lower San Luis Rey River basin in order to project the impacts of applying the Accelerated Salt TRANsport (ASTRAN) method over a 20 year planning period. The ASTRAN method is an operational approach to salinity control which encourages the application of groundwater downstream from where it is pumped. A management algorithm was developed for implementing the ASTRAN method in an optimal manner. The algorithm is composed of (1) a model simulating groundwater flow and TDS concentration, and (2) an optimizing model. General conclusions from operating the management algorithm for several salt balance levels are: (1) for the same required amount of imported water, the ASTRAN method can achieve a 50% reduction in salinity degradation rate in comparison with the normal practice in the basin of applying water where it is pumped; (2) this figure increases to up to 90% reduction with inclusion of projected availabilities of local Lake Henshaw water; (3) aside from possible investment in additional pumping capacity and unlined surface distribution systems, required capital investment is low in comparison to demineralization and tiling measures.
W78-04499

PHOSPHORUS ACCUMULATION-DISCHARGE CYCLES IN MARSHES,
Wisconsin Univ.-Oshkosh. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-04501

THE SIGNIFICANCE OF STORMWATER RUNOFF IN AN URBANIZING WATERSHED,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
For primary bibliographic entry see Field 5B.
W78-04512

QUALITY ASPECTS OF AGRICULTURAL RUNOFF AND DRAINAGE,
American Society of Civil Engineers, New York. Task Committee on Agricultural Runoff and Drainage of the Water Quality.
For primary bibliographic entry see Field 5B.
W78-04523

DESICCATION AND CONSOLIDATION OF DREDGED MATERIALS,
Northwestern Univ., Evanston, IL. Technological Inst.
R. J. Krizek, M. Casteleiro, and T. B. Edil.

Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 103, No. GT12, Proceedings Paper 13403, p 1399-1418, December 1977. 9 fig, 22 ref, 1 append. EPA 15070-GCK, R-880948.

Descriptors: *Dredging, *Spoil banks, *Consolidation, Desilting, Dewatering, Drying, Model studies, *Mathematical models, Evaporation, Evapotranspiration, Settlement(Structural), Moisture content, Sediments, Soils, Drainage, *Desiccation, Dredged materials, Hydraulic fills, *Toledo(Ohio).

A mathematical model, which numerically solves the boundary value problem representing these physical phenomena, was applied in conjunction with the results of an extensive experimental investigation: (1) calculate the settlements that are predicted for the dredged materials placed in the Penn 7 disposal area in Toledo, Ohio; and (2) to evaluate the effect that modifications in the boundary conditions have on the consolidation behavior of the fill. Although drainage conditions at the bottom of the layer do exert some influence on the consolidation rate during deposition on the dredgings, the evapotranspiration potential renders this effect almost negligible when desiccation takes place at the surface. On the other hand, transpiration plays an important role on the consolidation rate during the early stages of desiccation, but this effect is reduced considerably as the water table approaches an equilibrium position. Theoretical results indicated that significant improvement in the consolidation behavior of dredged materials apparently can not be achieved with low cost modification in the boundary conditions, but the use of vegetation with high transpiration rates appears to offer considerable promise. (Sims-ISWS)
W78-04525

STATE-OF-THE-ART SURVEY AND EVALUATION OF OPEN-WATER DREDGED MATERIAL PLACEMENT METHODOLOGY,
JBF Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 5E.
W78-04533

DREDGED MATERIAL RESEARCH PROGRAM, THIRD ANNUAL REPORT.
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W78-04534

THE ROLE OF ALKALINE RESERVE IN MINERALIZATION OF ORGANIC SUBSTANCES. (IN RUSSIAN),
Miniskii Meditsinskii Inst. (USSR).
N. A. Boldina.
Zdravookhr Beloruss. Vol 18, No 5, p 54-56. 1972.

Descriptors: Albumin, Ammonification, Decomposition, Fecal, Mineralization, Organic wastes, Sewage, Water pollution, Soils, *Decomposing organic matter, *Alkaline soils.

The rate of decomposition of organic substances in soils is determined by soil aeration, soil type and chemical composition of the organic substances. Mineralization of those organic substances occur optimally when their acidic and basic components are in equilibrium; this process is retarded by excess acidity. In soils buffered with alkaline reserve, the capacity for self-purification is much greater than in unbuffered soils. Albumen (egg source unspecified) was dissolved in a solution of N and household fecal sewage water. Aqueous extracts of garden soil were added for seeding (unspecified) soil microflora. Marble powder or quarz powder were also added to vials, which were aerated and maintained at room temperature. Ammonification started in 3-5 days in all vials, but oxidation into nitrites was completed at the end of the 4th month in vials with marble, while the ammonia in the quartz vials was preserved to the end of the 1st yr. The rate of nitrate formation was 3-4 times higher in vials with alkaline reserve (marble) than in those with quartz. The indicators of oxidizability and biochemical O consumption are 30-40% lower in vials with marble. One of the indicators of the course of mineralization of sewage water is the value of their relative stability. The indicator of the stability of the solutions. The ability to control processes of natural organic decomposition is important in both artificial and natural (environmental) purification.--Copyright 1974, Biological Abstracts, Inc.
W78-04538

PHOSPHORUS ACCUMULATION--DISCHARGE CYCLES IN MARSHES,
Wisconsin Univ.-Oshkosh. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-04545

BEST MANAGEMENT PRACTICE FOR URBAN STORM AND COMBINED SEWER POLLUTION CONTROL,
C. B. Murphy, Jr., F. J. Drehwing, T. A. Jordan, and D. J. Carleo.
Water and Sewage Works, Vol 124, No 11, p 81, November, 1977.

Descriptors: *Combined sewers, *Storm water, *Urban runoff, *Sewerage, *Storm runoff, Costs, Water pollution control, Sewers, Suspended solids, Equipment, Waste water treatment.

Since non-point sources are major contributors of urban water pollution, interest has been directed toward the control of storm water and combined sewer overflow discharges. The application of Best Management Practices (BMP) has been suggested as a rational and cost-effective solution to the abatement of both storm water and combined sewer overflow. Surface flow attenuation, porous pavement, erosion control, restrictions on chemical usage, land-use planning, and improved sanitation practices are suggested as abatement measures in source management. Collection system management alternatives include: inflow/infiltration control, improved system regulation and control, polymer addition for friction reduction, and collection system maintenance programs. Conventional vacuum sweepers have been recommended for removing the light fraction of total suspended solids from storm water. Hydraulic analyses of the collection system are recommended for a program of collection system management. (Schulz-FIRL)
W78-04552

EVALUATION OF STORM WATER ROUTEING MODELS,
MacLaren (James F.) Ltd., Toronto (Ontario).
N. A. Zaghoul.
Proceedings of the Institute of Civil Engineers (London), Vol 63, Part 2, p 925-933, December, 1977. 6 fig, 9 ref.

Descriptors: *Storm water, *Routing, *Streamflow forecasting, *Runoff, *Hydrographs, Hydrograph analysis, Rainfall, Rainfall-runoff relationships, Inflow, Diversion structures, Discharge(Water), Municipal wastes, Watershed management, Waste water treatment, Overflow, Canada.

Three storm water transport routing systems were compared. The Dorsch hydrograph volume method (HVM), the Water Resources Engineers' model (WRE), and the storm water management model (SWMM) were evaluated using the same runoff inlet hydrographs. The three models were tested in simulation studies with the Bannatyne combined sewer water shed in Winnipeg, Ontatio, Canada. The 542-acre Bannatyne watershed was divided into 41 subcatchments, ranging in size from 5 to 23 acres and in imperviousness from 23 to 75%. Transport routes were compared under normal flow conditions. Outflow hydrographs predicted by the models were compared to the outflow hydrographs recorded during a storm of low intensity and long duration and during a storm of medium intensity and short duration. The evaluation indicated that the SWMM model was not as accurate under surcharge conditions and should be used primarily in studies of storm water management and planning. The Dorsch HVM and WRE models provided more realistic storm sewer network designs. (Lisk-FIRL)
W78-04554

$4.7 BILLION FOR SAO PAULO SEWERS MARKS INVESTMENT SHIFT BY BRAZIL.
Engineering News-Record, Vol 199, No 25, p 44, December, 1977. 1 fig.

Descriptors: *Sewage treatment, *Activated sludge, *South America, *Treatment facilities, *Sewerage, Biological treatment, Economics, Municipal wastes, Waste water disposal, Waste water treatment, *Brazil.

Sao Paulo, Brazil, will soon begin to build its first comprehensive sewage collection and treatment system. Construction of the system will take place in stages and continue through the year 2000. Today, only 38% of Sao Paulo is served by sewers; and only 5% of the sewage receives primary treatment. The new system, when completed, will collect 90% of the sewage and subject it to secondary treatment. The 3300 mi collection system will be built by local contractors. The treatment equipment is to be purchased abroad. The stage of Sao Paulo allocates over 40% of its total capital budget to public health and sanitation projects. Sewage comprises 25% of the flow of the River Tiete which ultimately empties into a reservoir providing part of Sao Paulo's drinking water supply. Treated water will enter the Tiete after 1983, when the first waste treatment plant is scheduled to begin operation. Activated sludge will be used, but new treatment technology will be incorporated wherever possible. Engenharia de Projectos, Ltda., a local firm, prepared the master plan. Technical advice was provided by: Metcalf and Eddy, Incorporated, Boston; experts from Capetown University in South Africa; the Thames Water Authority in England; and the Ruhr Valley Pollution Control agency in West Germany. (Snyder-FIRL)
W78-04555

INTERNATIONAL PIPE PROTECTION CONFERENCE.
For primary bibliographic entry see Field 8G.
W78-04556

BREATHING NEW LIFE INTO POLLUTED WATERS.
Chemical Week, Vol. 121, No. 20, p 47-48, November, 1977.

Descriptors: *Aeration, *Water pollution control, *Pollution abatement, *Dissolved oxygen, *Treatment facilities, Environmental effects, Oxidation, Waste water treatment, *France.

A new plan has emerged for on-site clean-up of polluted rivers and lakes. The process employs ships equipped with liquid oxygen aeration units. Two Oxynautes have been built and tested successfully on the Seine and Deulle Rivers in France. The larger of the two ships, the Poseidone C 1000 can treat 5,800 liters of waste water/sec. The Poseidonie C 500 treats 2,900 liters/sec. The process can be applied to municipal wastes as well as industrial wastes containing hydrocarbons. In the continuous treatment process on board ship, turbine-propelled blades mix liquid oxygen with waste waters pumped into a shipboard mixing chamber. Mixing is done under pressure to create

high dissolved oxygen levels in the water. The oxygenated water returned to the waterway provides an environment suitable to bacterial consumption of organic wastes. Dissolved oxygen levels in the range of 0.3-10.0 mg 02/liter of waste water are required for the process. (Baker-FIRL)
W78-04580

UTILIZATION OF WASTEWATER RESIDUES TO RECLAIM DREDGED EMBANKMENTS,
For primary bibliographic entry see Field 5E.
W78-04585

THE GREAT LAKES CLEANUP,
International Joint Commission-United States and Canada. Great Lakes Regional Office.
K. H. Walker.
Water and Sewage Works, Vol. 124, No. 11, p 85, November, 1977.

Descriptors: *Great Lakes, *Water pollution control, *Environmental effects, *Phosphorus, *Waste water disposal, Phenols, Aquatic life, Absorption, Water quality standards, Fish, Path of pollutants.

The 1972 Great Lakes Water Quality Agreement was adopted to ensure effective pollution control via Canadian and American programs. One of the major goals of the project was to reduce phosphorus inputs and control eutrophication in the Great Lakes. Effluent standards for municipal waste water discharge have been set at 1.0 mg/liter for plants discharging in excess of 1 mgd. Although phosphorus loadings have decreased since 1975, to date only 9 of the 44 municipal waste water treatment plants are meeting phosphorus standards. Current activities of the International Joint Commission have been directed toward evaluating the use of sodium nitriloacetate as a replacement for phosphorus in laundry detergents. The commission also plans to provide information on Great Lakes water quality and the persistence of toxic chemicals in the Great Lakes ecosystem. (Schulz-FIRL)
W78-04586

WATER RECLAMATION--QUALITY TARGETS AND ECONOMIC CONSIDERATIONS,
National Inst. for Water Research, Pretoria (South Africa).
L. R. J. van Vuuren.
Water SA, Vol. 1, No. 3, p 133-143, October, 1975. 4 fig, 10 tab, 6 ref.

Descriptors: *Water reuse, *Water quality standards, *Water costs, *Competitive prices, *Treatment facilities, Sewage treatment, Africa, Municipal wastes, Industrial wastes, Waste water treatment, Waste water disposal, South Africa.

In Southern Africa, secondary effluents have been reclaimed for industrial and other purposes for some time. Most effluents from conventional sewage treatment plants have marked diurnal and seasonal variations in quality with regard to ammonia nitrogen, organic carbon, and alkalinity. Mineral quality, ammonia nitrogen, dissolved organic constituents, and suspended solids all affect the suitability of water for reuse. During recent years advanced treatment technology for waste water reclamation has progressed considerably. The Windhoek and the Stander waste water reclamation plants in South Africa each treat 4.5 Mliters/day using lime treatment and carbon filtration. It is possible to produce water meeting World Health Organization standards at a approximate cost of 10 South African cents/kiloliter. Alum and polyelectrolyte addition were used at another plant to improve treatment of waste water for reuse in pulp bleaching operations. The reuse of waste water for industrial purposes is possible at competitive prices and would be a rational way to deal with increasing water demands. Strict operational control of reclamation plants is required to produce potable water. Improved sewage treatment processes and separation of toxic industrial wastes can greatly reduce risks. (Snyder-FIRL)
W78-04597

PUBLIC HEALTH ASPECTS OF LAND UTILIZATION OF WASTEWATER EFFLUENTS AND SLUDGES,
Johns Hopkins Univ., Baltimore, MD.
For primary bibliographic entry see Field 5E.
W78-04604

'USED' WATER USED AGAIN FOR IRRIGATION.
Crops and Soils Magazine, Vol. 30, No. 3, p 24, December, 1977.

Descriptors: *Irrigation, *Return flow, *Cultivated lands, *Water reuse, *Water conservation, Recycling, Municipal wastes, Sewage treatment, Waste water disposal, Waste water treatment.

Irrigation of farmland has been suggested as a means of recycling large amounts of sewage treatment effluent, especially in California. California procudes 1.7 million acre-feet of reusable waste water annually. Currently, two-thirds of this is discharged directly into the ocean or estuaries. Municipal waste water has already been used to irrigate small areas of farmland owned by California sewage treatment agencies. Water supply and water treatment systems are usually coordinated by different agencies, making cooperative planning difficult. Major waste water sources are also usually located some distance from farming operations which need supplemental water. There are also uncertainties involving benefits and costs, crop yields, and soil and water resources. Some stable organic compounds found in waste water may be dangerous. Ideally, both the farmer and the city should benefit from waste water reclamation for irrigation. (Snyder-FIRL)
W78-04605

JURY ON LAND DISPOSAL OF WASTEWATER STILL OUT, MR. COSTLE,
S. Baxter.
The American City and County, Vol. 92, No. 12, p 28, December, 1977.

Descriptors: *Treatment facilities, *Land use, *Public health, *Water Pollution Control Federation, *Adoption of practices, Municipal wastes, Biological treatment, Conferences, Waste water disposal, Waste water treatment.

Health aspects of waste water and residual disposal on land were discussed at the Water Pollution Control Federation's (WPCF) 1977 annual conference. The Environmental Protection Agency (EPA) will urge publicly-owned treatment plants to use land treatment to reclaim and recycle municipal waste water. The engineer designing a treatment plant must present evidence against the feasibility of land application before standard mechanical and biological treatment processes can be adopted. The health problems associated with land disposal are not entirely understood. It is not known whether experience with land disposal in Muskegon, Michigan, will be sufficient to ensure 1983 and 1985 water pollution abatement goals. Land disposal should only be considered when the facility is properly operated and efforts are made to use sound engineering, geological, farming, areal, meteorological, and econimic expertise in design, construction, and control procedures. Many of the narrow viewpoints stem from arbitrary legal and regulatory provisions. (Snyder-FIRL)
W78-04606

OPERATION AND MAINTENANCE OF POLLUTION CONTROL EQUIPMENT,
F. L. Cross, Jr.
Pollution Engineering, Vol 9, No 12, p 52-55, December, 1977. 1 fig, 2 tab, 1 ref

Descriptors: *Activated sludge, *Operation and maintenance, *Treatment facilities, *Air pollution, *Monitoring, Waste water treatment, Environmental engineering, Management, Sludge treatment, Equipment.

Proper maintenance techniques for the efficient operation of pollution control facilities are outlined. Initially, the guidelines recommend an inventory of all equipment by maintenance crews or outside consultants. A monthly maintenance report is suggested as a record of servicing, failures, and costs. Maintenance of the activated sludge system involves the recognition of problems such as sludge bulking, erratic sludge volume, difficulty in maintaining balanced mixed liquor and dissolved oxygen in aeration tank, and excessive foam in aeration tanks. The establishment of a floating maintenance man or crew for regional area air pollution equipment is recommended. Routine maintenance of incineration equipment is advised for preventing major breakdowns. Regulations governing sanitary landfill use and maintenance and a routine check of potential problems are suggested. (Lisk-FIRL)
W78-04618

EVALUATING WASTEWATER FACILITY STAFFING NEEDS,
Culp, Wesner, Culp-Clean Water Consultants, El Dorado Hills, CA.
G. Culp, H. H. Benjes, Jr, and J. Puntenney.
Journal Water Pollution Control Federation, Vol. 49, No. 11, p 2226-2237, November, 1977. 15 tab, 2 ref.

Descriptors: *Personnel management, *Manpower, *Treatment facilities, *Operation and maintenance, On-site data collections, Waste water treatment.

Plans to expand the Metropolitan Denver Sewage Disposal District (MDSDD) secondary treatment facilities from a 98-mgd to a 170-mgd capacity led to a study on staffing needs. The program included a comparison with available staffing guidelines, comparisons with other plants, on-site interviews of existing MDSDD personnel, and recommendations of appropriate staffing levels. The various findings of this survey are reported. By reviewing work tasks, the minimum staff requirement was estimated as 177. The preliminary MDSDD plan had provided for 199 positions, a level of staffing guidelines agreed with MSDSS's preliminary staffing plans for their expanded facility. It was determined that the 22 positions could be left unfilled until a definite need was demonstrated. The results of this survey indicated the need for a thorough study of a specific plant's needs for an accurate estimation of staff requirements. (Baker-FIRL)
W78-04642

ENVIRONMENTAL PROBLEMS OF INDIA AND THEIR POSSIBLE TRENDS IN FUTURE,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
J. K. Parikh.
Environmental Conservation, Vol. 4, No. 3, p 189-198, Autumn 1977. 1 fig, 5 tab, 13 ref.

Descriptors: *Environmental effects, *Water pollution control, *Foreign countries, *Public health, Environmental sanitation, Sewerage, Water supply, Population, Water pollution effects, Waste water treatment, Waste water disposal.

Environmental problems in India and their possible influence on the future are reviewed. The anticipated population growth, increased industrial and agricultural activities, and depletion of natural resources are expected to present serious problems over the next 25 years. The quality of the

air, water, sanitation, health, and housing are considered. A quantitative outline is presented for various conservation techniques for forests, soils, and wildlife. Two of the most serious problems in India are water pollution and deforestation. Presently, in rural areas, less than 10% of the population is served by existing water distribution and waste water treatment systems. Unless drastic measures are taken, this percentage may not exceed 30% by the year 2000. The lack of adequate sewerage and sanitation facilities could lead to severe degradation of existing water supplies. Further consideration of the effects of agricultural runoff containing wastes, pesticides, and fertilizers on rural water sources is also suggested. (Baker-FIRL)
W78-04643

SEWERAGE COSTS RISING AT A FASTER PACE.
Engineering News-Record, Vol. 199, No. 25, p 102, December, 1977. 3 tab.

Descriptors: *Cost comparisons, *Costs, *Waste water treatment, *Economics, *Treatment facilities, Economic prediction, Municipal wastes.

Construction costs for waste water collection and treatment facilities in the United States are reported by the Environmental Protection Agency to have taken a sharp rise in the third quarter of 1977. This rise in cost parallels a similar increase in the concrete pipe and lumber industries. For 25 cities across the United States having waste water treatment plants of the 5-mgd treatment size, cost indexes averaged 126.3 in the July-September period, up 2.5% from the previous quarter. For 50-mgd treatment plants, costs indexes averaged 138.5, a 3.2% increase over second-quarter figures. Cost indexes for complete urban sewer systems averaged 143.2 in the third quarter, up 3.4% from the April-June period. (Baker-FIRL)
W78-04644

COMMUNITY ACTION ON WATER POLLUTION,
Cook Coll., New Brunswick, NJ. Dept. of Human Ecology.
J. J. Friedman.
Human Ecology, Vol. 5, No. 4, p 329-353, 1977. 2 tab, 48 ref.

Descriptors: *Environmental control, *Grants, *Waste water treatment, *Industrial wastes, *Sewage disposal, Municipal wastes, Water pollution control, Government supports, Local governments, Treatment facilities, Costs.

A community's progress toward the institution of water quality control is relative to the influence of polluting industries on the community, the cost-benefit factors, and the characteristics and needs of the community. Options available to communities for pollution control include EPA grants for the construction of new treatment facilities, HUD's Water and Sewer Facilities Program providing matching grants for sewers and waste disposal facilities, and the adoption and enforcement of regulations restricting pollution through industrial wastes. The benefit of these alternatives is considered collective, or shared by the entire community. Cost, however, may be more specific, falling mainly upon the users of treatment facilities and polluters, such as local industry. Opposition by local industry can influence the action taken by a community toward pollution control. Other factors that influence a community's application for waste control grants include location, need, population potential, and resources. (Lisk-FIRL)
W78-04645

DAMAGE TO POLLUTED LAKES CAN BE REVERSED, STUDY SAYS.
Water and Waste Engineering, Vol. 14, No. 12, p 5, December, 1977.

Descriptors: *Phosphorus, *Freshwater, *Aquatic algae, *Tertiary treatment, *Sewage disposal, Eutrophication, Reservoirs, Agricultural runoff, Waste water treatment, Water quality, Detergents.

A study by a group of Cornell University researchers has concluded tht dissolved phosphorus presents the major threat to freshwater lakes and that the pollution can be reversed. Erosion, which contributes undissolved phosphorus to water, is not as serious a threat to the water quality as dissolved phosphorus, which controls the growth of algae. This conclusion contradicts federal guidelines. Sewage is cited as the primary source of dissolved phosphates, originating from the use of phosphate detergents. Prohibiting use of these detergents and instituting tertiary treatment of wastes provide the most economical control. Water quality regulations should meet the needs of individual watersheds and their biological characteristics. Removal of phosphorus input from agricultural drainage and unsewered areas was found to be more costly than the other controls and treatment. Public awareness and concern is also considered. (Lisk-FIRL)
W78-04646

PHOSPHATE PROBLEMS COME TO THE UNITED KINGDOM,
For primary bibliographic entry see Field 5D.
W78-04647

CALIFORNIA TAKES HALTING LEAD ON SEWAGE PLANT CM.
Engineering News-Record, Vol. 200, No. 3, p 53, January, 1978.

Descriptors: *Construction, *Management, *Treatment facilities, *California, *Grants, Project planning, Design, Projects, Sewage treatment, Waste water treatment.

California now requires applicants for federal waste water treatment construction grants to submit plans for construction management of projects costing over $5 million. Separate construction managers are not required. This approach allows for project vanability and flexibility. The Environmental Protection Agency (EPA) has delegated more responsibility for water pollution control to California than to any other state. California and the EPA believe that a reduction in change orders and delays will more than offset any additional costs incurred by retaining a construction manager. The EPA is sending other states information about the program and encouraging them to adopt similar requirements. The EPA may order construction management at a later date. (Snyder-FIRL)
W78-04648

EPA HALTS AWARD.
Engineering News-Record, Vol. 199, No. 25, p 46, December, 1977.

Descriptors: *Bids, *Supply contracts, *Sewage treatment, *Sewerage, *Treatment facilities, Municipal wastes, Specifications, Administration, Equipment, Waste water treatment.

The Environmental Protection Agency (EPA) postponed funding of an $80 million waste water treatment plant. The action was in response to bid specifications requiring performance bonds covering equipment from potential suppliers which were considered too restrictive. Officials of the Passaic Valley Sewerage Commission felt that the ruling would unnecessarily delay construction of a $500-million treatment plant in Newark, New Jersey. It might also prevent New Jersey from meeting a federal deadline of December 31, 1989, to end ocean dumping of sludge. The specifications required suppliers of the thermal sludge conditioner to have at least 5 years of experience with the equipment or to post a bond to guarantee the system's performance for 5 years. According to the commission, an inexperienced supplier might install a system having defects which would not be found during construction or initial testing. Only two United States firms currently manufacture the wet air oxidation system: Zimpro Inc., of Rothschild, Wisconsin; and Envirotech Corp., in Menlo Park, California. The EPA had initially approved the experience requirement, but decided later that it only inhibited free competition. The Passaic Valley Sewerage Commission has contemplated appealing the EPA ruling. (Snyder-FIRL)
W78-04650

SEWER USE CHARGE SURVEY REVEALS WIDELY DIVERGENT POLICIES,
Charlotte/Meklenburg Utility Dept. Charlotte, NC.
L. S. Dukes, and R. R. Moore.
Public Works, Vol 108, No 12, p 48-49, 83, December, 1977. 2 fig, 2 tab.

Descriptors: *Pollution taxes(Charges), *Sewerage, *Costs, *Operation and maintenance, *Capital costs, Municipal wastes, Treatment facilities, Sewers, Waste water treatment.

A survey was taken to compare the current and proposed sewer use charge rates employed by the Charlotte-Mecklenburg Utility Department in Charlotte, North Carolina, with those of other cities with similar facilities. Information was obtained from 74 publicly-owned systems. The largest was Los Angeles with 455-mgd capacity; the smallest was New London, Connecticut, having a 6-mgd system. The survey solicited information on financing for operation, maintenance, and repair. Funding for capital expansion of collection and treatment systems was assessed. Charges based on waste water volume were significantly different for the various utilities. For a monthly volume of 1,000 cu ft, charges ranged $0.98-8.68 for users inside city limits and $3.02-13.00 for users outside city limits. Corresponding charges for a monthly volume of 100,000 cu ft were $71.65-531.50 and $103.25-1478.20, respectively. (Baker-FIRL)
W78-04651

REGIONAL WATER QUALITY PLANNING: A VIEW FROM SOUTHEAST MICHIGAN,
R. P. Akeley, Jr., P. G. Collins, C. D. Harlow, and J. W. Ridgway.
AIChE Symposium Series, Vol 73, No 167, p 288-296, 1977. 4 fig, 1 tab.

Descriptors: *Waste water treatment, *Waste water disposal, *Municipal wastes, *Sewage treatment, *Sewerage, Analytical techniques, Treatment facilities, Planning, Water quality, *Michigan.

The Southeast Michigan Council of Governments (SEMCOG) received $5.1 million to produce a plan for water quality management for the Detroit metropolitan region. Data requirements were extensive. Water quality models include: STORM-LLODS, a precipitation-runoff screening model; QUAL II, a stream quality routing model; and RUNQUAL, which routes surface runoff plus base flows through a converging, branching network of pipes of channels. Southeast Michigan has a complicated mixture of point, nonpoint, and intermittent point sources of pollution. Facilities planning was to include carful technical reviews, improved cooperation with the local units, close communication with the state clearinghouse, integration of facilities reviews and development of the water quality management plant, cooperation during facilities plan development, and a sewer service area map. Population forecasts were necessary for anticipating appropriate service area boundaries. The Council was given 2 given 2 years in which to create a plan that was both technically sound and implementable. (Snyder-FIRL)
W78-04652

EVALUATION OF 'CAM-1', A WARNING DEVICE FOR ORGANOPHOSPHATE HAZARDOUS MATERIAL SPILLS,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5A.
W78-04679

A REGIONAL WATER QUALITY MONITORING SYSTEM,
Minneapolis Metropolitan Sewer Board of the Twin Cities Area, Md.
For primary bibliographic entry see Field 5A.
W78-04687

AN AIRBORNE LASER FLUOROSENSOR FOR THE DETECTION OF OIL ON WATER,
National Aeronautics and Space Administration, Wallops Island, VA. Wallops Station.
For primary bibliographic entry see Field 5A.
W78-04689

AERIAL SPILL PREVENTION SURVEILLANCE DURING SUBOPTIMUM WEATHER,
Earth Satellite Corp., Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04693

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

APPLICATIONS FOR SOUTH CAROLINA'S WETLANDS OF A GENERAL MODEL OF EFFICIENT SOLUTIONS TO EXTERNALITIES,
Clemson Univ., SC. Dept. of Economics.
For primary bibliographic entry see Field 6C.
W78-04368

AN APPLICATION OF INTERACTIVE MULTIOBJECTIVE WATER RESOURCES PLANNING,
Cornell Univ., Ithaca, NY. Dept. of Environmental Engineering.
D. P. Loucks.
Interfaces, Vol. 8, No. 1, p 70-75, November, 1977. 2 fig, 2 ref.

Descriptors: *Water resources, *Multiobjective planning, *Irrigation efficiency, *Optimization, Decision making, Northern Africa, Conflicting objectives, Water yield maximization, Reliability maximization, Cost minimization, Projects, Alternative planning, Pipelines, Reservoirs, Constraints, Design, Iterative process, Mathematical models, Systems analysis.

A national goal in northern African countries is to increase agricultural production. In particular, a country is considering the construction of a rather large network of reservoirs, pipelines, pumping stations, and water treatment plants that would capture, treat and pump back much of the water normally discharged into the Mediterranean Sea. This water, supplemented by desalinated water from the Mediterranean would be transported to the interior of the country for irrigation use. This paper discusses the derivation of a single best preliminary plan for each irrigation area through the use of interactive multiobjective optimization methods. The iterative process involves the use of some dynamic multiobjective models for the generation of successive solutions that satisfy changing criteria established by decision makers of the host country. This process has enabled government officials to choose what they consider as the best compromise between three conflicting objectives: maximum water yield; maximum yield reliability; and minimum total cost. (Bell-Cornell)
W78-04476

CONTROL TARGETS FOR THE MANAGEMENT OF BIOLOGICAL SYSTEMS,
Arizona Univ., Tucson. Dept. of Aerospace and Mechanical Engineering.
T. L. Vincent, C. S. Lee, and B. S. Goh.
Ecological Modelling, Vol. 3, No. 4, p 285-300, October 1977. 27 ref.

Descriptors: *Fish harvest, *Management, *Biological systems, *Control targets, Isochronal systems, Cost minimization, Cost functions, Time intervals, System trajectory, Equations, Mathematical models, Systems analysis, *Optimization.

Attention is focused on biological systems which are describable in terms of ordinary differential equations subject to human control inputs. The concept of an isochronal system is introduced in order to include systems for which the differential equations are valid only over regularly recurring time intervals. It is assumed that the control inputs are to be chosen so that an integral cost function of the state of the system, the control used, current time, and the time interval of the control program are minimized. Problems associated with minimizing this cost function over an infinitely long time interval are then considered. Difficulties inherent with minimizing a cost integral on an infinite time interval are shown to be avoided by minimizing an average of the cost function over an unknown but periodic time interval. Under proper circumstance, the optimal control program for the average cost function, is either identical or a good approximation to the optimal control program for the original cost function over an infinitely long time interval. Necessary conditions are obtained for minimizing an average cost function over an unspecified time interval subject to the system equations. For a given problem, the necessary conditions will yield but a single system trajectory in the state space. For management purposes, this trajectory may be seen as a target to which the system should be driven and maintained. Examples in the field of fish harvesting illustrate the use of the necessary conditions to obtain control targets. Certain problems associated with the stability of the target solutions are illustrated with the examples. (Bell-Cornell)
W78-04477

THE ALL-PURPOSE MATHEMATICAL MODEL,
New York State Dept. of Environmental Conservation, Albany. Div. of Pure Waters.
H. H. Bagley.
Clearwaters (New York Water Pollution Control Association), Vol. 6, No. 4, p 12-13, December 1976.

Descriptors: *Mathematical models, *Water pollution, *Simulation analysis, Systems analysis.

The mathematical model is valid for only a geomorphology identical to that where the natural physical phenomena is observed. While it is true that the model is useful for determining values for the several unknown parameters under predictive situations by introducting finite mass balances for known variables, a model rarely serves as a matter of interest to more than a single client. This article describes the author's experimentation with the concept of an all-purpose mathematical model in order to overcome this obvious deficiency. The matrix used in the application of the All-Purpose Mathematical Model (APMM) is given. (Bell-Cornell)
W78-04478

CHARACTERISTICS OF THE SOLUTION ALGORITHMS FOR THE QUAL II RIVER MODEL,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5B.
W78-04479

GENERAL OVERVIEW OF APPLICATION OF STOCHASTIC METHODS TO WATER RESOURCES PROBLEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
In: Stochastic Approaches to Water Resources, Vol I. Edited and published by H. W. Shen, Colorado State University, Fort Collins, Chapter 1, p 1-1--1-46, 1976. 13 fig.

Descriptors: *Water resources, *Stochastic processes, *Analytical techniques, *Probability, *Mathematical statistics, *Water storage, Equations, Systems analysis, Estimating, Planning, Operating rules.

The overview is divided into five sections. The first is a discussion of broad concepts which demonstrate the need for stochastic methods in solving water resources problems. Considered are: data on water supply and demand; relations of processes and decisions; risks and uncertainties; concepts of noise; types of water management; the idealistic-deterministic approach; operational rules; stochastic optimization; and planning. The second part reviews some applications of the probability theory topics, stressing the problems to which they may apply. Discussed are: permutations and combinations; geometric probabilities; theorem of total probability; Bayesian theorem; limit theorems; and Chebishev inequality. The third section deals with the application of mathematical statistics in water resources. Considered here are: estimation of probability distributions of random variables; types of variables, series, and processes; and parameter estimation. Part five discusses the application of stochastic processes, including spectral and cross spectral analysis. Finally, methods available for solving water storage problems are classified into three major groups: (1) empirical (practical, historic, engineering); (2) analytical (theoretical, mathematical); and (3) experimental (Monte Carlo, statistical, data generation, synthetic hydrology, stochastic simulation). Various components of these three methods are discussed. (See also W77-10439) (Bell-Cornell)
W78-04482

STRUCTURE OF WATER USE TIME SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. Yevjevich.
In: Stochastic Approaches to Water Resources, Vol I. Edited and published by H. W. Shen, Colorado State University, Fort Collins, Col., Chapter 3, p 3-1--3-45, 1976. 24 fig, 8 tab, 15 ref.

Descriptors: *Water use, *Time series, *Water demand analysis, *Stochastic processes, Mathematical models, Equations, Systems analysis, Irrigation, Data, Temperature, Precipitation, Transient components, Mean and standard deviation, Periodic components, Autocorrelation coefficients, Linear relationship, Cross correlation function.

Water demands for cities, irrigation, power or other sources are extremely important elements of water resources planning. A lengthy introductory section explains water use time series (WUTS). Considered are: the significance of proper analysis and description of WUTS; it general characteristics; definitions of water uses and of their relation to irrigation and hydropower, as well as to navigation, recreation and water quality control; the general composition of WUTS; and sources of determinism and of stochasticity in WUTS. The next section deals with the identification, description, and removal of transient and periodic components. Discussed are mean and standard deviation and autocorrelation coefficients. Next, the chapter considers dependent and independent stochastic components. A general, deterministic-stochastic model for the analysis of WUTS is outlined which permits: the identification, estimation

and removal of trens in the mean and standard deviation; the periodic mean; standard deviation and autocorrelation coefficients; the time dependence structure; and thus the reduction of the original nonstationary process to a second-order stationary independent process. The next section considers the dependence between stochastic components of water use and climatologic series. Discussed are the linear relationship between series and the relation between water use series, temperature, and precipitation. Finally, examples of explained variables (variance by trends) are given. (See also W77-10439) (Bell-Cornell)
W78-04483

APPLICATION OF STOCHASTIC METHODS IN WATER RESOURCES STUDIES,
Texas Univ. at Austin. Center for Research in Water Resources.
L. R. Beard.
In: Stochastic Approaches to Water Resources, Vol I. Edited and published by H. W. Shen, Colorado State University, Fort Collins, Col., Chapter 7, p 7-1--7-13, 1976. 5 fig, 1 tab.

Descriptors: *Stochastic processes, *Water resources, *Projects, *Planning, *Design, Data fill-in, Hydrologic events, Simulation analysis, Texas Water Plan, Saskatchewan-Nelson Basin, Long-term droughts, Extreme droughts, Hydrologic data, Tandem stations, Monthly streamflow, Mathematical models, Equations, Systems analysis.

Planners and engineers are reluctant to use stochastic methods in dealing with water resources projects. This may be due to: (1) unfamiliarity with the available techniques; (2) inadequacy of available techniques; and (3) available techniques not having been tested and demonstrated. This chapter explains some problems in the application of stochastic methods to actual water resources studies, such as the Texas Water Plan and the Saskatchewan-Nelson Basin, and presents some problem solutions. Water project planning and design is still based generally on the assumption that a project need perform adequately only under recurrence of past hydrologic events as adjusted for future changes in basin conditions upstream. But the highly complex nature of a water resources project produces a need for stochastic methods; they are of greatest value in the simulation of project performance for conservation purposese (non-flood-control). Since a very large number of calibration coefficients is required for any realistic stochastic model of hydrologic events, mathematical techniques must be devised to overcome the effects of short records and incomplete data matrices; also, computation requirements must not be excessive. A monthly simulation program has been developed by the Corps of Engineers in order to conform with the requirements for a practical stochastic model for the study of long-term droughts. Studied are data fill-in and its value, long-term droughts, and tandem station problems. (See also W77-10439) (Bell-Cornell)
W78-04484

RISK AND UNCERTAINTY AS OBJECTIVES IN WATER RESOURCES,
Colorado State Univ., Fort Collins.
W. A. Hall.
In: Stochastic Approaches to Water Resources, Vol 1. Edited and published by H. Shen, Colorado State University, Fort Collins, Col., Chapter 8, p 8-1--8-13, 1976. 1 tab, 5 ref.

Descriptors: *Water resources, *Planning, *Management, *Risks, *Optimization, *Surrogate Worth Trade-Off method, *Stochastic processes, Reservoir storage, Minimization, Maximization, Equations, Mathematical models, Systems analysis.

Water resources management has many incommensurable objectives. This chapter briefly discusses basic approaches to risk and uncertainty as objectives in water resources planning and management. Considered is the form of the risk objective. The Surrogate Worth Trade-Off (SWT) method is developed to deal with risk optimization and is found to be a powerful tool. If the proper definition of risk can be formulated in terms of the decisions x or their results, and if these can be optimized subject to constraints, then the SWT method can always be utilized to determine the superior levels of risk and returns for the decision maker. (See also W77-10439) (Bell-Cornell)
W78-04485

OPTIMIZATION AND UNCERTAINTY,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
In: Stochastic Approaches to Water Resources, Vol 1. Edited and published by H. Shen, Colorado State University, Fort Collins, Vol, Chapter 9, p 9-1--9-37, 1976. 6 fig, 3 tab, 15 ref.

Descriptors: *Optimization, *Risks, *Water resources, *Stochastic processes, *Dynamic programming, *Decision theory, *Marginal analysis, Cost minimization, Benefit maximization, Reservoirs, Linear decision rule, Chance-constrained programming, Water supply, Scheduling, Equations, Mathematical models, Systems analysis.

After a consideration of natural versus man-made uncertainty and types of uncertainties (including those governed by laws of chance and those due to the randomness of nature or to the ignorance state of nature), this chapter deals with the effects of uncertainty in the choice of an objective in the optimization procedure. Decisions and consequences of decisions with uncertainty are discussed using illustrated examples. A particular method of solution--dynamic programming from a functional viewpoint--is described for sequential decision making. Marginal analysis with both deterministic and uncertain futures, future empirical decision values for various cases, and Masse's recurrence theory of marginal expectations are discussed. Examples include both cost minimization and benefit maximization problems, the problem of stocking water to meet a random demand, and the operation of a single reservoir. It is concluded that most water resources problems can be viewed as scheduling problems with uncertain and therefore variable supply. There are no standard approaches to optimization under uncertainty; the particular formulation selected will depend on the actual characteristics of the system under investigation. (See also W77-10439) (Bell-Cornell)
W78-04486

WATER RESOURCES PLANNING (AN ILLUSTRATION ON MANAGEMENT OF SURFACE AND GROUNDWATERS),
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
In: Stochastic Approaches to Water Resources, Vol I. Edited and published by H. W. Shen, Colorado State University, Fort Collins, Col., Chapter 10, p 10-1--10-61, 1976. 9 fig, 6 tab, 61 ref.

Descriptors: *Water management(Applied), *Planning, *Risks, *Mathematical models, *Hydrology, *Operations research, *Stochastic processes, Optimization, Linear programming, Simulation analysis, Equations, Methodology, Legal aspects, Conjunctive use, Surface waters, Groundwater, Colorado, River regulation, Flow, Economics, Wells, Farms, Constraints, Benefit maximization, Stream-aquier systems, Runoff, Pumping.

Whereas Chapter 9 of this volume discusses in general terms a number of approaches to optimization and uncertainty in water resources planning, this chapter considers in detail a few such approaches and demonstrates their application in case studies. Discussed first are legal problems related to management of surface and groundwaters in Colorado, litigation in Colorado, the State Engineer's tasks, economic contexts, and hydrologic uncertainties. Then two types of groundwater models--the simulation (traditional) model and kernal models--are briefly compared. Considered is stream-aquifer interaction. Next a model is developed and various strategies to manage the model are described. Presented are the derivations necessary for the model, which predicts simultaneously the two-dimensional evolution of drawdown and flow in the aquifer, the one-dimensional propagation of a flood in the river channel, and their interaction. The moments of the statistical distribution of the minimum storage are ordered by simulation. A combinatorial solution of the Kuhn-Tucker conditions leads to the piecewise linear relations between the minimum storage and the weekly flows. Every vertex of the domain is investigated for optimality. The problem of the determination of the statistical distribution of an optimal random variable, apparently overlooked by researchers, is a fundamental one in the effective use of optimization in the solution of water resources problems where uncertainty and randomness are rules rather than exceptions. (See also W77-10439) (Bell-Cornell)
W78-04487

APPLICATION OF STATISTICAL DECISION THEORY,
Arizona Univ., Tucson.
L. Duckstein, and D. R. Davis.
In: Stochastic Approaches to Water Resources, Vol I. Edited and published by H. W. Shen, Colorado State University, Fort Collins, Col., Chapter 11, p 11-1--11-52, 1976. 3 fig, 2 tab, 74 ref.

Descriptors: *Water resources, *Statistical decision theory, *Risks, *Bayesian decision theory, *Design, *Hydrology, *Stochastic processes, *Economics, Rainfall, Mathematical models, Equations, Systems analysis, Methodology, Probability, Seasonal, Flow, Flood control, Poisson model, Optimization, Benefit maximization, Sensitivity analysis, Hydrologic data, Simulation analysis.

Hydrologic design decisions are often made under various types of uncertainties; as a result, non-optimal decisions may result, with corresponding social and economic losses. The reduction of uncertainties may thus be an important task in the analysis of water resources systems. This chapter considers principally hydrologic and economic uncertainties which are only a part of the whole set of uncertainties present in water resources systems analysis. There are at least three kinds of hydrologic uncertainties present in design problems: (1) natural uncertainty as to rainfall, streamflow, etc.; (2) model uncertainty in that the models may not represent the true processes; and (3) parameter or sample uncertainty when the estimated parameters from historical data are not true population values. Examples of uncertainty in estimating hydrologic parameters and in design decisions are given. Parameter estimation for return periods of extreme events, rainfall and seasonal flow volumes are discussed. Decision making under natural as well as sample, uncertainty (Bayesian Decision Theory), trade-off between uncertainties, system design methodology, and an iterative process between models, decision, and data are also considered. (See also W77-10439) (Bell-Cornell)
W78-04488

PARAMETER REGIONALIZATION AND NETWORK DESIGN,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
S. I. Solomon.

In: Stochastic Approaches to Water Resources, Vol I. Edited and published by H. W. Shen, Colorado State University, Fort Collins, Col., Chapter 12, p 12-12-37, 1976. 9 fig, 1 tab, 26 ref, 3 append.

Descriptors: *Parametric hydrology, *Regionalization, *Networks, *Design, *Information transfer, *Stochastic processes, Runoff, Optimization, Cost minimization, Ontario(Canada), Floods, Cost function, Planning, Data bank, Physiographic characteristics, Equations, Mathematical models, Operations research.

Parameter regionalization can be used in hydrology for information transfer and network planning. Basic to parameter regionalization in hydrology is the subdivision of an area into natural regime and modified regime regions. The models used for regionalization in the two regions are of different natures. Model-homogeneous regions can be delineated by applying a selected model to a given region and examining the model errors from the viewpoint of their probability distribution and space-serial independence. Physiographic-homogeneous regions can be delineated by determining the physiographic characteristics which are significant for estimating the parameters of models of various hydrologic characteristics and delineating areas within which these physiographic characteristics vary within narrow limits. Model-homogeneous regionalization can be used to determine the best available model for information transfer and the parameter of error of space sampling required for network optimization. Natural regime network planning optimization can be accomplished by accepting a network planning objective related to data accuracy and constraints related to time, budget, physical resources, etc., by considering the 'whitened' errors of various sources as independent. Coordinated network planning is a most difficult task, but its economic rewards are probably so large that the solution of this task should be attempted in every country as soon as possible. (See also W77-10439) (Bell-Cornell)
W78-04489

WORTH OF DATA,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
S. I. Solomon.
In: Stochastic Approaches to Water Resources, Vol I. Edited and published by H. W. Shen, Colorado State University, Fort Collins, Col., Chapter 13, p 13-1--13-30, 1976. 9 fig, 3 tab, 22 ref.

Descriptors: *Economic worth, *Hydrometric data, *Dynamic programming, *Networks, *Stochastic processes, Planning, Sensitivity analysis, Estimating, Methodology, Optimization, Operating costs, Cost minimization, Equations, Mathematical models, Systems analysis.

Dynamic programming is shown to represent a valuable technique for planning the hydrometric network in areas with natural regime for which economic development is being planned; the technique can also be applied where no development is planned, if one can define an accuracy objective or if a budget allocation is given. A dynamic programming technique is applied to conditions in Canada; indicated are high benefit/cost ratios from investments in the hydrometric network. These ratios range from 300 percent if a period of 5 years only is considered to 700 percent if a period of 15 years is considered. High benefit/cost ratios (over 100%) are obtained from the network even under the most conservative assumptions regarding network expansion and operation costs, and other factors. The factor having the largest influence on the network planning decision variables is the rel..tionship between errors in estimating hydrologic characteristics and losses in investment and operation of projects affected by cyclic development, it is incorrect to reduce investment in the hydrometric network during the recession phase. (See also W77-10439) (Bell-Cornell)
W78-04490

SALINITY MANAGEMENT STRATEGIES FOR THE LOWER SAN LUIS REY RIVER BASIN,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04499

6B. Evaluation Process

MAR DEL PLATA IN RETROSPECT,
Biswas and Associates, Ottawa (Ontario).
For primary bibliographic entry see Field 6E.
W78-04306

ATTITUDES, CHARACTERISTICS, AND EDUCATION OF WATER RESOURCES PLANNERS AND MANAGERS RELATIVE TO EFFECTIVE PUBLIC PARTICIPATION,
Clemson Univ., SC. Dept. of Environmental Systems Engineering.
B. C. Dysart, III, J. J. Fletcher, S. T. Sutterfield, and C. H. Langdon, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 045, Price codes: A05 in paper copy, A01 in microfiche. South Carolina Water Resources Research Institute, Clemson, Report No 68, June 1977. 72 p, 11 tab, 4 append. OWRT B-081-SC(2).

Descriptors: *Public participation, *Planning, *Education, *Attitudes, *Surveys, Organizations, Social aspects, Water management(Applied), Water resources development, Decision making, Social participation, Southeast US, Personnel, South Atlantic-Gulf-Tennessee region.

Education, both formal and experience-related, of water resources planners and managers, in both the public and private sectors, is discussed as it pertains to their capabilities to conceive and implement public participation programs. The research is specifically oriented to the South Atlantic-Gulf-Tennessee region, although the resulting insights into water resources planners and managers are probably of much more general applicability. Approximately 300 individuals in the eight states investigated were identified as being actively involved in the water resources planning and management areas. From these, 170 individuals were selected and questioned, using mail questionnaires, as to the extent, orientation, depth, breadth, and currency of their formal and informal education, training and experience in water resources planning and management in general and especially as it related to public involvement. The individuals surveyed represented federal and state agencies, industry and the business community in general, academic and research-oriented persons, and public interest groups. A general conclusion from this analysis is that the greatest interest in some sort of meaningful public participation training program is to be found among engineers in the business and industrial community. The level of interest was also fairly high among non-engineers in business and industry and federal agency engineers. The least interest was consistently demonstrated by the engineers employed by state agencies.
W78-04498

ENERGY FROM THE WEST: A PROGRESS REPORT OF A TECHNOLOGY ASSESSMENT OF WESTERN ENERGY RESOURCE DEVELOPMENT.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 3E.
W78-04657

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COSTS AND PRODUCTIVITY IN HARVESTING OF AQUATIC PLANTS,
Wisconsin Univ.-Madison. Dept. of Agricultural Engineering
For primary bibliographic entry see Field 4A
W78-04338

APPLICATIONS FOR SOUTH CAROLINA'S WETLANDS OF A GENERAL MODEL OF EFFICIENT SOLUTIONS TO EXTERNALITIES,
Clemson Univ., SC. Dept. of Economics
M. T. Maloney, R. T. Byrns, and T. B. Yandle, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 705, Price codes: A08 in paper copy, A01 in microfiche. Water Resources Research Institute, Clemson University, Report No. 70, September 1977. 150 p, 20 fig, 2 tab, 44 ref. OWRT A-036-SC(1)

Descriptors: *Economic planning, *Externalities, *Shellfishing, *Marshlands, Institutions, *Wetlands, *Model studies, Commercial fishing, Commercial shellfish, Shrimp, *South Carolina coastlands, Shellfish farming.

A general model for all externality problems is based on a two-fold dichotomous classification scheme: public/private and large number/small number externalities. From this taxonomy a Pareto welfare model is built with constraints embodying the various types of externalities. The necessary conditions are derived for the various cases of externality problems. Theoretical policy choices are examined for those cases where government intervention is necessary; the market forces that cause bargaining to internalize the externality are shown for the Coasian case. The model is applied to he South Carolina marshland situation with a number of interesting results. First, if externalities exist between the various types of commercial wildlife, they will be internalized if the lands are competitively leased. The leasees should be allowed to engage in all fishing activities with the possible exception of shrimping. Second, if there are externalities between commercial shellfishing in the marsh and shrimping along the coast, a tax should be levied on the shrimpers and paid to the marsh leaseholders. This tax should be based on the number of shrimp leaving the estuary and should be increased so long as the quality of shrimp increases.
W78-04368

CONTROL TARGETS FOR THE MANAGEMENT OF BIOLOGICAL SYSTEMS,
Arizona Univ., Tucson. Dept. of Aerospace and Mechanical Engineering.
For primary bibliographic entry see Field 6A.
W78-04477

6D. Water Demand

THE 1977 IRRIGATION SURVEY.
For primary bibliographic entry see Field 3F.
W78-04294

STRUCTURE OF WATER USE TIME SERIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04483

6E. Water Law and Institutions

MAR DEL PLATA IN RETROSPECT,
Biswas and Associates, Ottawa (Ontario).
M. R. Biswas.

Water International, Vol. 2, No. 3, p 15-18+, September, 1977. 4 ref.

Descriptors: *Water resources development, *Conferences, United Nations, Developing countries, Water supply, Potable water, Environmental sanitation, Water utilization, Economics, Water pollution, Planning.

The United Nations Water Conference convened at Mar del Plata, Argentina, in March of 1977, and was attended by 116 governments and many non-government organizations. The work and recommendations of preceding UN conferences, notably those on Environment, Population, Food, and Human Settlements, contributed to the Water Conference. According to resolutions of the Economic and Social Council, the purposes of the conference were to: (1) exchange experiences on water resources development and uses; (2) review new technologies; (3) stimulate greater cooperation; (4) discuss comprehensively the problems of increasing water demand in areas of fixed supply, and; (5) consider specific economic and administrative aspects of water resources planning and development, primarily with respect to policymakers. Some 215 thematic papers were prepared by individual countries for the Conference. The period 1980-1990 was designated the International Drinking Water Supply to Sanitation Decade as a focal point of unanimous agreement on recommendations to provide clean water supplies for all by the end of that period. (Eberle-NWWA)
W78-04306

DETERMINATION OF FEDERAL WATER RIGHTS PURSUANT TO THE MCCARRAN AMENDMENT: GENERAL ADJUDICATIONS IN WYOMING,
Wyoming Univ., Laramie. Coll. of Law.
W. M. Kleppinger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 972, Price codes: A03 in paper copy, A01 in microfiche. Land and Water Review, Vol. 12, No. 2, p. 457-484 (1977). OWRT A-023-WYO(2), 14-34-0001-7108.

Descriptors: *Water law, *Water rights, *Wyoming, State jurisdiction, *Federal-State Water Rights Conflicts, *McCarran Amendment, Federal jurisdiction.

The McCarran Amendment was enacted by Congress in 1952. The Amendment allows the United States to be joined in a state water right adjudication thereby quantifying and coordinating the federal water claim with state water rights. In 1977, the Wyoming Legislature enacted a bill designed to permit general adjudication of all water claims within the state, including federal claims asserted under the reserved rights doctrine. The Legislature's intent was to construct the bill in such a manner that the waiver of sovereign immunity provisions of the McCarran Amendment could be taken advantage of. The reserved rights doctrine and the McCarran Amendment are discussed, especially in terms of the conditions a state must comply with in order to fall within the McCarran Amendment's waiver of sovereign immunity. An analysis is made of the new Wyoming general adjudication statute and it is discussed in light of the hurdles a statute must overcome to be within the McCarran Amendment requirements so the sovereign immunity of the United States is waived, i.e., due process, judicial proceedings, general adjudication. The Wyoming Statute may have left open an avenue of federal challenge in regard to whether the statute provides a truly general, non-private proceeding for water rights adjudication, however, the Wyoming Statute can withstand federal challenge because of its similarity to the accepted Colorado system and because the Wyoming system is harmonious with the McCarran Amendment policies.
W78-04369

CONTROLLING THE ENTRANCE OF TOXIC POLLUTANTS INTO U.S. WATERS,
Department of Commerce, Washington, DC. Office of Environmental Affairs.
For primary bibliographic entry see Field 5G.
W78-04389

SEWERAGE COSTS RISING AT A FASTER PACE.
For primary bibliographic entry see Field 5G.
W78-04644

6G. Ecologic Impact Of Water Development

GLOBAL DISTRIBUTION OF CARCINOGENIC POLLUTANTS IN WATER,
National Cancer Inst., Bethesda, MD.
For primary bibliographic entry see Field 5B.
W78-04304

ENVIRONMENTAL CONTAMINANTS INVENTORY STUDY NO. 4, THE PRODUCTION, USE AND DISTRIBUTION OF PHTHALIC ACID ESTERS IN CANADA,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-04348

WATER QUALITY AT FIVE PROPOSED INDUSTRIAL SITES ON THE ROANOKE AND NEW RIVERS,
Nuclear Regulatory Commission, Washington, DC. Office of Nuclear Reactor Regulation.
For primary bibliographic entry see Field 5C.
W78-04497

STATE-OF-THE-ART SURVEY AND EVALUATION OF OPEN-WATER DREDGED MATERIAL PLACEMENT METHODOLOGY,
JBF Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 5E.
W78-04533

DREDGED MATERIAL RESEARCH PROGRAM, THIRD ANNUAL REPORT.
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5E.
W78-04534

GROWTH RESPONSES OF COASTAL HALOPHYTES TO INORGANIC NITROGEN,
University of East Anglia, Norwich (England). School of Biological Sciences.
For primary bibliographic entry see Field 2L.
W78-04542

THE VEGETATION OF SALT MARSHES AT SOME COASTAL SITES IN ARCTIC NORTH AMERICA,
Toronto Univ. (Ontario). Dept. of Botany.
For primary bibliographic entry see Field 2L.
W78-04543

PALEOECOLOGICAL ASPECTS OF THE RED LAKE PEATLAND, NORTHERN MINNESOTA,
Oslo Univ. (Norwich). Inst. of Geology.
For primary bibliographic entry see Field 2H.
W78-04544

REMOTE SENSOR IMAGERY ANALYSIS FOR ENVIRONMENTAL IMPACT ASSESSMENT,
Army Engineer Topographic Labs., Fort Belvoir, VA. Geographic Sciences Lab.
For primary bibliographic entry see Field 5A.
W78-04692

A SEARCH FOR ENVIRONMENTAL PROBLEMS OF THE FUTURE,
Battelle Columbus Labs., OH.
For primary bibliographic entry see Field 5A.
W78-04696

7. RESOURCES DATA

7A. Network Design

PARAMETER REGIONALIZATION AND NETWORK DESIGN,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04489

WORTH OF DATA,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04490

A SEARCH FOR ENVIRONMENTAL PROBLEMS OF THE FUTURE,
Battelle Columbus Labs., OH.
For primary bibliographic entry see Field 5A.
W78-04696

7B. Data Acquisition

SNOTEL: MONITORING CLIMATIC FACTORS TO PREDICT WATER SUPPLIES,
Soil Conservation Service, Portland, OR. West Technical Service Center.
A. G. Crook.
Journal of Soil and Water Conservation, Vol. 32, No. 6, p 294-295, November-December 1977. 2 fig, 5 ref.

Descriptors: *Snowpacks, *Monitoring, *Telemetry, Surveys, Snow, Mountains, Water resources, *Water supply, Remote sensing, Measurement, Snowmelt, Runoff, Forecasting, Snow management, *Instrumentation, *Western US, Snowpack telemetry, Meteor burst telemetry, Telemetry systems.

A new program, SNOTEL, is being implemented in the West to provide water managers with information that should help them make more efficient use of existing water supplies. In May 1976, the Government Services Division of Western Union began development of a data communications system using the meteor burst concept. The first phase of the project consists of 2 master stations and 160 remote data sites in 11 western states. A typical remote site has sensors that measure the water equivalent of the snowpack, rainfall, and air temperature. The central computer automatically instructs the base stations to poll remote sites at the desired frequency. With the SNOTEL system, which provides snow resource data almost instantaneously, forecasters should be able to determine more accurately the volume and distribution of the next summer's snowmelt runoff. (Sims-ISWS)
W78-04213

APPLICATIONS OF REMOTE SENSING TECHNIQUES TO COUNTY LAND USE AND FLOOD HAZARD MAPPING,
Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 7C.
W78-04215

UTILITY OF A SCANNING DENSITOMETER IN ANALYZING REMOTELY SENSED IMAGERY,
National Aeronautics and Space Administration, Cleveland, OH. Lewis Research Center.

J. T. Dooley.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-16415, Price codes: A02 in paper copy, A01 in microfiche. NASA Technical Memorandum X-73533, December 1976. 19 p, 9 fig, 2 tab, 9 ref.

Descriptors: *Remote sensing, *Data processing, Equipment, *Instrumentation, Analytical techniques, Photography, Aerial photography, Satellites(Artificial), Land use, Water quality, Strip mines, *Scanning densitometers.

The utility of a scanning densitometer for analyzing imagery in the NASA Lewis Research Center's regional remote sensing program was evaluated. Uses studied included: (1) quick-look screening of imagery by means of density slicing, magnification, color coding, and edge enhancement; (2) preliminary category classification of both low- and high-resolution data bases; and (3) quantitative measurement of the extent of features within selected areas. The densitometer was capable of providing fast, convenient, and relatively inexpensive preliminary analysis of aerial and satellite photography and scanner imagery involving land cover, water quality, strip mining, and energy conservation. (Sims-ISWS)
W78-04220

GROUNDED ICE IN THE FAST ICE ZONE ALONG THE BEAUFORT SEA COAST OF ALASKA,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-04224

WINTER THERMAL STRUCTURE AND ICE CONDITIONS ON LAKE CHAMPLAIN, VERMONT,
Army Terrestrial Sciences Center, Hanover, NH. Snow and Ice Branch.
For primary bibliographic entry see Field 2C.
W78-04227

AN ERTS-1 INVESTIGATION FOR LAKE ONTARIO AND ITS BASIN,
Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
For primary bibliographic entry see Field 2H.
W78-04230

APPLICATION OF REMOTE SENSING IN THE DETERMINATION OF WATER QUALITY IN NEBRASKA RESERVOIRS,
Nebraska Univ., Lincoln. School of Life Sciences.
For primary bibliographic entry see Field 5A.
W78-04231

REMOTE SENSING OF ACCUMULATED FRAZIL AND BRASH ICE IN THE ST. LAWRENCE RIVER,
Army Terrestrial Sciences Center, Hanover, NH. Applied Research Branch.
For primary bibliographic entry see Field 2C.
W78-04234

NEWER TECHNIQUES AID SEARCH FOR GROUND WATER,
Universal Oil Products, St. Paul, MN. Johnson Div.
W. L. Anderson.
Johnson Drillers Journal, Vol 49, No 6, p 2-4, November-December, 1977. 2 fig.

Descriptors: *Electrical studies, *Resistivity, Groundwater, Exploration, Porosity, Permeability, Dissolved solids, Sediments, Aquifers, Electrical conductance.

Because test-hole drilling at random has become far too expensive as a ground water prospecting technique, surface geophysical methods such as electrical resistivity profiling are seeing increased use. Knowing the relative resistance value of subsurface materials, it is possible for a geologist or driller to select a prime location for exploratory drilling by passing curent rhgough two outer electrodes and measuring the voltage drop between two interior electrodes. The degree to which unconsolidated sediments and bedrock conduct electrical current depends on three factors: the amount of void space between particles (porosity), the permeability of the material, and the conductivity of the fluid contained in pore spaces (the greater the TDS, the higher the conductivity value) In general, resistivity decreases with porosity and water volume and as water conductivity increases. These relations provide the basis for distinguishing, in an approximate fashion, variations in subsurface materials. (Eberle-NWWA)
W78-04296

EXPENDABLE OCEANOGRAPHY PROBE,
Matsushita Electric Industrial Co., Ltd., Osaka (Japan). (Assignee).
Y. Kaname, M. Nakajima, and K. Tabuchi.
U.S. Patent No. 4,044,611, 12 p, 10 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 961, No 5, p 1986, August 30, 1977.

Descriptors: *Patents, *Sensors, Instruments, *Oceanography, Acoustics, Temperature, Salinity, *Expendable probes(Oceanography).

An improved and completely free-falling oceanography probe which has a cylindrical-shaped housing the fall of which is not restricted by wires or any other mechanical connections is described. It can be thrown from a vessel moving at sea. A simple construction transmits telemetered signals to a vessel with a sound wave carrier in the water. The probe has a transducer holder which has an acoustical cavity for controlling the directional pattern of the sound wave into the surrounding water. A sensor is mounted on the front end to detect information relating to the water to be tested. An electroacoustical disk transducer combined with an oscillating circuit radiates a sound signal into the water. (Sinha - OEIS)
W78-04317

TRACING VERTICAL TRANSLOCATION OF SOIL MOISTURE,
Clemson Univ., SC. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-04332

A RADIOTRACER TECHNIQUE FOR MEASURING SEDIMENT MOVEMENT,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-04344

THE DETERMINATION OF REGIONAL EVAPOTRANSPIRATION BY MEANS OF STANDARD METEOROLOGICAL DATA,
Cornell University Ithaca, New York, School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2D.
W78-04372

NEW HYGIENIC FLOWMETER.
Water and Waste Treatment, Vol 20, No 10, p 52-53, October, 1977.

Descriptors: *Flowmeters, *Flow measurement, Equipment, *Food processing industry, Flow rates, Automation, Monitoring, Industrial water, Industrial wastes, Electronic equipment.

Euromatic Flowmeters Ltd., under the auspices of Euromatic Machine and Oil Company Ltd., has begun marketing the Type S3 flowmeter for use in the dairy, brewery, wine, spirits, food processing, and pharmaceutical industries. The modular design of the flowmeter includes a body, and two bearing supports. The bearing supports are held in place by magnetic force and are machined to prevent incorrect assembly. Standard Tri-clover clamps can be used to attach the meter to a pipline. The meter can be attached to an air detection probe or to electronic equipment read-out units. The five models in production can handle a flow range of 3-500 gpm at an accuracy of 0.01% for a 5/1 turndown. The Type S3 flowmeter is reported to have a linearity of 0.15%, repeatibility of 0.02%, and bi-directional correlation of 0.2%. (Schulz-FIRL)
W78-04392

HYDROGEOLOGY AND DELINEATION OF BURIED GLACIAL RIVER VALLEY AQUIFERS IN NORTHWESTERN MISSOURI,
Missouri Univ.-Columbia. Dept. of Geology
For primary bibliographic entry see Field 2F
W78-04496

ICEBERG SOUNDING BY IMPULSE RADAR,
Memorial Univ. of Newfoundland, St. John's Centre for Cold Ocean Resources Engineering.
For primary bibliographic entry see Field 2C.
W78-04516

THE SMALL SAMPLE ESTIMATION OF H,
Technical Univ. of Istanbul. (Turkey). Dept. of Hydraulics and Water Power.
For primary bibliographic entry see Field 2E.
W78-04526

PATH- AND AREA-INTEGRATED RAINFALL MEASUREMENT BY MICROWAVE ATTENUATION IN THE 1-3 CM BAND,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 2B.
W78-04530

MEASUREMENT TECHNIQUES FOR COASTAL WAVES AND CURRENTS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-04532

THE USE OF COLOR INFRARED IMAGERY FOR THE STUDY OF MARSH BUGGY TRACKS,
Louisiana State Univ., Baton Rouge.
For primary bibliographic entry see Field 2L.
W78-04536

MODEL DDO/MARK V DIGITAL DISSOLVED OXYGEN ANALYZER.
National Oceanographic Instrumentation Center, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04547

BECKMAN FIELDLAB DISSOLVED OXYGEN SYSTEM.
National Oceanographic Instrumentation Center, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04548

DISSOLVED OXYGEN ANALYZER MODEL 330.
National Oceanographic Instrumentation Center, Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04549

THERMOCOUPLE READOUT INSTRUMENT,
Robert S. Kerr Environmental Research Lab., Ada, OK.
C. G. Enfield, and C. V. Gillaspy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 420, Price codes: A02 in paper copy, A01 in microfiche. Report EPA-600/2-77-220, November 1977. 14 p, 3 fig, 2 tab, 7 ref. 1BC611.

Descriptors: *Instrumentation, Temperature, Thermal properties, Sampling, *Electrical equipment, *Thermocouples, Ice bath, Circuit diagrams.

An electronic circuit, which acts as an electronic ice bath for chromel-constantan thermocouples has been developed. The electronic ice bath is accurate to within + or - 0.2 degree Centigrade from 5 degrees Centigrade to + 50 degrees Centigrade. Simultaneously, the thermocouple output is scaled and linerarized such that the temperature can be read directly in degrees Centigrade with a sensitivity of 100 mV/degree Centigrade with 0 VDC at 0 degree Centigrade. Circuit diagrams and construction considerations are furnished. A temperature readout instrument can be constructed for use in remote locations where a supply of ice is not readily available for use as a reference temperature. (Wares-IPA).
W78-04678

AERIAL AIR POLLUTION SENSING TECHNIQUES,
Environmental Protection Agency, Las Vegas, NV. Monitoring Operations Lab.
For primary bibliographic entry see Field 5A.
W78-04680

REMOTE DETECTION OF WATER POLLUTION WITH MOCS: AN IMAGINING MULTISPECTRAL SCANNER,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-04681

THE USE OF NEAR-INFRARED REFLECTED SUNLIGHT FOR BIODEGRADABLE POLLUTION MONITORING,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-04682

ST. LOUIS REGIONAL AIR MONITORING SYSTEM,
National Environmental Research Center, Las Vegas, NV.
For primary bibliographic entry see Field 5A.
W78-04683

LONG PATH OPTICAL MEASUREMENT OF ATMOSPHERIC POLLUTANTS,
Health Effects Research Lab., Research Triangle Park, NC. Chemistry and Physics Lab.
For primary bibliographic entry see Field 5A.
W78-04684

A REVIEW OF AVAILABLE TECHNIQUES FOR COUPLING CONTINUOUS GASEOUS POLLUTANT MONITORS TO EMISSION SOURCES,
Health Effects Research Lab., Research Triangle Park, NC. Chemistry and Physics Lab.
For primary bibliographic entry see Field 5A.
W78-04685

MITU SENSOR SYSTEMS FOR WATER QUALITY MEASUREMENT,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5A.
W78-04686

A REGIONAL WATER QUALITY MONITORING SYSTEM,
Minneapolis Metropolitan Sewer Board of the Twin Cities Area, Md.
For primary bibliographic entry see Field 5A.
W78-04687

WATER QUALITY MONITORING IN SOME EASTERN EUROPEAN COUNTRIES,
Vanderbilt Univ., Nashville, TN. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 5A.
W78-04688

AN AIRBORNE LASER FLUOROSENSOR FOR THE DETECTION OF OIL ON WATER,
National Aeronautics and Space Administration, Wallops Island, VA. Wallops Station.
For primary bibliographic entry see Field 5A.
W78-04689

REMOTE SENSING DATA, A BASIS FOR MONITORING SYSTEMS DESIGN,
Geological Survey, Iowa City, IA.
For primary bibliographic entry see Field 5A.
W78-04690

TECHNIQUES AND PROCEDURES FOR QUANTITATIVE WATER SURFACE TEMPERATURE SURVEYS USING AIRBORNE SENSORS,
National Aeronautics and Space Administration, Bay Saint Louis, MS. Earth Resources Lab.
For primary bibliographic entry see Field 5A.
W78-04691

REMOTE SENSOR IMAGERY ANALYSIS FOR ENVIRONMENTAL IMPACT ASSESSMENT,
Army Engineer Topographic Labs., Fort Belvoir, VA. Geographic Sciences Lab.
For primary bibliographic entry see Field 5A.
W78-04692

AERIAL SPILL PREVENTION SURVEILLANCE DURING SUBOPTIMUM WEATHER,
Earth Satellite Corp., Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04693

ENVIRONMENTAL APPLICATION OF THE EARTH RESOURCES TECHNOLOGY SATELLITE,
General Electric Co., Beltsville, MD. Space Div.
For primary bibliographic entry see Field 5A.
W78-04694

AIRCRAFT AND SATELLITE MONITORING OF LAKE SUPERIOR POLLUTION SOURCES,
Wisconsin Univ.-Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W78-04695

SENSOR UTILIZATION IN NEW ENGLAND,
Environmental Protection Agency, Boston, MA. Region I.
For primary bibliographic entry see Field 5A.
W78-04697

ENVIRONMENTAL MONITORING NEEDS IN REGION V,
Environmental Protection Agency, Chicago, IL. Region V.
For primary bibliographic entry see Field 5A.
W78-04698

COMMENTS ON ENVIRONMENTAL MONITORING IN REGION VII AND SOME MONITORING PLANS AND NEEDS PREPARED FOR SECOND CONFERENCE ON ENVIRONMENTAL SENSORS,
Environmental Protection Agency, Kansas City, MO. Region VII.
For primary bibliographic entry see Field 5A.
W78-04699

7C. Evaluation, Processing and Publication

APPLICATIONS OF REMOTE SENSING TECHNIQUES TO COUNTY LAND USE AND FLOOD HAZARD MAPPING,
Arizona Univ., Tucson. Office of Arid Lands Studies.
R. B. Clark, J. S. Conn, D. A. Miller, and D. A. Mouat.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-32617, Price codes: A03 in paper copy, A01 in microfiche. OALS Bulletin 12, November 1975. 36 p, 12 fig, 2 tab, 11 ref. NASA NGL 03-002-313.

Descriptors: *Remote sensing, *Flood plains, *Flood plain zoning, *Arizona, Satellites(Artificial), Aerial photography, Flood plain insurance, Land use, Soils, Vegetation, Geomorphology, Rivers, Arid lands, Data processing, Analytical techniques, Floods, Erosion, Hydrology, *LANDSAT.

Local governmental planning agencies traditionally have regulated the design of new subdivisions by adoption of local regulations which sometimes require (among other considerations) minimum drainage design criteria. Due to passage of the mandatory floodplain regulations at the state level, local planning agencies now are faced with the task of the delineation of floodplains. Remote sensing systems offer a dynamic resource inventory system which can be used to complement traditional detailed studies or can serve as an important source of information in regions where detailed studies are not available. In Graham, Yuma, Yavapai, and Apache Counties, Arizona, remote sensing techniques have provided hydrologic information in areas where planning had been hampered by the lack of suitable hydrologic data. The County Planning Departments now can guide development more wisely away from flood prone areas, even with only limited funds and manpower. (Sims-ISWS)
W78-04215

PRECIPITABLE WATER OVER THE UNITED STATES, VOLUME 1: MONTHLY MEANS,
National Weather Service, Silver Spring, MD. Office of Hydrology.
For primary bibliographic entry see Field 2B.
W78-04218

DIGITAL FLOW MODEL OF THE CHOWAN RIVER ESTUARY, NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 2L.
W78-04250

A DIGITAL MODEL OF THE FLORIDAN AQUIFER, NORTH OF TAMPA, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-04251

GROUND-WATER BASIC DATA FOR MORTON COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
D. J. Ackerman.

North Dakota County Ground-Water Studies 27--Part II, and North Dakota Geological Survey Bulletin 72--Part II, Bismarck, 1977. 592 p, 2 fig, 1 plate, 6 tab, 10 ref.

Descriptors: *Groundwater, *Basic data collections, *North Dakota, *Aquifer characteristics, *Water quality, Water supply, Groundwater availability, Hydrogeology, Water wells, Groundwater recharge, Well data, Water yield, Potential water supply, Observation wells, Water levels, Water users, Chemical analysis, Morton County(N Dak).

The purpose of this ground-water investigation in Morton County, N. Dak., was to determine the quantity and quality of ground water available for municipal, domestic, livestock, industrial, and irrigation uses. Specifically, the objectives were: (1) determine the location, extent, and nature of the major aquifers; (2) evaluate the occurrence and movement of ground water, including the sources of recharge and discharge; (3) estimate the quantities of water stored in the aquifers; (4) estimate the potential yields to wells tapping the aquifers; and (5) determine the chemical quality of the ground water. Most data in this report were collected between 1972 and 1975. All data-collection points are shown. The data consist of the following: (1) Geologic and hydrologic data for 1,209 wells, test holes, and springs; (2) water-level measurements for 148 observation wells; (3) lithologic and geophysical logs for 247 test holes and wells; (4) chemical analyses of 353 water samples; and (5) analyses of physical properties of 42 core samples. (Woodard-USGS)
W78-04252

GROUND-WATER LEVELS IN THE UNITED STATES, 1973-74. NORTHEASTERN STATES.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04255

GEOHYDROLOGY OF NORTH EASTERN PROVINCE, KENYA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04256

SUMMARY OF BASIC HYDROLOGIC DATA COLLECTED AT COSO HOT SPRINGS, INYO COUNTY, CALIFORNIA,
Geological Survey, Luguna Niguel, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04258

APPROXIMATE AREAS OF RECHARGE TO THE CHICOT AND EVANGELINE AQUIFER SYSTEM IN THE HOUSTON-GALVESTON AREA, TEXAS,
Geological Survey, Houston, TX. Water Resources Div.
R. K. Gabrysch.
Open-file report 77-754, November 1977. 1 sheet, 11 ref.

Descriptors: *Groundwater recharge, *Natural recharge, *Aquifers, *Texas, *Maps, *Houston-Galveston area(Tex), *Evangeline aquifer(Tex), *Chicot aquifer(Tex).

This map shows the general geographic areas of recharge to the Chicot and Evangeline aquifers in the Houston area, Texas. The area of recharge for the Evangeline an Chicot aquifers is between the outcrop of the Beaumont Clay and the updip part of the Fleming Formation. The recharge area for the Evangeline aquifer includes the most landward outcrop of the Willis Formation and in places, the coastward outcrop of the Fleming Formation. The recharge area of the Chicot aquifer includes the outcrops of the Montgomery and Bentley Formations and coastward outcrop of the Willis Formation. (Woodard-USGS)
W78-04264

WATER-LEVEL CHANGES IN THE NORTHERN HIGH PLAINS OF COLORADO, 1964 TO 1976 AND 1972 TO 1976,
Geological Survey, Lakewood, CO. Water Resources Div.
R. G. Borman, and T. J. Major.
Water-Resources Investigations 77-42 (open-file report), November 1977. 1 sheet, 8 ref.

Descriptors: *Groundwater resources, *Groundwater mining, *Water level fluctuations, *Maps, *Aquifers, Colorado, Pumping, Water supply, Irrigation, Hydrogeology, Hydrologic data, *Northern High Plains(Colo), Ogallala Formation.

The northern High Plains of Colorado, an area of 9,500 square miles (24,600 square kilometers) in the eastern part of the State, is underlain by the Ogallala Formation. Water levels in the Ogallala Formation, the major aquifer in the area, have been declining in areas of ground-water pumping for irrigation. Knowledge of the amount and extent of these declines is necessary for management of the ground-water resource. Water levels have declined as much as 32-40 feet (9.8-12 meters) in an area near Burlington, Kit Carson County, from 1964 to 1976. Maximum declines of 24-32 feet (7.3-9.8 meters) have occurred near the Kiowa-Prowers County line and in a small area northeast of Burlington from 1972 to 1976. Water levels in much of the rest of the area affected by irrigation pumping have declined less than 16 feet (4.9 meters) from 1964 to 1976 and less than 8 feet (2.4 meters) from 1972 to 1976. Water levels have been declining more rapidly in recent years, especially since 1974. (Woodard-USGS)
W78-04265

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 1. COLORADO RIVER BASIN, SOUTHERN GREAT BASIN FROM MEXICAN BORDER TO MONO LAKE BASIN, AND PACIFIC SLOPE BASINS FROM TIJUANA RIVER TO SANTA MARIA RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
Water-Data Report CA-76-1, December 1977. 632 p, 6 fig, 1 tab.

Descriptors: *California, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Colorado River basin, Great Basin, Southern Great Basin(Mexican border to Mono Lake Basin), *Pacific Slope basins(Tijuana River to Santa Maria River).

Volume 1 of water resources data for the 1976 water year for California consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality in lakes and reservoirs; and water levels in wells. This report contains discharge records for 243 gaging stations, stage-only record for 1 gaging station, stage and contents for 19 lakes and reservoirs, water quality for 60 stations and 2 wells, and water levels for 22 observation wells. Also included are 22 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as special investigations and miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W78-04266

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 4. NORTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM HONEY LAKE BASIN TO OREGON STATE LINE.
Geological Survey, Menlo Park, CA. Water Resources Div.
Water-Data Report CA-76-4, December 1977. 389 p, 12 fig, 1 tab.

Descriptors: *California, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Northwest California, Northern Central Valley basins, The Great Basin.

Volume 4 of the water resources data for the 1976 water year for California consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality in lakes and reservoirs; and water levels in wells. This report contains discharge records for 197 gaging stations, stage and contents for 31 lakes and reservoirs, water quality for 38 stations, and water levels for 3 observation wells. Also included are 25 crest-stage partial-record stations, 15 low-flow partial-record stations, and 7 water-quality partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as special investigations and miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W78-04267

WATER RESOURCES DATA FOR CALIFORNIA, WATER YEAR 1976--VOLUME 3. SOUTHERN CENTRAL VALLEY BASINS AND THE GREAT BASIN FROM WALKER RIVER TO TRUCKEE RIVER.
Geological Survey, Menlo Park, CA. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 354, Price codes: A18 in paper copy, A01 in microfiche.
Water-Data Report CA-76-3, December 1977. 397 p, 12 fig, 1 tab.

Descriptors: *California, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Central California.

Volume 3 of water resources data for the 1976 water year for California consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality in lakes and reservoirs; and water levels in wells. This report contains discharge records for 180 gaging stations, stage and contents for 42 lakes and reservoirs, water quality for 44 stations and 1 well, and water levels for 14 observation wells. Also included are 33 crest-stage partial-record stations, 25 low-flow partial-record stations, and 8 water-quality partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as special investigations and miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California. (Woodard-USGS)
W78-04268

COMPUTER AIDS DESIGN OF PRESSURE STORAGE TANKS,
For primary bibliographic entry see Field 8C.
W78-04298

STORAGE FOR STORM WATER QUALITY CONTROL - MEADOWVALE TEST SITE STUDY,
Toronto Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04357

THE ALL-PURPOSE MATHEMATICAL MODEL,
New York State Dept. of Environmental Conservation, Albany. Div. of Pure Waters.
For primary bibliographic entry see Field 6A.
W78-04478

CHARACTERISTICS OF THE SOLUTION ALGORITHMS FOR THE QUAL II RIVER MODEL,
Utah State Univ., Logan.
For primary bibliographic entry see Field 5B.
W78-04479

AN EVALUATION OF A COMPUTER SIMULATION MODEL OF PLANKTON DYNAMICS IN MONTEREY BAY,
Naval Postgraduate School, Monterey, CA.
For primary bibliographic entry see Field 5C.
W78-04480

GENERAL OVERVIEW OF APPLICATION OF STOCHASTIC METHODS TO WATER RESOURCES PROBLEMS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04482

APPLICATION OF STOCHASTIC METHODS IN WATER RESOURCES STUDIES,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 6A.
W78-04484

WORTH OF DATA,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-04490

RIVER BASIN WATER QUALITY SAMPLING,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-04491

COASTAL WETLANDS ALONG LAKE ONTARIO AND THE ST. LAWRENCE RIVER IN JEFFERSON COUNTY, NEW YORK,
State Univ. of New York at Syracuse. Coll. of Environmental Science and Forestry.
For primary bibliographic entry see Field 2H.
W78-04546

INTERACTIVE COMPUTER DESIGN OF WASTEWATER PLANTS,
Berkenhoff (Grodon) and Associates, Inc., Albuquerque, NM.
J. E. Shoemaker, and W. A. Barkley.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE5, p 929-934, October, 1977. 1 fig, 10 ref, 1 append.

Descriptors: *Design criteria, *Computer models, Mathematical models, *Model studies, *Water quality standards, *Treatment facilities, Network design, Waste water treatment.

Increased interest in higher level, more costly waste water treatment facilities has led to the need for more effective design practices. A variety of mathematical models have been developed to aid in treatment plant design. The two basic design approaches involve either effluent criteria and unit sizes or are directed toward upgrading existing facilities. Standard values and indices have been used in many models. Since treatment streams are often recycled to process units, programs have been developed to analyze and minimize recycling requirements. The use of low diagrams, stream parameters, and unit operation parameters is discussed with respect to unit process ordering and input requirements. A design example involving the addition of an activated sludge unit to an existing trickling filter plant is used to illustrate input parameters, computer output, and final sizes of the unit processes which have been calculated by an interactive computer program for waste water treatment plant design. (Schulz-FIRL)
W78-04626

A MODEL FOR THE SIMULATION OF RAINWATER RUNOFF IN SEWERS (EIN MODELL ZUR SIMULATION DES REGENABFLUSSES IN KANALISATIONSNETZEN),
Balzari Blaser Schudel, Ingenieure und Planer, Bern (Switzerland).
For primary bibliographic entry see Field 5B.
W78-04627

8. ENGINEERING WORKS

8B. Hydraulics

HYDROLOGIC CONSIDERATIONS OF THE UPPER ST. JOHNS RIVER BASIN, FLORIDA,
Florida State Dept. of Environmental Regulation, Tallahassee.
For primary bibliographic entry see Field 2E.
W78-04204

WAVE PERIOD EFFECT ON THE STABILITY OF RIPRAP,
Coastal Engineering Research Center, Fort Belvoir, VA.
J. P. Ahrens, and B. L. McCartney.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 726, Price codes: A02 in paper copy, A01 in microfiche. CERC Reprint R 76-2, June 1975. Reprinted by the American Society of Civil Engineers from the Proc of the Specialty Conference on 'Civil Engineering in the Oceans/III' held June 9-12, 1975 at the Univ of Del, Newark. p 1019-1034, 6 fig, 3 tab, 9 ref.

Descriptors: *Riprap, *Bank stabilization, *Laboratory tests, Waves(Water), Bank protection, Shore protection, Model studies, Data processing, Erosion control, Structures, Rocks, Slopes, Shores, Engineering, Coastal engineering, *Riprap stability.

Test data on the stability of dumped quarry stone riprap to wave attack were presented and analyzed. The tests were conducted in the large two-dimensional wave tank at the Coastal Engineering Research Center (CERC) at near prototype scale. The test data showed riprap stability changes with wave period with the lowest stability occurring at a period that creates a collapsing breaker. Methods to predict riprap stability and wave runup on riprap were developed and discussed. (Sims-ISWS)
W78-04214

DESIGN WAVE INFORMATION FOR THE GREAT LAKES, REPORT 3, LAKE MICHIGAN,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
D. T. Resio, and C. L. Vincent.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 029, Price codes: A11 in paper copy, A01 in microfiche. Technical Report H-76-1, November 1976. 229 p, 37 fig, 9 tab, 66 ref, 6 append.

Descriptors: *Waves(Water), *Lake Michigan, *Great Lakes, Winds, Extratropical cyclones, Tropical cyclones, Air circulation, Boundary layers, Wind velocity, Model studies, On-site data collections, Mathematical models, Equations, Regression analysis, Data processing, Lakes, Limnology, *Wave data, *Design waves, Wave models, Wave spectra, Wind-generated waves.

Hindcast wave information was presented that is applicable to many planning and design purposes on Lake Michigan. Historical wind data from six stations along Lake Michigan served as input to the numerical hindcast model, and significant wave heights were calculated for 5-, 10-, 20-, 50-, and 100-yr return periods. The results were provided in tabular form for 64 points along the Lake Michigan shoreline. The mean significant period for each of these wave heights also was given. Information was provided for four seasons of the year (January-March, April-June, July-September, and October-December) and was separated into three approach directions relative to shore. (Sims-ISWS)
W78-04217

WAVE ATTENUATION BY ARTIFICIAL SEAWEED,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-04232

ST. MARYS RIVER ICE BOOMS, DESIGN FORCE ESTIMATE AND FIELD MEASUREMENTS,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-04233

FLOW PATTERN CONTROL BY ENTRAINMENT REGULATION,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W78-04336

THE SLIDING BED FACIES IN ESKER SANDS AND GRAVELS: A CRITERION FOR FULL-PIPE (TUNNEL) FLOW,
Wilfrid Laurier Univ., Waterloo (Ontario). Dept. of Geography.
H. C. Saunderson.
Sedimentology, Vol. 24, No. 5, p 623-638, October 1977. 7 fig, 2 tab, 37 ref.

Descriptors: *Canada, *Glacial sediments, *Sands, *Gravels, Sedimentation, Tunnels, Sediment transport, Particle size, Graphical analysis, Deltas, *Facies(Sedimentary), *Eskers, Subglacial tunnels, Sliding-bed facies.

The Guelph esker (Ontario) consists of a sinuous, steep-sided, and segmented ridge which comprises poorly sorted, matrix-supported sands, and gravels. These sands and gravels probably were deposited during the sliding bed stage which has been observed by others in closed-conduit hydraulic experiments. The poor sorting probably resulted from a high concentration of bed-material load in the lower part of a subglacial tunnel, sorting being restricted to that produced by particle collisions. Inclusive graphic standard deviation is characteristically large for the sands and gravels, indicating that virtually all sizes available were in transport. The overall grain size distribution shows a characteristic undulatory shape on arithmetic probability paper, mostly because of selective

removal of pebble gravel and granule sizes. This poorly sorted facies is believed to be diagnostic of transport in a subglacial tunnel flowing full of water and may be used to identify subglacial conditions in other eskers. Deltaic sands and gravels occur downcurrent of the esker and contain a greater diversity of structures; climbing-ripple crosslaminae, parallel laminae and massive structure, deposited in large-scale foresets at the end of a subglacial tunnel. These deltaic sands and gravels grade distally into outwash sands and gravels. (Visocky-ISWS)
W78-04504

ACCUMULATION OF SLIME IN DRAINAGE PIPES AND THEIR EFFECT ON FLOW RESISTANCE,
Clay Pipe Development Association Ltd., London (England).
C. F. G. Bland, R. W. Bayley, and E. V. Thomas.
Journal Water Pollution Control Federation, Vol. 50, No. 1, p 134-143, January 1978. 4 fig, 8 tab, 10 ref.

Descriptors: *Slime, *Pipes, *Sewers, Flow, Drainage, Drainage water, Sewage, Pipelines, Clay pipes, Plastic pipes, Pipe flow, Roughness(Hydraulic), Hydraulics, Laboratory tests, *Slime accumulation.

Experimental work on the hydraulic roughness of clean new vitrified clay pipes carrying potable water was detailed, and the results for the three types of interior finishes were given. Experimental work to determine the accumulation of microbiological slime on short lengths of drainage pipes of six different materials was discussed, and results of the dry weight accumulation were given. Also described were the experimental apparatus used to determine the hydraulic roughness of vitrified clay and the unplasticized poly-vinyl chloride pipes of 100-mm nominal bore when flowing full. The results of various velocities and duration of test were given. The conclusions showed that the mean hydraulic roughness as expressed as a k value in the Colebrook-White equation for both unplasticized poly-vinyl chloride and vitrified clay are practically the same after the pipes have matured. (Sims-ISWS)
W78-04506

APPLICATION OF THE DRILL-STEM TEST TO HYDROGEOLOGY,
Research Council of Alberta, Edmonton. Groundwater Div.
D. A. Hackbarth.
Ground Water, Vol 16, No 1, p 5-11, January-February 1978. 8 fig, 17 ref.

Descriptors: *Drill holes, *Hydrogeology, *Hydraulic conductivity, *Groundwater, Drilling, Sampling, Drilling samples, Pressure, On-site investigations, Wells, Oil wells, Observation wells, Equipment, Data processing, Groundwater movement, Geology, Hydrology, *Drill-stem tests.

Drill-stem tests may be useful for such hydrogeological purposes as regional groundwater or geothermal resource studies. Water samples, hydraulic head, and hydraulic conductivity may be obtained from the tests. Analysis of 41 drill-stem tests conducted for a regional groundwater study revealed that maximum pressures recorded during a test should exceed 30% of the full scale of the pressure gauge used in the case of bourdon-type instruments. Use of drill-stem test data without consideration of percent deflection of the pressure recorder, even with evaluation of mechanical quality, will mean that individual values of pressure head may be as much as 30% different from that which would be obtained in an observation well. The error is random and has a median value approximating that which would be observed in a well completed over the same interval. Use of large numbers of drill-stem tests well produce hydraulic head maps which agree with those produced by conventional observation wells (Sims-ISWS)
W78-04508

MINIMUM STREAM POWER FOR RIVERS AND DELTAS,
San Diego State Univ., CA. Dept. of Civil Engineering.
H. H. Chang, and J. C. Hill.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY12, Proceedings Paper 13394, p 1375-1389, December 1977. 11 fig, 12 ref.

Descriptors: *Channels, *Deltas, *Rivers, Erosion, Sediment transport, Open channel flow, Sedimentation, Mathematical models, Numerical analysis, Hydraulics, Fluvial sediment, Aggradation, Alluvial channels, Alluvial fans, Oceans, *Channel alteration, Unsteady stream flow, Delta flow.

A numerical model for channel alterations was developed for sand bed rivers and deltas. The unsteady river flow was computed using the continuity equation and momentum equation of flow with prescribed boundary conditions. Changes in cross sectional area and delta growth were evaluated based upon the continuity equation for sediment and a sediment transport equation. Subject to certain physical constraints, the part of the river on the delta (delta stream) was assumed to adjust its width freely. To determine the variation in delta stream width, it was assumed to vary in such a way that the total stream power of the river flow is a minimum subject to the physical constraints. The analytical results substantiated with field data indicated that the width-depth ratio of the delta stream tends to increase with a decreasing velocity in an aggrading delta stream, while it tends to decrease with an increasing velocity in a degrading delta stream. (Lee-ISWS)
W78-04519

BAFFLED APRON AS SPILLWAY ENERGY DISSIPATOR,
Bureau of Reclamation, Denver, CO. Hydraulics Branch.
T. J. Rhone.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY12, Proceedings Paper 13373, p 1391-1401, December 1977. 17 fig, 3 ref, 1 append.

Descriptors: *Spillways, *Energy dissipation, *Hydraulic models, *Baffles, *Design criteria, Model studies, Laboratory tests, Chutes, Hydraulic structures, Flow, *Aprons, Hydraulics, Pressure head, Water pressure, Discharge(Water), Outlet works, Conveyance structures, Energy gradient.

Hydraulic model investigations were performed to determine basic design criteria for a baffled apron spillway as an energy dissipator. Described were the effects of baffle block heights and spacing of the hydraulic efficiency of the system. Impact pressures were measured on the upstream faces of the blocks to determine impact forces. Pressures on the side, top, and back of the blocks also were measured to determine the possibility of cavitation damage. Special consideration was given to develop alternative entrances to the baffled spillway. Three entrance configurations were proposed, two of which will not increase the upstream water level. The third entrance is similar to the conventional type used in contemporary designs. Typical design procedures were outlined. Included were the detemination of ideal design discharge criteria which might be less than the expected maximum and suggestions on how to modify the structure to handle discharges greater than the design. These studies indicated that this type of structure was satisfactory for any discharge, but structural and size-of-block limitations might control the quantity of the design unit discharge. Model tests of specific projects showed that the concept could be used in lieu of spillway energy dissipators at larger unit discharges. As with all new concepts, a design based on this example should be confirmed by hydraulic model studies. (Humphreys-ISWS)
W78-04520

DESIGN CHART FOR PREDICTING CRITICAL POINT ON SPILLWAYS,
Ministry of Works and Development, Lower Hutt (New Zealand). Central Lab.
R. J. Keller, and A. K. Rastogi.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 103, No HY12, Proceedings Paper 13426, p 1417-1429, December 1977. 5 fig, 5 tab, 7 ref, 2 append.

Descriptors: *Spillways, *Boundary layers, *Design criteria, *Aeration, Hydraulics, Open channel flow, Flow control, Analytical technique, Analysis, Dimensional analysis, Theoretical analysis, Mathematical models, Flow, Chutes, Numerical analysis, Equations, Charts, Aerated flow.

On the basis of numerical solutions of the time-averaged Navier-Stokes equations and a simple dimensional analysis, design charts were presented for predicting the critical point where self-aeration first appears on overflow spillways. Synthetic data covering a wide range of possible spillway flow situations were fed into a previously developed and verified theoretical model. The results were presented in terms of generalized design variables using dimensional analysis. The design charts are applicable only to the WES spillway shape with vertical upstream face. Extension of the charts to other spillway shapes must await model testing to determine upper nappe profiles, discharge coefficients, and crest pressure characteristics. (Humphreys-ISWS)
W78-04521

DRAIN DISCHARGE FROM A LEVEL AGRICULTURAL WATERSHED,
Guelph Univ. (Ontario). School of Engineering.
For primary bibliographic entry see Field 4D.
W78-04522

ON THE TIME TO FIRST OVERFLOW IN DAMS WITH INPUTS FORMING A MARKOV CHAIN,
Stanford Univ., CA. Dept. of Operations Research.
D. P. Kennedy.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 464, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 40, August 1976. 13 p, 3 ref. Prepared for Office of Naval Research, Washington, D.C. ONR N00014-76-C-0578.

Descriptors: *Dams, *Markov processes, Water demand, *Methodology, Statistical models, Overflow, Analytical techniques, Storage, Probability, Equations, *Joint distribution, Finite dam, State space, Transitional probabilities.

The joint distribution of the cumulative unsatisfied demand and time to the first overflow was investigated for a finite dam. The net input in each period was considered a function of a Markov chain. The probability of overflow before the unsatisfied demand exceeds a fixed level also was considered. Three examples were given to illustrate the use of the methodology developed. (Singh-ISWS)
W78-04535

WORKING PARTY ON THE HYDRAULIC DESIGN OF STORM SEWERS.
Chartered Municipal Engineer, Vol 104, No 10, p 189-190, October, 1977.

Descriptors: *Storm drains, *Hydraulic design, *Sewerage, *Rainfall, *Model studies, Computer programs, Analytical techniques, Publications, Cloudbursts, Winds, Municipal wastes, Waste water disposal.

New procedures for designing storm sewers and a design practice manual are being developed. The Working Party on the Hydraulic Design of Storm Sewers in England came into existence in March 1974. A pilot study found no systematic relationship between movement of intense rainfall and winds. Computer programs are being developed to simulate the hydraulic behavior of storm sewer systems. The improved design methods will probably include means of choosing appropriate values for rainfall data for calculation of the peak discharge for a required return period. More realistic modelling of above-ground hydrology and storm water flow in the sewer system is being developed. The design practice manual is expected to be available in 1979. The working party maintains communication with other organizations involved in setting standards for sewer design. (Snyder-FIRL)
W78-04551

EVALUATION OF STORM WATER ROUTEING MODELS,
MacLaren (James F.) Ltd., Toronto (Ontario).
For primary bibliographic entry see Field 5G.
W78-04554

FIXED-GRID CHARACTERISTIC FOR PIPELINE TRANSIENTS,
Michigan State Univ., East Lansing. Dept. of Civil Engineering.
D. C. Wiggert, and M. J. Sundquist.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol 103, No HY12, p 1403-1416, December, 1977. 8 fig, 8 ref, append.

Descriptors: *Pipelines, *Conduits, *Internal waves, *Attenuation, *Dispersion, Flow, Fluctuations, Waste water treatment, Municipal wastes, Sewerage.

A method for the prediction of pipeline transients in closed waste water lines which involves the use of a general linear interpolation in conjunction with the method of characteristics technique and a rectangular grid has been developed. The variations of numerical attenuation and dispersion with respect to interpolation, spacing, and grid size were calculated through error analysis. The error analysis indicated that maximization of both the interpolation parameters and the number of spatial intervals for interpolation effectively reduced the numerical attenuation and dispersion. Results also showed that interpolation parameters should be maintained near unity and the number of spacial intervals for interpolation increased to more than one when applied to systems with constant wave speed and no friction factors. The method of characteristics interpolation technique was used to predict pipeline transients in hypothetical systems under conditions of constant wave speed, variable wave speed, and severe wave speed fluctuations. (Lisk-FIRL)
W78-04559

INTERACTIVE COMPUTER DESIGN OF WASTEWATER PLANTS,
Berkenhoff (Grodon) and Associates, Inc., Albuquerque, NM.
For primary bibliographic entry see Field 7C.
W78-04626

ACTIVATED SLUDGE-UNIFIED SYSTEM DESIGN AND OPERATION,
Clemson Univ., SC. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5D.
W78-04630

8C. Hydraulic Machinery

UNBALANCED DRILL COLLAR INCREASES PENETRATION RATES.
World Oil, Vol 186, No 1, p 103-105, January, 1978. 3 fig, 1 tab, 1 ref.

Descriptors: *Rotary drilling, *Drilling equipment, Oil industry, Wells, *Drill collars, *Penetration rate.

An eccentrically weighted drill collar that induces a low-frequency vibration in the drill string has allowed a Kansas drilling contractor to increase penetration rates by almost twenty-five percent without increasing the number of bits used, the number of connection failures, the average indicated bit weight, or the total revolutions. The collar appears to have lengthened bit life, and because the overall number of revolutions are reduced, rig maintenance is decreased, resulting in substantial savings. The collar also provides better hole conditions such as increased ease in running casing, better cement jobs, and in-gauge holes. The collar is primarily utilized to control deviation, because it transmits throughout the collarstring a low-intensity, once-per-revolution vibration every time the heavy side of the longitudinally unbalanced collar approaches the downward side of the hole, which helps to break sidewall friction and place more collar-string weight on the bit. Since the bit produces more consistent penetration rates, planning for future holes is facilitated. The collar can also eliminate the need for a shock sub. (Palmer-NWWA)
W78-04287

MAINTAINING YOUR WATER WELL DRILL.
Ground Water Age, Vol 12, No 3, p 20+, January, 1978.

Descriptors: *Drilling equipment, Water wells, Rotary drilling, Maintenance, Operating costs, *Percussion drilling, Wire rope.

A water well drill operates better and lasts longer when properly maintained. Rig maintenance should include care of the body to prevent rust or other corrosion and damage, lubrication of all moving parts, and thorough servicing of the engine and drive mechanisms. Wire rope, in particular, is subject to wear, so steps are suggested for its use and handling, and for storing it. Worn rope should be handled with extreme care until it can be replaced. Clips should also be attached according to outlined procedures to prevent strain or failure. (Palmer-NWWA)
W78-04288

COMPUTER AIDS DESIGN OF PRESSURE STORAGE TANKS,
R. A. Sterling.
Water and Sewage Works, Vol. 125, No. 1, p 80-81, January, 1978. 2 tabs.

Descriptors: *Pressure tanks, *Hydropneumatic tanks, *Computer programs, Design, Specifications, Pumping, Pressure.

Pressure or hydropneumatic tanks make delivery of water possible within a selected pressure range, without the necessity of operating pumps continuously or having the pumps cut in with every call for water on the distribution system. To assist in the design of pressure storage tanks for small water supply systems a computer prograh has been developed, written in BASIC and utilizing a Wand System 2200. The parameters which must be taken into account in the design of a pressure tank are: (1) pressure range; (2) pumping rate; (3) adequate water seal over tank outlets, and; (4) pumping cycles per hour. The tank selected must, of course, have dimensions that are commerically available. If the tank size is computed via this particular program, the design compromises with the nearest commercially available tank will usually be negligible. A sample of computer output and the full text of the program are given in this article. (Eberle-NWWA)
W78-04298

NEW MEXICO PUMP STUDY POINTS TO FARMERS' NEED FOR EFFICIENCY KNOWLEDGE,
For primary bibliographic entry see Field 3F.
W78-04300

BRINE CHEMISTRY, SCALING AND CORROSION: GEOTHERMAL RESEARCH STUDY IN THE SALTON SEA REGION OF CALIFORNIA,
California Inst. of Tech., Pasadena. Environmental Quality Lab.
For primary bibliographic entry see Field 8G.
W78-04303

TRENCH CUTTER FOR EXCAVATING TRENCHES AND FOR LAYING WATER PIPES AND DRAINAGE PIPES,
Firma Klaus-Gerd Hoes, Oldenburg (West Germany).
K. G. Hoes, and G. Wobken.
U.S. Patent No. 4,043,135, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 961, No 4, p 1497, August 23, 1977.

Descriptors: *Patents, *Pipelines, *Trenches, *Excavation, Engineering structures, Drainage systems, Water distribution(Applied).

A trench cutter for excavating trenches and for laying water pipes and drainage pipes into trenches consists of a travelling cutter chain with a jib supporting the cutter chain, the jib being pivotable in a vertical plane. A pipe laying duct is included for entering the excavation and sliding on the bottom of the excavation trench, the laying duct being pivotably connected to the job. A duct guide arm extends parallel to the back surface of the pipelaying duct for supporting the duct vertically so that it faces the cutter chain. Parallel guide rollers have one end pivotably connected to the duct guide arm and their opposite end connected to the outward drive shaft of the trench cutter. The drive shaft is pivotably connected to the free end of the jib. Guide rod linkages are connected to at least one work cyliner in order to adjust the angle of inclination between the cutter chain and the duct to change the clearance between the duct and the chain so that the duct can describe a curved path to permit the lower edge of the duct to be substantially tangential to the outer turning radius of the lower cutter chain. (Sinha-OEIS)
W78-04309

WATER WHEEL ASSEMBLY,
L. Gotti.
U.S. Patent No. 4,043,702, 5 p, 4 fig, 18 ref; Official Gazette of the United States Patent Office, Vol 961, No 4, p 1687, August 23, 1977.

Descriptors: *Patents, *Water wheels, Engineering structures, Hydroelectric power, Gravity, Railroad car wheels.

There is a need for a water wheel assembly which utilizes both the pressure generated from an elevated water supply and the force of gravity on one quarter of the water wheel, and is supported other than by the central axle so that the power take-off linkage is separated from the support bearings which are rotationally mounted in a stationary base. These bearings preferably are the wheels of railroad cars. Generally radially extended paddle elements placed between side walls and extending from their periphery includes an upward extended chute which is connected to an elevated water supply. This chute has a lower end shaped to deflect water generally horizontally and tangentially into the upper portion of the water

wheel and against the paddle elements. (Sinha - OEIS)
W78-04312

OPTIMIZATION OF AN OCEAN THERMAL ENERGY CONVERSION SYSTEM,
Swarthmore Coll., PA. Dept. of Engineering.
H. S. Dunn.
Ocean Engineering, Vol. 4, No. 1, p 23-39, March 1977. 3 fig, 2 tab, 5 ref.

Descriptors: *Sea water, *Thermal energy, *Optimization, *Conversion plants, Water temperature, Heat transfer, Rankine cycle, Linear term, Net power, Gross power output, Water supply, Ocean depths, Ammonia, Pumping, Design, Mathematical models, Equations, Systems analysis.

The optimum performance of a simple Rankine cycle ocean thermal energy conversion plant is investigated analytically. It is shown that the ratio of maximum net power output to heat exchanger surface area varies as H(Delta t - t sub 0) where H describes the overall heat transfer properties of the evaporator and condenser, delta t is the temperature difference between the warm and cold sea water supplies, and t sub 0 is a parameter depending primarily upon the pressure drops across the warm and cold sea water pumping systems. The model is relatively insensitive to the choice of working fluid, although ammonia is used as the illustrative example. (Bell-Cornell)
W78-04474

STORM SEWAGE OVERFLOWS,
Liverpool City Council (England). Dept. of the City Engineer.
P. R. Tottill.
Chartered Municipal Engineer, Vol. 104, No. 10, p 181-186, October, 1977. 6 fig, 18 ref.

Descriptors: *Storm water, *Overflow, *Combined sewers, *High flow, *Sewerage, Sewage, Storms, Municipal wastes, Analytical techniques, Waste water disposal.

Because flow in combined sewers can increase by 50 times during wet weather, it is frequently necessary to use a storm overflow chamber to decrease the load on sewers further downstream. Available storm overflow chambers include the high side weir, the stilling pond, and vortex overflows. Most research and development has been concentrated on improving conventional types of overflow treatment equipment. Some more recent developments show promise, but are relatively untried. The normal choice will be either a stilling pond or a high side weir with provisions for storage. Further research on the vortex overflow could produce an improved, more compact overflow chamber. Because small changes in an overflow chamber can affect performance considerably, model tests are important in designing an overflow chamber. The re-establishment of a technical committee to review research conducted since 1971 is recommended. (Snyder-FIRL)
W78-04550

NEW PORTOBELLO OUTFALL, BRIGHTON.
For primary bibliographic entry see Field 5E.
W78-04561

SYKES HANDLE PUMPEX SUBMERSIBLES.
Water and Waste Treatment, Vol. 20, No. 10, p 7, October, 1977.

Descriptors: *Pumps, *Waste water treatment, *Treatment facilities, *Drainage engineering, *Pumping plants, Sanitary engineering, Solid wastes, Equipment, Design data, Liquid wastes

Pumpex AB of Sweden is producing a line of submersible drainage and sewage pumps. Six sizes of drainage pumps are available with 15 different versions capable of outputs of 70-840 gpm. Two of the models have torque flow impellers and are specifically designed for pumping solids in waste water. Drainage pumps suited to restricted access areas, such as deep wells and narrow trenches, are produced with overall diameters of 11-1/4 inches. A wide variety of sewage pumps for treatment plants and main drainage systems are produced by Pumpex. The sewage pumps have interchangeable components, allowing for many variations. The sewage pumps handle a capacity from 2100 gpm, when equipped with single channel impellers, and up to 1210 gpm with torque flow models. (Lisk-FIRL)
W78-04587

MAINE WASTEWATER TREATMENT PLANT OPTS FOR SOLAR HEATING.
For primary bibliographic entry see Field 5D.
W78-04640

8D. Soil Mechanics

FEASIBILITY STUDY FOR DYKE MARSH DEMONSTRATION AREA, POTOMAC RIVER, VIRGINIA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 4A.
W78-04216

CAN TRENCH CAVE-IN DEATHS BE CUT.
Civil Engineering-ASCE, Vol 47, No 7, p 82-86, 1977. 1 ref.

Descriptors: *Sewers, *Design criteria, *Accidents, *Structural design, *Earth handling equipment, Reinforcement, Engineering structures, Construction materials, Pipelines.

Approximately 100 construction workers die annually because of trench cave-ins, primarily in sewer lines 5 to 20 feet deep. Most of these occur in excavations which are unshored. Careful study of the soils through which the trench will be cut and adequate engineering design are recommended. The major factor contributing to the high number of cave-ins is the lack of adequate engineering design and preplanning. Engineers should determine the nature of the soils to be encountered and design and specify the temporary support systems. Jurisdictions requiring that trench shoring be engineer-designed are noted. Thoughts from the insurance industry on trench cave-ins are presented. It is suggested that post-cave-in analyses of trench soil be conducted in efforts to learn as much as possible from actual accident scenes. (Baker-FIRL)
W78-04558

8G. Materials

NEW TUBULARS, STANDARDS DESIGNED FOR CORROSIVE SERVICE,
Armco Steel Corp., Houston, TX. National Supply Div.
R. L. Vingoe.
Oil and Gas Journal, Vol. 76, No. 4, p 58-62, January 23, 1978. 9 fig, 6 tab, 2 ref.

Descriptors: *Drill pipe, *Steel pipes, *Corrosion, Well casings, Heat treatment, Hydrogen sulfide, Failure(Mechanics), Cracking, Stress, Joints(Connections), *Corrosion control.

The worldwide search for energy has advanced into many areas where there is considerable concern over corrosion attack or stress corrosion cracking of casing, tubing, and drill pipe. The state of the art of tubular manufacture by American mills for corrosive environments is represented by the API L-80 grade casing and tubing. In the early 1970's, American mills made substantial progress in expanding heat treatment facilities. Ultimately, a new capability to provide quenched and tempered structure for corrosive environments was achieved. A resurgence of Modified N-80 tubular goods newly produced by Q and T method led to the standardization of such products as API L-80. This new grade is currently meeting well, providing customer acceptance and is showing good service performance. (Eberle-NWWA)
W78-04299

BRINE CHEMISTRY, SCALING AND CORROSION: GEOTHERMAL RESEARCH STUDY IN THE SALTON SEA REGION OF CALIFORNIA,
California Inst. of Tech., Pasadena. Environmental Quality Lab.
M. R. Hoffmann.
EQL Memorandum No. 14, July, 1975. 48 p, 1 fig, 2 tab, 88 ref.

Descriptors: *Geothermal studies, *Geochemistry, *Brines, *Corrosion, *Scaling, *Salton Sea(California), Thermal water, Water analysis, Silica, Engineering, Projects, Documentation.

Exploitation of the vase energy resources of the Salton Sea Known Geothermal Area have been severely hampered by scaling and corrosion problems in wells and equipment. Silica scaling in particular has been the most troublesome of all geothermal difficulties encountered. Although there are indications that private industry has made important discoveries in alleviating such impediments to geothermal energy production, research reports to this effect have not yet been released for public inspection. In spite of this fact, this paper lists and comments upon available literature on geothermal scaling problems and surveys current research in brine chemistry and utilization. Guidelines for future research are presented. While the importance of brine analysis and laboratory test programs is noted, emphasis is also given to the viability of the pragmatic approach; the installation of equipment, analysis of failure at specific points, and the initiation of corrective procedures without previous extensive brine analysis may indeed be the quickest method of making thermal energy sources available. (Eberle-NWWA)
W78-04303

HYDRAULIC CONDUCTIVITY MEASUREMENTS UTILIZING HEAT-SHRINKABLE TUBING,
Pennsylvania State Univ., University Park. Dept. of Geosciences.
D. R. Buss, B. D. Trexler, and W. A. Kneller.
Ground Water, Vol 16, No 1, p 49-50, January-February 1978. 2 fig, 1 ref.

Descriptors: *Hydraulic conductivity, *Laboratory tests, Equipment, Soils, Permeability, Permeameters, Analytical techniques, Groundwater, Groundwater movement, Geohydrology, *Heat-shrinkable tubing.

Hydraulic conductivity studies of a consolidated pozzolanic material indicated that heat-shrinkable tubing can be utilized to encase cylinders for use in a permeameter. The materials required for encasement of a sample include: heat-shrinkable tubing, hose clamps, polyvinyl chloride discs, glass tubing, and an electric oven. The procedure requires that the assembled PVC discs, filters, shrinkable tubing, and sample be placed on a support stand in an electric oven for 3 to 4 minutes at a temperature between 450-500 F. Upon removal from the oven, hose clamps are placed around each PVC disc. The method has several advantages: it saves time and money over conventional methods such as pneumatic pressurezed core holders or triaxial testing units, and it preserves the original interstitial bore spaces of the sample. (Sims-ISWS)
W78-04510

BAFFLED APRON AS SPILLWAY ENERGY DISSIPATOR,
Bureau of Reclamation, Denver, CO. Hydraulics Branch.
For primary bibliographic entry see Field 8B.
W78-04520

DEVELOPMENT OF LARGE ICE SAWS,
Army Terrestrial Sciences Center, Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-04531

INTERNATIONAL PIPE PROTECTION CONFERENCE.
Corrosion Prevention and Control, Vol 24, No 5, p 2-4, October, 1977.

Descriptors: *Linings, *Pipes, *Concrete pipes, *Corrosion, *Construction materials, Sewers, Sewerage, Waste water treatment.

Highlights of the International Pipe Protection Conference held in 1977 at the University of Kent n Canterbury, England, are presented. Coating naterials, pipe linings, sewer protection, erosion control, and electrochemical aspects of corrosion were discussed. The development of a new sewer material, sulfur-concrete, prefaced a discussion of nethods of protecting concrete pipes in hot climates from attack by sulfuric acid formed in septic ewage. Solutions proposed include epoxy or coal ar-epoxy linings and glass-reinforced cement. Structural and non-structural lining of water mains vas considered. At present, structural renovation echniques are limited to polyethylene pipe inserions and spray application of fiber-reinforced ceent. Various techniques of corrosion control for vater treatment systems were presented. (Baker-FIRL)
W78-04556

HE EFFECT OF TEMPERATURE CHANGE N PLASTIC PIPE,
laman (I. A.) and Associates, Los Angeles, CA.
. Demergian.
lumbing Engineer, Vol 5, No 6, p 27, 48-50, lovember-December, 1977. 3 fig, 1 tab, 6 ref.

escriptors: *Plastic pipes, *Thermal stress, Steel pipes, *Plastic deformation, *Stress analys, Expansion joints, Construction materials, lexibility, Rigidity, Elasticity, Thermal expanon, Sewers.

roperties of expansion and contraction of plastic pe are compared with those of metal pipe under ariations in temperature. When polyvinyl loride (PVC) pipe is subjected to the same ange in temperature as an equal length of steel pe, the PVC pipe is five times more flexible than e steel under unobstructed conditions. Under id installation conditions, the PVC pipe is subct to less stress under thermal variations than the eel pipe. Piping installation should allow for mbined stresses related to internal and external essure, temperature changes, and the pipes' eight. Thermal contraction can be compensated r by snaking the pipe during installation. For id pipe, expansion joints or loops and changes direction can be used. When expansion is anipated, straight installation of plastic pipe can mpensate for the thermal increase and conuent expansion. Thermal expansion coeffients are calculated for a number of other metal d plastic pipes. (Lisk-FIRL)
78-04557

OXY COATED GRATING RESISTS CORRON IN SEWAGE PLANT APPLICATION,
F. Kelly.
ter and Sewage Works, Vol 124, No 12, p 72, cember, 1977.

Descriptors: *Treatment facilities, *Chemical wastes, *Sewerage, *Sewage treatment, *Corrosion control, Construction materials, Protective coatings, Municipal wastes, Epoxy resins, Industrial wastes, Equipment, Waste water treatment, Waste water disposal, Michigan.

A potential air contamination problem was presented by the combination of strong chemicals and sewage in waste water treatment and incineration plants located at the confluence of the Detroit and Rouge rivers. A self-ventilating plant was designed. Industrial steel grating was specified for much of the flooring of one of the incinerator complexes. A type of grating that offered the load strength of the regular product, in addition to corrosion resistance, was required. Ponbake epoxy-coated grating from Blaw-Knox Equipment, Inc., in Pittsburgh, Pennsylvania, was selected. Waste flows from residential, commercial, and industrial sources in Wayne, Oakland, and Macomb counties, as well as storm water from Detroit and some Detroit suburbs, are treated. Volumes sometimes exceed 1,000 mgd, but 800 mgd is typical. Ferrous chloride is used to bind phosphates into a settleable form. Coarse screens remove solid materials and grit settling polyelectrolyte addition, sedimentation and skimming, aeration, clarification, and chlorination. Treated effluent is discharged to the Detroit River; sludge is dewatered and transferred to 14 multiple hearth furnaces. The ash is transported to a landfill. The industrial grating at $3-5/sq ft was much less costly than conventional stee and concrete flooring. (Snyder-FIRL)
W78-04654

8I. Fisheries Engineering

ENTRAPMENT AND IMPINGEMENT OF FISHES BY POWER PLANT COOLING-WATER INTAKES: AN OVERVIEW,
California Univ., Davis. Div. of Wildlife and Fisheries Biology.
C. H. Hanson, J. R. White, and H. W. Li.
Marine Fisheries Review, Vol. 39, No. 10, October 1977, p 7-17, 3 fig, 1 tab, 52 ref.

Descriptors: *Environmental effects, *Powerplants, *Cooling water intakes, Fish passages, Engineering structures, Fish, Mortality, Design, Reviews, *Entrapment(Fish), *Impingement(Fish).

A discussion is presented on types of biological problems caused by intake structures, strengths and weaknesses of various water intake/fish protections sytems, and biological/ecological processes relevant to entrapment and inpingement problems. Water velocity, impingement time and physiological stress are considered as they relate to mortality caused by impingement. It was concluded that two major issues need to be addressed in future research: (1) what effect, if any, does entrapment/impingement have on the productivity of the ecosystem or resources; and (2) what criteria determine the best intake-design technologies for minimizing effects on the system. (Chilton-ORNL)
W78-04661

AQUATIC EFFECTS OF STEAM-ELECTRIC GENERATING PLANTS: FEDERAL REGULATIONS AND POSSIBLE IMPACTS ON MULTIPURPOSE RESERVOIRS IN OKLAHOMA,
Texas Instruments Inc., Dallas. Ecological Services.
For primary bibliographic entry see Field 5C.
W78-04668

9. MANPOWER, GRANTS AND FACILITIES

9C. Research Facilities

NWWA RESEARCH FACILITY: AN OVERVIEW.
For primary bibliographic entry see Field 4B.
W78-04289

10. SCIENTIFIC AND TECHNICAL INFORMATION

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NWWA RESEARCH FACILITY: AN OVERVIEW.
For primary bibliographic entry see Field 4B.
W78-04289

STATE-OF-THE-ART SURVEY AND EVALUATION OF OPEN-WATER DREDGED MATERIAL PLACEMENT METHODOLOGY,
JBF Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 05E.
W78-04533

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SELECTED WATER RESOURCES ABSTRACTS

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 11
JUNE 1, 1978

W78-04701 -- W78-05200

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

COMPUTATION OF INFILTRATION FOR UNSTEADY UNINTERRUPTED HIGH RAINFALL,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 2B.
W78-04715

INTERSTITIAL WATER COMPONENTS AND EXCHANGE ACROSS THE WATER SEDIMENT INTERFACE OF WESTERN LAKE SUPERIOR,
For primary bibliographic entry see Field 5C.
W78-04769

MODELING DAILY PRECIPITATION OCCURRENCE PROCESS WITH MARKOV CHAIN,
National Weather Service, Silver Spring, MD. Office of Hydrology.
For primary bibliographic entry see Field 2B.
W78-04827

PARAMETER ESTIMATION OF THE GREEN AND AMPT INFILTRATION EQUATION,
Agricultural Research Service, Boise, ID. Northwest Watershed Research Center.
For primary bibliographic entry see Field 2G.
W78-04836

HYDROLOGY - 1976,
Geological Survey, Reston, VA. Water Resources Div.
L. A. Heindl.
Encyclopedia Britannica Book of the Year Earth Sciences, p 292-295, 1977.

Descriptors: *Hydrology, *Surface waters, *Groundwater, *Reviews, Floods, Droughts, Streamflow, Regulated flow, Sediment transport, Groundwater resources, Pumping, Drawdown, Land subsidence, Groundwater recharge, Injection wells, Water pollution sources, Water pollution control, Water supply, Water utilization.

This article reviews some of the catastrophic-hydrological events that have occurred in different parts of the world and methods of managing our water resources. (Woodard-USGS)
W78-04864

COMPUTER PROGRAMMING FOR MAXIMUM MODELING INFORMATION TRANSFER,
Booker Associates, Inc., Lexington, KY.
For primary bibliographic entry see Field 2E.
W78-05025

2B. Precipitation

COMPUTATION OF INFILTRATION FOR UNSTEADY UNINTERRUPTED HIGH RAINFALL,
Colorado State Univ., Fort Collins. Engineering Research Center.
H. J. Morel-Seytoux, T. A. Pick, and T. Jonch-Clausen.
Journal of Hydrology, Vol 35, No 3/4, p 221-234, November 1977. 7 fig, 1 tab, 21 ref. OWRT B-144-COLO(5), 14-34-0001-6064.

Descriptors: *Infiltration, *Rainfall, *Model studies, Mathematical models, Precipitation(Atmospheric), Ponding, Runoff, Equations, Formulas, Hydrographs, Hydraulic conductivity, Precipitation intensity, Precipitation excess, Soils, Soil water movement, Percolation, Permeability, Soil properties, Rainfall patterns.

The use of previously proposed formulas for rainfall infiltration demonstrated the sensitivity of the response hydrographs to the rainfall pattern. For steady rainfall, the proposed formulas of ponding time and of infiltration rate after ponding were verified by comparison with experimental data. For unsteady rainfall, inspection of the formulas indicated that they may be in serious error for low-intensity rains of long duration. (Sims-ISWS)
W78-04715

MODELING DAILY PRECIPITATION OCCURRENCE PROCESS WITH MARKOV CHAIN,
National Weather Service, Silver Spring, MD. Office of Hydrology.
E. H. Chin.
Water Resources Research, Vol 13, No 6, p949-956, December 1977. 2 fig, 6 tab, 7 ref.

Descriptors: *Precipitation(Atmospheric), *Model studies, *Markov process, *United States, Mathematical models, Summer, Winter, Statistics, Statistical models, Analytical techniques, Rainfall, Snow fall, Meteorology, Climatology, Daily precipitation.

Daily precipitation records for 25 years at more than 100 stations in the conterminous United States were analyzed. The order of the Markov chain representing the conditional dependence of precipitation occurrences at each station was studied. This was done by using a decision procedure based on an extension of the principle of maximum likelihood. A loss function composed of a log-likelihood ratio term and a degree-of-freedom term was used as the decision criterion. Among several competing Markov orders, the on that minimizes this loss function was selected. The results showed that the order of conditional dependence of daily precipitation occurrences depends on the season and geographical location. There exists a prevalence of first-order conditional dependence in summer and higher-order conditional dependence in winter. An explanation based on meteorology was proposed. In both seasons, there are areas where the Markov order deviates from the prevalent patterss. If the record length is too short (much less than 1000 days), there is a tendency for a low-order chain to be misrepresented as the proper model. A specific example in which a third-order model is required to depict the precipitation occurrence in winter also was given in some detail. Therefore, the proper Markov order describing the daily precipitation occurrence process has to be determined and cannot be assumed a priori. The common practice of assuming that the Markov order is always 1 is unjustified. (Sims-ISWS)
W78-04827

HURRICANE WIND AND WAVE FORECASTING TECHNIQUES,
Hawaii Univ., Honolulu. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 2L.
W78-04968

MARINE CLIMATOLOGY OF THE GULF OF ALASKA, THE BERING AND BEAUFORT SEAS,
Alaska Univ., Anchorage. Arctic Environmental Information and Data Center.
J. L. Wise.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977. Vol 15. Transport, p 279-392, March 1977. 3 fig. 03-5-022-56.

Descriptors: *Baseline studies, *Resources development, Climatology, Coasts, Alaska, *Outer Continental Shelf, *Gulf of Alaska, *Bering Sea, *Beaufort Sea, Oil and gas development.

All available climatological data for the Gulf of Alaska, Bering and Beaufort Seas are used in determining and publishing the present state of knowledge in this area. An atlas will be produced and published for each of the three areas. Summarized data for period of record for coastal stations will also be included. Specific objectives are to present information on temperature, precipitation, wind and how they relate to such things as cloud cover, wave heights, and visibility (fog). Storm tracks and frequencies, storm surges and coastal flooding are part of the presentation. Such things as potential superstructure icing, tides, surface currents, immersion hypothermia and topography of both land and sea will be included. Extremely severe weather conditions can and do occur over all of the continental shelf areas of Alaska as well as coastal and interior portions. This makes it important that the intensities and durations of storms are known and available for use in planning, design and actual operations. (Sinha-OEIS)
W78-04992

CLIMATIC ATLAS OF THE OUTER CONTINENTAL SHELF WATERS AND COASTAL REGIONS OF ALASKA,
Alaska Univ., Anchorage. Arctic Environmental Information and Data Center; and National Climatic Center, Ashville, NC.
J. L. Wise, H. W. Searby, W. A. Brower, Jr., H. F. Diaz, and A. S. Prechtel.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977. Vol 15. Transport, p 393-405, March 1977. 5 fig.

Descriptors: *Baseline studies, *Resources development, Climatology, Climatic data, Alaska, Coasts, *Outer Continental Shelf, Climatic atlases, Oil and gas development, Petroleum development.

This study is to establish descriptive climatology and data analysis of surface marine and atmospheric parameters for the outer continental shelf waters and coastal regions of Alaska. It is to serve as an environmental guide in assessing potential impact of oil and gas exploration and development and in influencing leasing and operation regulations and design of monitoring programs to permit resource development with the necessary environmental protection. The climatic data in each atlas are to be represented monthly, by isopleths on charts and by statistical graphs. Each atlas will be 11 inch x 11 inch in size and contain some 480 pages, of which 228 will be 3-color charts, each page having an opposing page of graphs for the particular set of coastal stations and marine areas pertinent to each atlas volume. The remaining pages will consist of statistical tables and a descriptive narrative of the atlas content. (Sinha-OEIS)
W78-04993

COASTAL METEOROLOGY OF THE ALASKAN ARCTIC COAST,
Washington Univ., Seattle. Polar Research Center.
F. Carsey.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977. Vol 15. Transport, p 538-578, March 1977. 16 fig, 3 append. 03-5-022-671011.

Descriptors: *Baseline studies, *Resources development, *Water pollution, *Winds, *Diffusion, Sea ice, Arctic Ocean, Alaska, Pollutants, Oil spills, Tides, Currents(Water), *Outer Continental Shelf, Pollutant transport, Prudhoe Bay(AK).

This study was designed to examine actual winds in the Prudhoe Bay area, to compare these winds with those predicted by the National Weather Ser-

vice analysis and to model local or mesoscale phenomena which create departures of measured from predicted winds. The winds of interest in this work are those which produce significant surface currents and tides in the Prudhoe Bay area. Therefore, these winds will, when taken with other current-producing mechanisms, describe the mean trajectory and lateral diffusion of oil on open water and, to a certain extent, oil under sea ice. The magnitude of these flow terms will enable determination of the size and extent of an oil slick and its likelihood of impacting the biota of specific regions and depths. In order to accomplish this entire task, other research, such as into the behavior of spilled oil with time in arctic conditions, must be performed. (Sinha-OEIS)
W78-04997

RADARSCOPE INTERPRETATION: SEVERE THUNDERSTORMS AND TORNADOES,
Air Weather Service, Scott AFB, IL.
R. C. Whiton, and R. E. Hamilton.
Report No. AWS-TR-76-266, September, 1976. 23 p, 12 fig, 4 tab, 48 ref. Supercedes AWS Technical Report 243, On the Use of Radar in Identifying Tornadoes and Severe Thunderstorms: A Diagnostic Guide for Radar-Scope Interpretation, May, 1971.

Descriptors: *Meteorology, *Radar, *Weather forecasting, *Meteorological data, Thunderstorms, Tornadoes, Hail, Precipitation(Atmospheric), Warning systems, Weather, Weather patterns, Radar detection, Meteorological radar, Radar echo signatures, X-band radar, S-band radar, C band radar.

This report contains material taken from the available literature on the identification of severe thunderstorms, hail, and tornadoes from radar echoes. Radar echo signatures indicating severe weather are consolidated for geographical areas and weather types to afford the radar meteorological easy access to the findings of several investigators in the weather radar field. Information concerning X-band, S-band, and C-band radars is presented. Also included are threshold values, above which severe weather is expected, and an evaluation table designed to assist each installation in determining their particular need for warning information by establishing Probability of Detection, False Alarm Ratio, and Critical Success Index threshold values for each radar techniques. (Seip-IPA)
W78-05006

WATER-QUALITY AND RAINFALL DATA COLLECTED WITH AUTOMATED FIELD STATION, FORT MCCLELLAN, ALABAMA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 5A.
W78-05010

RESUSPENSION OF PLUTONIUM FROM CONTAMINATED LAND SURFACES: METEOROLOGICAL FACTORS,
Environmental Monitoring and Support Lab., Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5B.
W78-05056

2C. Snow, Ice, and Frost

EVAPORATION IN HIGH LATITUDES,
McMaster Univ., Hamilton (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 2D.
W78-04823

TURBULENT DIFFUSION IN CHANNELS WITH A SURFACE COVER,
University of Science and Technology, Kumasi (Ghana), Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-04848

STUDY OF CLIMATIC EFFECTS ON FAST ICE EXTENT AND ITS SEASONAL DECAY ALONG THE BEAUFORT-CHUKCHI COASTS,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
For primary bibliographic entry see Field 5B.
W78-04984

MECHANICS OF ORIGIN OF PRESSURE RIDGES, SHEAR RIDGES AND HUMMOCK FIELDS IN LANDFAST ICE,
Alaska Univ., College. Geophysical Inst.
L. H. Shapiro, H. F. Bates, and W. D. Harrison.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 15. Transport, p 1-41, March 1977. 7 fig, 12 ref. 03-5-022-55.

Descriptors: *Baseline studies, *Resources development, *Ice, Deformation, Bathymetry, Alaska, Outer Continental Shelf, Landfast ice, Pressure ridges, Shear ridges, Pollutant transport.

The results of three studies in progress are summarized. The first of these involves the formation of ridges along the shore at Barrow in the late Spring of 1975 and 1976. The second study is based upon observations of vibrations of ice sheets, with amplitudes of a few centimeters and periods of about 10 minutes, in apparent association with increasing stress levels in the ice. Finally, bathymetry survey of the coast near Barrow was done during the past year, and the results are presented. The distribution of gouges in the sea floor was studied, and a change in the density of these at a depth of 30 feet was identified. In addition, gouges were found to depths of 120 feet, the limit of the survey. (Sinha-OEIS)
W78-04985

MORPHOLOGY OF BEAUFORT, CHUKCHI AND BERING SEAS NEAR SHORE ICE CONDITIONS BY MEANS OF SATELLITE AND AERIAL REMOTE SENSING,
Alaska Univ., College. Geophysical Inst.
W. J. Stringer, S. A. Barrett, N. Balvin, and D. Thomson.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 15. Transport, p 42-150, March 1977. 9 fig. 03-5-022-55.

Descriptors: *Baseline studies, *Resources development, *Environmental effects, *Morphology, Ice, *Remote sensing, Hazards, Sea ice, Alaska, Outer Continental Shelf, Oil and gas resources, Environmental conditions, Petroleum development.

The objective of this research was to develop a morphology of near shore ice along the Beaufort, Chukchi and Bering coasts of Alaska, and identify those features which may represent hazards imposed by ice conditions on OCS oil and gas development. The general conclusion is that near shore sea ice behavorial patterns are similar from year to year thereby yielding some predictability in terms of offshore sea ice hazards to oil and gas development. The implications are that geographical zones of different design and construction criteria can be established in the offshore areas taking into consideration the probability of damage to the structure by adverse ice conditions and the relative risk imposed to the adjacent ecosystems. (Sinha-OEIS)
W78-04986

EXPERIMENTAL MEASUREMENTS OF SEA ICE FAILURE STRESSES NEAR GROUNDED STRUCTURES,
Alaska Univ., College. Geophysical Inst.
W. M. Sackinger, and R. D. Nelson.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 15. Transport, p 151-179, March 1977. 14 fig, 12 ref. 03-05-022-55.

Descriptors: *Baseline studies, *Resources development, *Stress analysis, *Sea ice, Alaska, Deformation, Hazards, *Outer Continental Shelf, Ice sheets, Environmental conditions, Petroleum development, Oil and gas resources, Pollutant transport.

The objectives of this study were to measure, in-situ, the stresses generated in a sea ice sheet as it fails in the vicinity of a static obstacle and the rate of approach of the ice sheet during this process. The stresses in a floe of multi-year ice near a grounded floe-island were studied for 60 hours starting April 21, 1976. The instrumented floe was subjected to many compressive stress pulses during the first 26 hours of the experiment. The highest stress pulse recorded on the strip charts was 250 p.s.i. compression. The length of this pulse was not adequately resolved by the recorder, but probably lay between 0.33 seconds and 32 seconds. It did not cause destruction of the ice at the transducer. A second installation in annual ice beyond a grounded pressure ridge in 20 meter water depth showed a tensile stress buildup to 100 p.s.i. which was followed by crack formation adjacent to the transducer. Offshore structures subjected to multi-year ice floes must withstand ice stresses greater than 250 p.s.i. Impulse loading should be expected. (Sinha-OEIS)
W78-04987

BEAUFORT SEA, SHUKCHI SEA, AND BERING STRAIT BASELINE ICE STUDY,
Alaska Univ., College.
W. R. Hunt, and C. M. Naske.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 15. Transport, p 180-191, March 1977. 03-5-022-55.

Descriptors: *Baseline studies, *Resources development, *Sea ice, Maps, Navigation, Alaska, *Outer Continental Shelf, *Ice navigation, *Beaufort Sea, *Chukchi Sea, Bering Strait.

A number of maps which show the historic variations in ice conditions over a 100 year period were completed. These maps were presented at the February 1977, conference of principal investigators in Barrow, Alaska. They will be utilized in the preliminary report which the Arctic Project Office is preparing. The data was extracted from ship logs of whaling vessels, U.S. Revenue Marine Service and U.S. Coast Guard vessels as well as trading ships. A sample of ice data that lends itself to chronological narrative rather than carographic representation is included with this report. (Sinha-OEIS)
W78-04988

DEVELOPMENT OF HARDWARE AND PROCEDURES FOR IN SITU MEASUREMENT OF CREEP IN SEA ICE,
Alaska Univ., College. Geophysical Inst.
L. H. Shapiro, R. D. Nelson, and E. R. Hoskins.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 15. Transport, p 192-241, March 1977. 14 fig, 1 tab, 13 ref. 03-5-022-55.

Descriptors: *Baseline studies, *Resources development, *Mechanical properties, *Sea ice, Construction, Creep, Arctic Ocean, Alaska, *Outer Continental Shelf, Petroleum development, In-situ measurement, Offshore structures.

The procedures and hardware required for in-situ measurement of the mechanical properties of sea ice were developed and tested and a program of such measurements was conducted. In addition, the results of the extensive series of laboratory tests of sea ice in creep and at constant loading rates are being reevaluated. Any permanent or semi-permanent structure off the Arctic Coast of Alaska must contend with the hazard that sea ice presents to its stability. In order to properly design such installations it is necessary that reliable values of the mechanical properties of the ice be available both for establishing the design of the structure, and for the evaluation of that design by public agencies. In additon, significant savings in cost of construction can be realized if less conservative safety factors can be utilized. (Sinha-OEIS)
W78-04989

SNOW MAPPING, AND LAND USE STUDIES IN SWITZERLAND,
Zurich Univ. (Switzerland). Dept of Geography.
H. Haefner.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-21504, Price codes: A04 in paper copy, A01 in microfiche. Final Report No. 29760, January 1977. 53 p, 26 fig.

Descriptors: *Snow, *Runoff, *Snowmelt, *Runoff forecasting, *Snow survey, Areal mapping, Satellites, Human population, Density, *Land use, *Switzerland, Data collections, *LANDSAT.

A project was conducted to develop an integrated classification system to operationally map and measure dynamic surface features in Switzerland (in particular snow and land use) by means of multitemporal digital satellite (LANDSAT) data. The application of these data should lead to better surface water runoff predictions and provide a better surface water runoff predictions and provide a better data base for hydrologic balance, population, settlement and planning purposes. The system developed was based on a supervised classification method using various algorithms and representation of the results in maplike form on color film with a photomation system. Snow mapping in high mountain terrain can be achieved independently of relief and shadow effects, sun angle, snow type, surface conditions, etc. The transition zone between the totally snow-covered and the totally snowfree areas, which is of specific interest in the melting process and for runoff predictions, was analyzed in detail regarding location, extent and vertical dimensions, with an accuracy of approximately 94%. Land use categories considered and analyzed included water, agriculture, forest, and built-hup areas. Further study is indicated to determine population density changes and fringe zones as well as snow movement and changes. (Seip-IPA)
W78-05012

2D. Evaporation and Transpiration

EVAPORATION IN HIGH LATITUDES,
McMaster Univ., Hamilton (Ontario). Dept. of Geography.
W. R. Rouse, P. F. Mills, and R. B. Stewart.
Water Resources Research, Vol. 13, No. 6, p 909-914, December 1977. 5 fig, 3 tab, 9 ref.

Descriptors: *Evaporation, *Tundra, *Subarctic, *Canada, Equilibrium, Vegetation, Radiation, Air temperature, Model studies, Douglas fir trees, *High latitudes, *Hudson Bay Coast, *Lake Athabasca(Canada), Energy balance.

A simplified form of the equilibrium model of evaporation predicted evaporation from six subarctic and tundra surfaces with an accuracy of 8%. Input data to the model were net radiation, screen air temperature, and an evaporability factor characteristic of the surface. The radiation and energy balances of the six surfaces were compared. The tundra sites were located adjacent to one another near the Hudson Bay coast. The upland lichen heath was covered in a lichen and shrub vegetation varying from 30 to 70 mm in mat thickness. It was extremely flat, and for measurement purposes had an unlimited fetch in all directions. The subarctic woodland and burn sites were located north of Lake Athabasca. The arboreal vegetation in the mature lichen woodland was exclusively black spruce, averaging 14 m in height. Each tree was an average of 3 m from its nearest neighbor. The ground flora was dominated by various species of non-transpiring lichen. The mature lichen woodland had the highest evaporation of any of the upland surfaces. The lichen heath had similar evaporation rates and displayed a strong surface resistance to evaporation. (Roberts-ISWS)
W78-04823

EVAPORATION FROM THE WET CANOPY OF A PINE FOREST,
Institute of Hydrology, Wallingford (England).
J. B. Stewart.
Water Resources Research, Vol. 13, No. 6, p 915-921, December 1977. 2 fig, 1 tab, 28 ref.

Descriptors: *Evaporation, *Forests, *Canopy, On-site investigations, Data collections, On-site data collections, Evapotranspiration, Trees, Pine trees, Precipitation(Atmospheric), Rainfall, Wetting, Solar radiation, Heat transfer, Humidity, Measurement, Data processing, Mathematical models, Watersheds(Basins).

Measurements of the energy budget of a pine forest were made on 70 dyas when the canopy was wet. Out of 245 20-min periods when the canopy was wholly wet, 173 were occasions when the latent heat flux exceeded the net radiation, the additional energy being provided by a downward flux of sensible heat. Under the same level of radiation, the average rate of evaporation of intercepted precipitation was found to be three times the average rate of transpiration, so that the loss by evaporation of intercepted precipitation is only partly compensated by the suppression of transpiration. It was concluded that reliable estimates of the water resources of forested areas require a separate calculation of the interception and transpiration components of the total evaporation loss. (Sims-ISWS)
W78-04824

MODELING SOIL WATER MOVEMENT INTO PLANT ROOTS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
D. C. Slack, C. T. Haan, and L. G. Wells.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 5, p 919-927, 933, September-October 1977. 7 fig, 1 tab, 48 ref.

Descriptors: *Soil water movement, *Soil-water-plant relationships, *Evapotranspiration, Root systems, Leaves, Plant physiology, *Corn(Field), Laboratory tests, Model studies, Mathematical models, Soil water, Soil properties, Hydraulic conductivity, Evaporation, Agriculture.

A mathematical model was developed which describes uptake of water by plant roots as a function of leaf and soi water potentials. The model was used to estimate transpiration from corn grown in a controlled environment under soil drying conditions. The model predicted daily transpiration quite well for the period modeled. (Sims-ISWS)
W78-04843

QUANTITY AND QUALITY CONSIDERATIONS FOR WATER USE EFFICIENCY IN IRRIGATION,
Texas Tech Univ., Lubbock. Dept. of Plant and Soil Science; and Texas Tech Univ., Lubbock. Dept. of Biological Sciences.
For primary bibliographic entry see Field 3F.
W78-05054

AIR TEMPERATURE AND VAPOR PRESSURE CHANGES CAUSED BY SPRINKLER IRRIGATION,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
R. A. Kohl, and J. L. Wright.
Agron J. 66(1), p 85-88, 1974.

Descriptors: *Air temperature, Cooling, *Evaporation, Growth rates, Irrigation, Plant growth, *Sprinkler irrigation, *Vapor pressure, Water loss.

The downwind effect of evaporation from sprinkler spray was studied in the field to determine if air temperature and vapor pressure were changed enough to influence plant growth and water use. Wet-bulb and dry-bulb temperature profiles were measured upwind and at 3-distances downwind from a sprinkler lateral before and during sprinkling. Wind-speed and direction were also measured. Air temperature generally was reduced less than 1C, and vapor pressure in the air was increased less than 0.8 mbar. This amount of change in the air temperature and humidity is not likely to be sufficient to cause any significant change in plant growth or evaporative loss of water.--Copyright 1974, Biological Abstracts, Inc.
W78-05086

2E. Streamflow and Runoff

THE SAMPLING ERROR OF STORAGE SIZE,
Monash Univ., Clayton (Australia). Dept. of Mathematics.
R. M. Phatarfod.
Water Resources Research, Vol. 13, No. 6, p 967-969, December 1977. 1 tab, 5 ref.

Descriptors: *Reservoirs, *Storage capacity, *Model studies, Mathematical models, Markov processes, Mathematics, Sampling, Distribution patterns, Flow, Discharge(Water), Lakes, *Sampling errors, Error analysis, Gamma distribution, Reservoir size.

The size of a reservoir for a given draft ratio and reliablity usually is obtained by fitting a distribution to the historical flows. Since the parameters of the inflow model are estimates obtained from data, they are subject to sampling errors. There errors are carried on and magnified when the size of the reservoir is determined. The bias and the standard error of the reservoir size were consdiered. Details were worked out for the case of the gamma input. (Sims-ISWS)
W78-04829

THE SMALL SAMPLE EXPECTATION OF POPULATION AND ADJUSTED RANGES,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulics and Water Power.
Z. Sen.
Water Resources Research, Vol. 13, No. 6, p 975-980, December 1977. 2 fig, 14 ref.

Descriptors: *Hydrology, *Reservoirs, *Model studies, *Mathematical models, Synthetic hydrology, Streamflow, Storage capacity, Markov processes, Monte Carlo method, Mathematics, Statistics, Analytical techniques, Computer models, Small sample estimation, Normal independent processes, Population range, Brownian motion.

The general form of small sample expectations for population and adjusted ranges was derived by employing a methodology based on the Brownian motion. An application of the methodology to any normal and stationary process used in hydrology was performed. Moreover, the asymptotic ideal reservoir sizes for dependent processes was derived. (Sims-ISWS)
W78-04830

THE SMALL SAMPLE EXPECTATION OF RESCALED POPULATION AND RESCALED ADJUSTED RANGES,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulics and Water Power.
Z. Sen.
Water Resources Research, Vol. 13, No. 6, p 981-986, December 1977. 6 fig, 10 ref, 1 append.

Descriptors: *Hydrology, *Model studies, *Mathematical models, Markov processes, Monte Carlo method, Mathematics, Equations, Streamflow, Regression analysis, Analytical techniques, Computer models, Rescaled ranges, Small sample estimation, Normal independent processes.

The expected value of the rescaled range R/S, which is a measure of long-term persistence in hydrology, was obtained analytically by making use of t distribution. The application of the model was performed for various hydrological processes. Finally, the asymptotic equivalence for expectations of the range and the rescaled range was proven. (Sims-ISWS)
W78-04831

THE LOG PEARSON TYPE 3 DISTRIBUTION: THE T-YEAR EVENT AND ITS ASYMPTOTIC STANDARD ERROR BY MAXIMUM LIKELIHOOD THEORY,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
R. Condie.
Water Resources Research, Vol. 13, No. 6, p 987-991, December 1977. 2 tab, 9 ref, 1 append.

Descriptors: *Flood frequency, *Distribution patterns, *Frequency, *Floods, *Canada, Data processing, Analytical techniques, Maximum probable flood, Rivers, Flow, Discharge(Water), Hydrology, Climatology, *Log Pearson distribution.

The maximum likelihood estimators for the three distribution parameters of a log Pearson type 3 distribution were derived from the logarithmic likelihood function, and a solution method was given. The T-year event was derived then as a function of these parameters and the standard normal deviate t. These parameters are subject to sampling variances and covariances, whereas t is not. By using the logarithmic likelihood function, the inverse dispersion matrix was derived, and hence, the variances and covariances of the parameters. Entering these in the general variance of the estimate equation of a function of three variables led to an estimate of the asymptotic standard error of estimate of the T-year event. Flood data from 37 hydrometric stations on Canadian rivers were analyzed by this method and compared with the more common moment analysis. In all cases, the maximum likelihood analysis is markedly superior in terms of the estimate of standard error of estimate, but the asymptotic nature of the result always must be borne in mind. Possible sources of bias in the maximum likelihood estimate of the T-year event were discussed. (Sims-ISWS)
W78-04832

A NOTE ON THE HURST PHENOMENON IN TURBULENT FLOW,
California Univ., San Diego, La Jolla. Dept. of Applied Mechanics and Engineering Sciences.
C. W. Van Atta, and K. N. Helland.
Water Resources Research, Vol. 13, No. 6, p 1003-1005, December 1977. 2 fig, 10 ref. ONR N00014-76-C-0702,NSF ENG76-13147.

Descriptors: *Turbulent flow, *Model studies, *Rivers, River flow, Unsteady flow, Flow, Fluctuations, Time series analysis, Analytical techniques, Hydraulics, Hydrology, *Hurst phenomenon.

Experimental observation of a long-established theoretical result for the behavior of the rescaled range was reported. Suitable dimensional scaling was found to collapse all available geophysical and laboratory data for the rescaled range in turbulent flows. (Sims-ISWS)
W78-04834

OHIO RIVER POWER CURVE REGRESSION EQUATIONS,
Missouri Univ., St. Louis. Dept. of Physics.
L. J. Lee, and B. L. Henson.
Water Resources Research, Vol 13, No 6, p 1006-1008, December 1977. 2 tab, 11 ref.

Descriptors: *Rivers, Properties, *Regression analysis, *Ohio River, *Correlation analysis, Equations, Flow, Streamflow, Discharge(Water), Slope, Depth, Width, Velocity, Statistics, Mathematics, Computer programs, *Forecasting.

By the use of a statistical computer program, power curve regression equations and correlation coefficients were developed for as many river parameters as could be quantified accurately for the Ohio River. This was done with the expectation that these equations would be useful in sorting from the many river parameters those variables that are strongly related and would aid in predicting changes that the river might undergo as a result of the manipulative behavior of man. Results indicated that the equations developed may be useful for both purposes. (Sims-ISWS)
W78-04835

COMPETENCE OF HOPE RIVER, JAMAICA: A REAPPRAISAL OF R AS A FUNCTION OF D,
University of the West Indies, Kingston (Jamaica). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-04837

TURBULENT DIFFUSION IN CHANNELS WITH A SURFACE COVER,
University of Science and Technology, Kumasi (Ghana), Dept. of Civil Engineering.
E. O. Engmann.
Journal of Hydraulic Research, Vol. 15, No. 4, p 327-335, 1977. 4 fig, 3 tab, 5 ref.

Descriptors: *Diffusion, *Open channels, *Ice cover, *Laboratory tests, Turbulent flow, Velocity, Profiles, Distribution patterns, Mixing, Flow, Data collections, Foreign research, Open channel flow, Transverse diffusion.

The effect of a surface cover (ice-cover) on transverse spreading of a tracer released at a constant and steady rate into a turbulent channel flow was investigated. Velocity, depth, and transverse profiles of tracer concentration were obtained a four cross sections downstream of the tracer source. It was shown that the transverse diffusion coefficient for ice-cover conditions, in a straight rectangular channel, is approximately 50% smaller than the corresponding coefficients for open water conditions. However, when these coefficients are normalised with the product of shear velocity and hydraulic radius, they do not differ significantly. An expression was derived for evaluating the average transverse diffusion coefficient over a channel reach by using concentration measurements at one station downstream of tracer source. This expression was found to give good results. (Humphreys-ISWS)
W78-04848

A BRIEF INVESTIGATION OF THE SURFACE-WATER HYDROLOGY OF YEMEN ARAB REPUBLIC,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-04872

SURVEY OF FISHES, MAMMALS AND HERPETOFAUNA OF THE COLORADO RIVER IN GRAND CANYON,
Mississippi State Univ., Mississippi State.
R. D. Suttkus, G. H. Clemmer, C. Jones, and C. R. Shoop.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 718, Price codes: A04 in paper copy, A01 in microfiche. National Park Service, Grand Canyon National Park Report Series Colorado River Research Program, Final Report, Technical Report No. 5, June 1976. 48 p, 11 fig, 5 ref, 7 append.

Descriptors: *Surveys, Data collections, Fish, Suckers, Shiners, Fish barriers, Fish establishment, Fish management, *Fish populations, Discharge(Water), Basic data collections, On-site data collections, Sampling, *Arizona, *Colorado River, *Mammals, *Reptiles, National Parks, *Grand Canyon National Park, Lee's Ferry, Diamond Creek.

In a survey study conducted to obtain base-line data, eleven extensive float trips were made down the Colorado River in the period from September 1970 through mid-June 1976. Samples of fish, mammals, plants and herpetofauna were collected; species collected are listed. In addition, terrestrial surveys were made at various land sites in the region. Major results of this survey were the lack of success in obtaining a speciman of the humpback sucker, xyrauchen texanus, and the discovery of the relative scarcity of chubs of the genus Gila. Both of these outcomes have been tied to the low water temperatures caused by releases from the Grand Canyon Dam, as well as to the barrier that the dam presents to upstream movement to suitable spawning areas. (Payton-Arizona)
W78-05001

THE ROLE OF MINIMUM VARIANCE THEORY IN DEFINING THE REGIME CHARACTERISTICS OF THE LOWER NAMOI-GWIDIR DRAINAGE BASIN,
Macquarie Univ., Ryde (Australia). School of Earth Sciences.
S. J. Riley.
Water Resources Bulletin, Vol 14, No 1, p 1-11, February 1978. 1 fig, 2 tab, 16 ref.

Descriptors: *Regime, *Hydraulics, *Model studies, *Mathematical models, Channels, Rivers, Channel morphology, Flow, Velocity, Depth, Foreign countries, Slopes, Foreign research, Friction, Fluid friction, Sediments, Sediment load, Watersheds(Basins), *Namoi-Gwydir river system(Australia).

While minimum variance theory appears to offer an explanation for the hydraulic behavior and regularity among channel systems, it is not entirely successful in predicting the regime of a channel system. In the case of the Namoi-Gwydir river system, the hydraulic variables velocity, depth, width, slope, friction, and shear appear to govern the behavior and, hence, regime of the channels. The significance of sediment load in determining regime could not be assessed. (Sims-ISWS)
W78-05019

LINE SOURCE DISPERSION WITH APPLICATION TO MIXING IN RIVER CHANNELS,
Clarkson Coll. of Technology, Potsdam, NY. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-05021

ORDER CLASSIFICATION OF URBAN CATCHMENTS,
North Carolina Univ. at Raleigh. Water Resources Research Center.
N. S. Grigg, and T. Sriburi.
Water Resources Bulletin, Vol. 14, No. 1, p 63-71, February 1978. 5 fig, 4 tab, 6 ref.

Descriptors: *Urban drainage, *Classification, Urban hydrology, Urban runoff, Watersheds(Basins), Drainage systems, Hortons Law, Hydrology, Systematics, Sewers, Channel morphology, Tributaries, Stream order systems, Bifurcation ratio.

Stream order systems provide useful classification methods according to the number of tributaries collected. In urban catchments, sewer line order is a concept providing for the same type of classification. Horton's stream order system was used to classify sewers, beginning with the smallest lines as first order to the largest main sewer which is sixth order for two catchments studied. Average tributary area, average length and number of lines were shown as functions of order. The bifurcation ratios also were presented. They can be used for finding the number of sewer lines in the next order. The number of first order lines depend on lot size, and the bifurcation ratios vary widely. (Lee-ISWS)
W78-05022

A UNIFYING SET OF PROBABILITY TRANSFORMS FOR STOCHASTIC HYDROLOGY,
Agriculture Research Service, Athens, GA. Southeast Watershed Lab.
W. M. Snyder, W. C. Mills, and W. G. Knisel, Jr.
Water Resources Bulletin, Vol. 14, No. 1, p 83-98, February 1978. 9 fig, 3 tab, 6 ref.

Descriptors: *Synthetic hydrology, *Statistics, *Probability, Model studies, Mathematical models, Storms, Floods, Design storm, Statistical methods, Stochastic processes, Monte Carlo method, Distribution patterns, Reservoirs, Storage, Watersheds(Basins), Hydrology, Transform, Lognormal distributions, Mixed distributions, Extremes, Risk analysis.

An ordered set of probability density functions was derived from transforms of the normal distribution. Variate transforms were based on orders of exponentiation. The set of distributions included the log-normal. A partial basis for use of these functions in hydrology was demonstrated by establishing some required properties. A concept of mixed samples of zero and nonzero elements forming nonseparable sets of virtual and real elements was introduced to establish a physical lower limit of samples data independent of functional bounds. (Sims-ISWS)
W78-05023

COMPUTER PROGRAMMING FOR MAXIMUM MODELING INFORMATION TRANSFER,
Booker Associates, Inc., Lexington, KY.
D. I. Carey, A. B. Crane, and D. J. Henderson.
Water Resources Bulletin, Vol. 14, No. 1, p 109-118, February 1978. 3 fig, 1 tab, 7 ref, 1 append.

Descriptors: *Computer programs, *Programming languages, *Information exchange, Model studies, Computer models, Mathematical models, Runoff, Rainfall, Hydrology, FORTRAN.

The difficulty in understanding the listings of many available hydrologic models programmed in FORTRAN is a serious limitation to their verification and use. By expending more effort in creating written computer programs, more information can be transferred to those interested in modeling hydrologic processes. The use of simulation languages to produce more understandable program listings and increase the flow of information was recommended. An example was presented in which surface water runoff from storms on small rural watersheds is modeled. (Sims-ISWS)
W78-05025

SHALLOW WAVE PROPAGATION IN OPEN CHANNEL FLOW,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-05045

IMPINGEMENT OF AXISYMMETRIC DEVELOPING JETS,
Research Council of Alberta, Edmonton. Transportation and Surface Water Engineering Div.
For primary bibliographic entry see Field 8B.
W78-05047

2F. Groundwater

THE KINETICS OF MINERAL DISSOLUTION IN CARBONATE AQUIFERS AS A TOOL FOR HYDROLOGICAL INVESTIGATIONS, II. HYDROGEOCHEMICAL MODELS,
Tahal-Water Planning for Israel Ltd., Tel Aviv.
A. Mercado.
Journal of Hydrology, Vol 35, No 3/4, p 365-384, November 1977. 10 fig, 13 ref. OWRT B-038-NMEX(3).

Descriptors: *Dissolved solids, *Mineral water, *Transmissivity, *New Mexico, Model studies, Mathematical models, Aquifers, Chemicals, Water chemistry, Groundwater, Groundwater movement, Spatial distribution, Hydraulic conductivity, Permeability, Recharge, Rainfall, Water quality, Limestones, Hydrology, *Hydrogeochemistry, *Roswell(NM).

A general differential equation, describing the dissolution of minerals and the transport of their products in porous media, was derived and simplified for the case of steady-state, non-equilibrium distribution of solutes in confined carbonate aquifers. The numerical solution of the equation, which represents the hydrogeochemical model of a given aquifer, was based on the transformatiion of aquifer space coordinates into time coordinates of 'tracing points' moving along groundwater streamlines, followed by an inverse transformation which yields theoretical water quality maps. The applicability of the model for integrating hydrologic and geochemical data in aquifers was demonstrated for the limestone aquifer of Roswell, New Mexico. (See also W75-08190) (Sims-ISWS)
W78-04716

EVALUATION OF GROUNDWATER RESERVES IN THE SANTA CRUZ VALLEY AREA, PIMA AND SANTA CRUZ COUNTIES, ARIZONA,
Arizona Univ., Tucson. Dept. of Geosciences.
For primary bibliographic entry see Field 4B.
W78-04819

A MODIFIED OPTIMIZATION METHOD OF ESTIMATING AQUIFER PARAMETERS,
United Nations Centre for Natural Resources, Energy, and Transport, New York. Dept. of Economic and Social Affairs.
A. Navarro.
Water Resources Research, Vol. 13, No. 6, p 935-939, December 1977. 3 tab, 15 ref.

Descriptors: *Optimization, *Mathematical models, *Aquifer characteristics, *Hydraulic properties, Estimating, Transmissivity, Storage coefficient, Equations, Computer models, *Inverse problem.

A modified optimization methof for estimating transmissivity and storativity parameters was utilized for he fast calibration of mathematical models of transient aquifers. The method provides 'usable solutions' at an intermediary point between the minimization of residuals in the water budget equations and the similitude of solutions to field estimations of parameters T and S. Four field examples of the use of the method were given and discussed in terms of relative accuracy of results. (Visocky-ISWS)
W78-04826

GROUND-WATER RESOURCES OF POSEY COUNTY, INDIANA,
Geological Survey, Mineola, NY. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04862

GROUND-WATER RESOURCES OF CHESTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04869

HYDROLOGIC EVALUATION OF THE ARIKAREE FORMATION NEAR LUSK, NIOBRARA AND GOSHEN COUNTIES, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04873

SURFACE CHEMICAL PROCESSES IN GROUND-WATER SYSTEMS,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. D. Hem.
In: Proceedings of the Second International Symposium on Water-Rock Interaction, Strasbourg, France, August 17-25, 1977, p IV 76 - IV 85, 1977. 3 fig, 16 ref.

Descriptors: *Water chemistry, *Groundwater, *Chemical reactions, *Interfaces, *Sorption, Chemical precipitation, Ion exchange, Catalysts, Oxidation, Reduction(Chemical), Soils, Subsoil, Earth-water interfaces, Seepage, Groundwater movement.

Surface areas exposed per unit of volume of ground water stored in an aquifer can range from less than a square meter per liter up to 2000 sq m/liter or more. A liter of water may contact as much as 10,000 sq m/m of distance traveled. Dissolution and precipitation processes will be promoted by high surface to volume ratios but attainment of solubility equilibrium may still be slow enough to permit existence of broad transition unsaturated zones near recharge sources. Fast processes such as ion exchange sorption, however, tend to be completed in very narrow transition zones. Redox processes at iron and manganese surfaces may control concentrations of other metals. Quantitative models are given for reduction of copper at ferric oxyhydroxide surfaces and oxidation and coprecipitation of cobalt with manganese oxide. Disproportionation of mixed valence manganese oxide can be a highly effective oxidation mechanism. (Woodard-USGS)
W78-04877

WATER-LEVEL DECLINES, LAND SUBSIDENCE AND EARTH FISSURES IN SOUTH-CENTRAL ARIZONA,
Geological Survey, Phoenix, AR. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04878

GROUNDWATER FLOW IN WEATHERED GRANITE IN THE TAMNE BASIN, NORTH EAST GHANA,
Council for Scientific and Industrial Research, Accra (Ghana).
For primary bibliographic entry see Field 4B.
W78-04923

GEOPHYSICAL INVESTIGATIONS OF GROUNDWATER RESOURCES IN THE KALAHARI BASIN,
Council for Scientific and Industrial Research, Pretoria (South Africa), National Physical Research Lab.
For primary bibliographic entry see Field 4B.
W78-04931

GEOTHERMAL ENERGY IN THE PACIFIC REGION,
Colorado School of Mines, Golden.
For primary bibliographic entry see Field 4B.
W78-04942

DETERMINATION OF TRANSPORT MODEL PARAMETERS IN GROUNDWATER AQUIFERS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soil and Water Engineering.
For primary bibliographic entry see Field 5B.
W78-05043

GROUNDWATER AND NEARSHORE HYPOSALINE CONDITIONS AT FANNING ISLAND DURING A PERIOD OF HIGHER THAN NORMAL RAINFALL,
Hawaii Univ., Honolulu. Dept. of Zoology.
E. B. Guinther.
Pac Sci. 28(3), p 319-338, 1974.

Descriptors: *Groundwater, *Hyposaline conditions, Pacific Ocean islands, Estuaries, *Aquifers, *Fanning Island, Nearshore processes, Coral reefs, *Rainfall, Saline water.

Exceptionally high rainfall levels accompanying instability of the Intertropical Convergence Zone in 1972 greatly expanded the freshwater realm of Fanning Island (Line Island, Central Pacific Ocean). Changes in the head of the groundwater body (a Ghyben-Herzberg aquifer), as measured at frequent intervals in 11 wells, revealed variations in sediment permeabilities but proved an unsuccessful technique for determining amounts of freshwater discharge into inlets along the shore. The aquifer stores freshwater and maintains reduced salinities in the inlets along after an initial salinity depression during the period of precipitation. The spatial and temporal distribution of salinities in the inlets of the atoll closely resembled those of an estuary. However, the factors contributing to salinity fluctuations in each inlet are sufficiently complex and show both regular and irregular patterns of temporal variation, so that the inlets constitute highly unpredictable environments. The biological implications of this unpredictability are deemed interesting because of the close proximity to the predictable and stable environments of the tropical, shallow water lagoon (coral) reefs.--Copyright 1975, Biological Abstracts, Inc.
W78-05110

REGIONAL GEOLOGY SERIES: PART 2, HIGH PLAINS GROUND WATER REGION,
National Water Well Association, Worthington, OH.
J. A. Hunt.
Water Well Journal, Vol 32, No 3, p 83-84, March, 1978. 1 fig.

Descriptors: *Groundwater, *Aquifers, *High plains, *Ogallala aquifer, Texas, Kansas, Oklahoma, Nebraska, Rotary drilling, Water wells, Water supply, Alluvium, Overdraft.

The High Plains ground water region is a narrow discontinuous belt that stretches from southern South Dakota to southwestern Texas. The ground water supply occurs primarily in the Ogallala formation, the huge alluvial apron formed at the foot of the Rocky Mountains which was subsequently uplifted. This deposit covers an eroded surface to a thickness that exceeds 500 feet in some places. Ground water storage is estimated at two billion acre-feet. Except for some areas in Nebraska, recharge rates are generally thought to be less than 1% of rainfall. Because ground water pumpage throughout the High Plains exceeds 8,000,000 gallons per day (9,000,000 acre-feet annually), increased utilization of water management techniques will be necessary to avoid severe shortages in the area. Typical wells in the High Plains are of gravel pack construction, drilled by straight or reverse rotary methods using either clear water or small amounts of mud. The sands encountered during drilling are easily penetrated, while clays in the formation help maintain hole stability. Boulders and 'slip clay' occasionally pose drilling problems. (Eberle-NWWA)
W78-05199

2G. Water In Soils

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER: PART I. SOIL-WATER QUALITY AND VEGETATIVE RESPONSES,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-04704

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER: PART II, SOIL PHYSICAL AND CHEMICAL CHANGES,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-04705

COMPUTATION OF INFILTRATION FOR UNSTEADY UNINTERRUPTED HIGH RAINFALL,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 2B.
W78-04715

SOIL HYDRAULIC PROPERTIES DETERMINED BY INFILTRATION EXPERIMENTS AND SIMULATION,
Wyoming Univ., Laramie. Water Resources Research Inst.
W. J. Anderson, and W. G. Hedstrom.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 315, Price codes: A05 in paper copy, A01 in microfiche. Wyoming Water Resources Series No. 70, November, 1977. 73 p, 24 fig, 32 ref, 3 append. OWRT A-007-WYO(1), 14-31-0001-3551, 3851.

Descriptors: *Infiltration, *Infiltration rate, *Simulation analysis, Irrigation efficiency, *Soil physical properties, Methodology, *Computer programs, *Richards equation.

The objective was to develop and test a method for determining the water content - matric potential relationship and the hydraulic conductivity - matric potential relationship for infiltration into soil. A computer program developed to solve the Richards equation used these relationships to simulate infiltration into soil under various conditions. Evaluation of the proposed method consisted of conducting several infiltration experiments using soil columns from which infiltration rate-time data, the initial and final water contents, and an estimate of the hydraulic conductivity at the final water content were obtained. Simulation of the infiltration tests was performed by the computer using various parameters including the bubbling matric potential , pore size distribution index, transition values on the theta (h) curve, and the hydraulic conductivity at the final water content in the previously mentioned relationship. The parameters were varied until the simulated and observed infiltration rate-time relationships agreed closely. Experimental tests were also run to determine the agreement of these parameters to those resulting from the simulation. Results showed that the proposed method can be used to determine the above relationships by numerical simulation of infiltration.
W78-04812

EFFECT OF SPRAY IRRIGATION OF MUNICIPAL WASTEWATER ON SOIL INVERTEBRATE POPULATIONS AND THE POTENTIAL INFLUENCE ON PHYSICAL FACTORS OF SOIL,
State Univ. of New York Coll. of Environmental Science and Forestry. Dept. of Environmental and Forestry Biology.
For primary bibliographic entry see Field 5C.
W78-04818

RADIOECOLOGY,
For primary bibliographic entry see Field 5C.
W78-04820

DETERMINATION OF WATER IN SURFACE SOILS BY ACOUSTIC METHODS,
South Dakota State Univ., Brookings. Dept. of Electrical Engineering.
R. A. Higgins.
Available from the National Technical Information Service, Springfield, VA 22161, As price codes: A03 in paper copy, A01 in microfiche. South Dakota Water Resources Institute, Brookings, Partial Completion Report, August 1975. 45 p, 18 fig, 2 tab, 31 ref. OWRT B-027 SDAK(1).

Descriptors: Soil Water, *Acoustic methods, *Soil moisture meters, *Measurement, *Loan, Instrumentation, Correlation analysis.

The objective was to develop an acoustic method for soil moisture determination. Three phases of this research were: (1) Development of system to send and receive elastic waves through soils. (2) Development of an experiment to obtain accurate indications of acoustic transmission parameters. (3) Development of analysis and interpretive methods to obtain soil mositure information from acoustic measurements. The third phase, if successful, leads to a formulation of principles for the design of an acoustic soil mositure monitoring device. For a silt loam soil, a series of acoustic measurements from 0 to 14 KHz was taken for eleven moisture conditions from 0 to 0.912 of saturation. Simultaneously, gamma-ray density scanning of the sample provided independent measurement of the soil moisture profile. In the frequency range from 3600 to 6975 Hz these correlations indicated that acoustic transmission was an increasing function of soil moisture. Multiple regression analysis give two possible relationships. In the frequency range from 900 to 1595 Hz, the analysis yielded negative correlation indicating a tendency for acoustic loss to increase with soil moisture. Additional results in the frequency range 450 to 675 Hz gave positive correlations to soil moisture with different minimum regression lines. Further measurement and analyses would provide more extensive information applicable in formulating design principles for an acoustic soil moisture monitor and the development of a soil moisture instrument suited to a variety of soil types.
W78-04821

EXPERIMENTAL EVALUATION OF THEORETICAL SOLUTIONS FOR SUBSURFACE DRAINAGE AND IRRIGATION,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
Y. K. Tang, and R. W. Skaggs.
Water Resources Research, Vol. 13, No. 6, p 957-965, December 1977. 12 fig, 3 tab, 23 ref.

Descriptors: *Drainage, *Subsurface irrigation, *Laboratory tests, *Model studies, Mathematical models, Soil properties, Soils, Water table, Hydraulic conductivity, Porosity, Equations, Irrigation, Soil water, Soil water movement, Unsaturated flow, Saturated flow, Agriculture watersheds.

The Richards equation for two-dimensional saturated-unsaturated water movement was solved for drainage and subirrigation boundary conditions by using finite difference methods. The solutions were compared to results of experiments conducted for various initial and boundary conditions in a arge laboratory soil tank. The soil water characteristic and hydraulic conductivity function were measured by conventional methods and used as inputs in the numerical solution to the Richards equation. Although predicted water table drawdown was somewhat slower than was observed, agreement between the numerical solutions and experimental observations was good. Approximate methods also were used to characterize drainage and subirrigation and were found to be in good agreement with solutions to the more exact Richards equation and with experimental results when a variable drainable porosity is considered. In view of significant field varibility of soil properties and the difficulty of measuring those properties required by the Richards equation, it appears that simpler, approximate methods will continue to be more useful than the exact approach for predicting water table movement under drainage and subirrigation conditions. (Simms-ISWS)
W78-04828

INFLUENCE OF THE HYSTERESIS EFFECT ON TRANSIENT FLOWS IN SATURATED-UNSATURATED POROUS MEDIA,
Toulouse-3 Univ. (France). Inst. de Mecanique des Fluides.
N. T. Hoa, R. Gaudu, and C. Thirriot.
Water Resources Research, Vol. 13, No. 6, p 992-996, December 1977. 5 fig, 7 ref.

Descriptors: *Hysteresis, *Porous media, *Unsteady flow, *Model studies, Mathematical models, Laboratory tests, Soils, Soil properties, Physical properties, Hydraulic conductivity, Saturated flow, Unsaturated flow, Soil water movement, Analytical techniques, Soil physics, Soil science.

One-and two-dimensional transient flows where the hysteresis of the relationship of suction-water content clearly appears were studied experimentally and numerically. In the numerical simulation of these flows, by using a finite element method, the hysteresis effect was taken into account by considering both its primary and secondary scanning curves; when the seepage surface occurred, it too was taken into account. The comparison with experimental results showed that in the concerned problems a numerical simulation in which this hysteresis effect is ignored may involve important errors. (Sims-ISWS)
W78-04833

PARAMETER ESTIMATION OF THE GREEN AND AMPT INFILTRATION EQUATION,
Agricultural Research Service, Boise, ID. Northwest Watershed Research Center.
D. L. Brakensiek, and C. A. Onstad.
Water Resources Research, Vol 13, No 6, p 1009-1012, December 1977. 2 fig, 3 tab, 10 ref.

Descriptors: *Infiltration, *Runoff, *Model studies, Mathematical models, Equations, Hydraulic conductivity, Porosity, Capillary conductivity, Soil water, Soil water movement, Hydrographs, Overland flow, Watersheds(Basins).

Infiltrometer data were utilized to test a fitting procedure for the Green and Ampt infiltration equation parameters. The spatial variation of the estimated parameters was averaged to give lumped parameter values for watershed modeling. An appropriate scale for parameter averaging was discussed, which transforms parameter values to normal deviates. A sensitivity analysis for the equation parameters was performed for both infiltration estimates and runoff hydrograph volume and peak rates. The capillary pressure parameter shows least sensitivity; however, variation in the fillable porosity and effective conductivity parameters has a major influence on infiltration and runoff amounts and rates. (Sims-ISWS)
W78-04836

RAINFALL PARAMETERS FOR SOIL LOSS ESTIMATION IN A SUBTROPICAL CLIMATE,
Rhodesia Dept. of Conservation and Extension, Salisbury.
H. A. Elwell, and M. A. Stocking.
J Agric Eng Res. 18(3), p 169-177, 1973.

Descriptors: *Africa, *Climates, *Rainfall, *Soil loss, Subtropical climates, *Soil erosion.

Underlying relationships between subtropical rainfall variables and soil losses from agricultural lands in central Africa are studied. Long-term average annual soil losses can be predicted from specific field conditions, provided only that a sufficiently long period of autographic rainaguage recordings are available. The extent to which the physical conditions on the earth's surface influence the type of parameters most closely related to soil losses is discussed. Parameters are categorized according to their practical and theoretical applications. The practical significance of the results is discussed.--Copyright 1974, Biological Abstracts, Inc.
W78-04894

ARID ZONE IRRIGATION, ECOLOGICAL STUDIES: ANALYSIS AND SYNTHESIS, VOL. 5,
For primary bibliographic entry see Field 3F.
W78-04926

WATER QUALITY AND SOIL PROPERTIES: WATER QUALITY AND ITS EFFECT ON THE PROPERTIES OF LIGHT TEXTURED SOILS,
Rajasthan Coll. of Agriculture, Jaipur (India). Dept. of Soil Science and Agricultural Chemistry.
P. Lal, and F. Lal.
Annals of Arid Zone, Vol 16, No 2, p 213-220, June 1977. 3 tab, 15 ref.

Descriptors: *Water analysis, *Irrigation water, *Irrigation effects, Chemical analysis, Irrigation, *Soil analysis, Boron, Salts, Salinity, Soil chemical properties, Sodium, Soil profiles, Soil management, Soil improvement, Soil texture, Permeability, Hydrologic properties, Soil tests, Saturation, Water quality, India(Rajasthan).

Forty-seven water samples and an equal number of corresponding soil samples from the semi-arid region of Rajasthan were analyzed for different constituents. Results showed the majority of water samples belonged to high salinity and sodium categories. The potential salinity and residual sodium carbonate were also high and significant positive correlation coefficients were found between both EC and potential salinity of irrigation water and EC of saturation extract of the irrigated soils. Similarly, significant positive correlations were obtained between SAR and residual sodium carbonate of the water and ESP of the irrigated soils as well as between boron contents of the water and water soluble boron in the soils. The hydraulic conductivity of irrigated soils was negatively correlated with the permeability index of water. In general, the EC of saturation extract and water soluble boron in irrigted soils were 63.6% and 60% of the EC and boron content of water respectively. The need for suitable standards for judging water suitability for light textured soils is emphasized. (Payton-Arizona)
W78-04930

SOIL MOISTURE SENSING WITH AIRCRAFT OBSERVATIONS OF THE DIURNAL RANGE OF SURFACE TEMPERATURE,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
T. Schmugge, B. Blanchard, A. Anderson, and J. Wang.
Water Resources Bulletin, Vol. 14, No. 1, p 169-178, February 1978. 7 fig, 1 tab, 7 ref.

Descriptors: *Remote sensing, *Soil moisture, *Soil temperature, *Arizona, Aircraft, Soil surfaces, Temperature, Diurnal, Data processing, Correlation analysis, Vegetation, Crops, Irrigation, Agriculture, Soil moisture sensing, Crop status, *Phoenix(Ariz).

Aircraft observations of the surface temperature were made by measurements of the thermal emission in the 8-14 micrometer band over agricultural fields around Phoenix, Arizona. The diurnal range of these surface temperature measurements was well correlated with the ground measurement of soil moisture in the 0-2 cm layer. The surface temperature observations for vegetated fields were found to be within 1 or 2C of the ambient air temperature, indicating no moisture stress. These results indicated that for clear atmospheric conditions remotely sensed, surface temperatures can be a reliable indicator of soil moisture conditions and crop status. (Sims-ISWS)
W78-05027

FINE PARTICULATE EMISSIONS DUE TO WIND EROSION,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 2J.
W78-05032

TRANSIENT DRAINAGE EQUATIONS FOR NON-HOMOGENEOUS SOILS,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
S. T. Chu.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 6, p 1085-1088, November-December 1977. 3 fig, 3 tab, 9 ref.

Descriptors: *Drainage, *Soils, *Unsteady flow, *South Dakota, Water table, Theoretical analysis, Model studies, Mathematical models, Analytical techniques, On-site tests, Water levels, Hydraulic conductivity, Equations, Soil physical properties, Non-homogeneous soils, Drain spacing.

One of the limitations inherent in the derivation of many transient dranage equations is the assumption of a homogeneous soil. Graphical representation of transient drainage equation for non-homogeneous soil was obtained by a scheme devised by Bouwer. He devised a scheme where the soil profile is split up into a number layers. Within each layer, the soil parameters were considered as constants. He combined the solutions for each layer and obtained the solution of the Green and Ampt infiltration equation for non-homogeneous soils. The application of the theoretical solution to predict the fall of a water table was illustrated. An evaluation of the theory by field measurements was presented. Good agreement between the the theoretical and field measured water table height was found. (See also W70-02447) (Humphreys-ISWS)
W78-05033

LIME TREATMENT OF DAMS CONSTRUCTED WITH DISPERSIVE CLAY SOILS,
Soil Conservation Service, Grenada, MS.
For primary bibliographic entry see Field 8D.
W78-05035

PHYSICAL AND CHEMICAL PARAMETERS AFFECTING TRANSPORT OF 137CS IN ARID WATERSHEDS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 5A.
W78-05042

SOIL SALINITY- FOUR-ELECTRODE CONDUCTIVITY RELATIONSHIPS FOR SOILS OF THE NORTHERN GREAT PLAINS,
Agricultural Research Service, Sidney, MT.
A. D. Halvorson, J. D. Rhoades, and C. A. Reule.
Soil Science Society of America Journal, Vol. 41, No. 5, p 966-971, September-October 1977. 4 fig, 5 tab, 12 ref.

Descriptors: *Saline soils, *Soil texture, *Electrodes, *Electrical conductance, *Great Plains, *Montana, *North Dakota, Calibrations, Instrumentation, Conductivity, Measurement, Correlation analysis, Regression analysis, Soil water, Seepage, Sampling, *Saturation extract electrical conductivity, *Bulk soil electrical conductivity, Four-electrode technique, Parent material, Dryland salinity, Soil sample.

Influence of soil texture, soil geographic location, and parent material and calibration method on the linear EC sub e-EC sub a relationship was investigated. Linear regression relationships between saturation extract electrical conductivity (EC sub e), and bulk soil electrical conductivity (EC sub a) as measured by the four-electrode technique were developed for northern Great Plains soils. Most correlation coefficients (r) exceeded 0.95, and all were significant at the 0.01 probability level. Geographic location had little effect on the EC sub e vs EC sub a relationship; therefore, an EC sub e vs EC sub a calibration made for a soil textural class at one location will apply to another location having a similar range in soil water, clay content, and salinity. Clay content affected linear regression line slopes more than did other factors investigated. Regression slopes varied from 3.06 for a clay to 12.99 for a loamy sand over the clay concentration range of 63.0 to 6.5%, respectively. To minimize adverse effects caused by natural variation in soil texture, water content, and salinity when making field EC sub e vs EC sub a calibrations, artificial salinization of columns of the soil type in question, which will permit subsequent analysis of the soil by either the cell or EC-probe calibration method, was suggested. (Visocky-ISWS)
W78-05046

RESUSPENSION OF PLUTONIUM FROM CONTAMINATED LAND SURFACES: METEOROLOGICAL FACTORS,
Environmental Monitoring and Support Lab., Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5B.
W78-05056

NOTE ON THE PARLANGE METHOD FOR THE NUMERICAL SOLUTION OF HORIZONTAL INFILTRATION OF WATER INTO SOIL,
National Council for Scientific Research, Lusaka (Zambia).
J. Cisler.
Soil Sci. 117(1), p 70-73, 1974.

Descriptors: *Diffusivity, *Infiltration(Horizontal), Numerical studies, *Parlange methods, Soils, Water.

Parlange's approximate analytical solution for the horizontal infiltration of water into soil is numerically tested for the case of 2-step diffusivity function and also for the Yolo Light Clay diffusivity of Philip (1957). Parlange's 2nd approximation for the Boltzman variable =x.t to the -1/2 power (where x is the horizontal coordinate; t is time) as a function of moisture content gives in both cases too high values, as compared to the analytical solution for 2-step diffusivity, or Philip's solution for the soil-water case. The error decreases as the diffusivity function approaches more closely to the delta-function type of diffusivity. The improved 2nd approximation of Parlange is, however, very precise, even for the diffusivities, which are not of delta-function type. The increase of labor of this improved approximation is very small. A recurrence formula for the successive O's is also examined, but it is found, however, that this formula does not give convergent values and the computational effort is larger than the improved 2nd approximation.--Copyright 1974, Biological Abstracts, Inc.
W78-05098

IMPACT OF WATER LEVEL CHANGES ON WOODY RIPARIAN AND WETLAND COMMUNITIES. VOLUME I: PLANT AND SOIL RESPONSES TO FLOODING,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 6G.
W78-05101

PERSISTENCE OF AZINPHOSMETHYL IN SOIL,
Environmental Protection Agency, Wenatchee, WA. Field Studies Section.
For primary bibliographic entry see Field 5B.
W78-05121

PROBLEMS INVOLVED IN MEASURING THE SOIL THERMAL CONDUCTIVITY AND DIFFUSIVITY IN A MOIST SOIL,
Agricultural Research Organization, Bet-Dagan (Israel). Div. of Soil Physics.
A. Hadas.
Agric Meteorol. 13(1), p 105-113, 1974.

Descriptors: *Diffusivity, Planar probes, *Soil thermal conductivity, Measurement, *Soil moisture, Moisture content.

The methods of cylindrical or planar probes for determining the thermal conductivity and diffusivity of soils involve problems of probe-soil contact impedance of unknown magnitudes which impairs accuracy. Probe-soil contact impedance was determined experimentally for planar probe in a moist soil and used to evaluate the expected accuracy of determining the soil thermal properties in situ. Planar or cylindrical probes should be used in moist soils, provided low thermal outputs of short duration are applied.--Copyright 1975, Biological Abstracts, Inc.
W78-05122

FIELD MEASUREMENT OF HYDRAULIC CONDUCTIVITY OF LAKELAND FINE SAND,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
L. Wang, and A. R. Overman.
Soil Crop Sci Soc Fla Proc. 33, p 154-157, 1974.

Descriptors: Fine sands, *Florida, Flow, *Hydraulic conductivity, Lakeland, Measurement, Neutron scattering, *Sands, Soil, Tensiometer, Water level recording, *Infiltration, Drainage, *Soil profiles.

Infiltration and drainage experiments were conducted in a basin located at Southwest Sewage Treatment Plant, Tallahassee, Florida from Sept.-Dec. 1972. Field hydraulic data were collected with neutron scattering, tensiometer and water level recorder procedures. A soil water pressure characteristic curve previously derived from a Tempe cell was used to convert pressure head values to water content. A computer program based on the instantaneous profile method was used to determine field hydraulic conductivity by analyzing various hydraulic data. The instantaneous profile method gives reasonable results when the profiles are known. It works well for field data. The results show the variation of hydraulic conductivity within the soil profile.--Copyright 1975, Biologica Abstracts, Inc.
W78-05127

TRANSFORMATION OF S35-LABELLED SULPHATE IN AEROBIC AND FLOODED SOIL CONDITIONS,
Indian Agricultural Research Inst., New Delhi. Nuclear Research Lab.
M. S. Sachdev, and P. Chhabra.
Plant Soil. 41(2), p 335-341, 1974.

Descriptors: Flooding, *Aerobic conditions, Amino acids, *Flooded soils, Humus, Hydrogen, Organic matter, Soil, *Sulfates, Sulfide, Sulfur, *Sulfur-35.

After 4 mo. of incubation 68.1% of the added sulfate was present in the aerobic condition, and only 12.7% in flooded conditions. The main transformation was into organic forms, 28.1 and 37.8% in aerobic and flooded soil conditions respectively. In aerobic condition 99% of the added sulfate S could be accounted for in different fractions determined viz sulfate, organic, humus, amino acid and evolved hydrogen sulfide-sulphur. In flooded condition only 56% was present in all these fractions, which indicates that remaining 44% is in chemical forms between SO4 to the -2 power and S to the -2 power.--Copyright 1975, Biological Abstracts, Inc.
W78-05152

DISTRIBUTION OF PURPLE PHOTOSYNTHETIC BACTERIA IN WETLAND AND WOODLAND HABITATS OF CENTRAL AND NORTHERN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-05168

2H. Lakes

EFFECTS OF DESTRATIFICATION ON DEPTH DISTRIBUTION OF FISH,
Oklahoma Cooperative Fishery Research Unit., Stillwater.
For primary bibliographic entry see Field 5C.
W78-04713

DISTRIBUTION AND ABUNDANCE OF BENTHIC ALGAE ALONG PHOSPHATE GRADIENTS IN KOOTENAY LAKES, BRITISH COLUMBIA,
For primary bibliographic entry see Field 5B.
W78-04737

PHYTOPLANKTON IN LAKE HJALMAREN,
Uppsala Univ. (Sweden). Inst. of Ecological Botany.
For primary bibliographic entry see Field 5C.
W78-04739

ORTHOPHOSPHATE CONCENTRATION AND FLUX WITHIN THE EPILIMNIA OF TWO CANADIAN SHIELD LAKES,
For primary bibliographic entry see Field 5C.
W78-04740

THE SALINE LAKES OF SASKATCHEWAN,
U. T. Hammer, R. C. Haynes, J. M. Heseltine, and S. M. Swanson.

Verh. Internat. Verein. Limnol, Vol 19, p 589-598, October 1975. 3 fig, 2 tab, 36 ref. NRC A1412.

Descriptors: *Saskatchewan(Canada), *Saline Lakes, *Aquatic life, *Ecosystems, *Canada, Salinity, Lakes, Phytoplankton, Primary productivity, Zooplankton, Benthic fauna, Fish, Aquatic plants.

Literature on some 40 saline lakes in Saskatchewan, Canada was examined, and comparative data on physical and chemical characteristics, phytoplankton primary production, vascular hydrophytes, zooplankton, benthic fauna, and fish are presented. Lakes above 3% salinity are concentrated in the prairies, but also occur in the aspen-grove region and rarely in the forest zone. Salinity varies from 3-370 g/l, size from a few hectares to 420 sq km, depth from 1-20 m, Secchi disk transparency from 10-cm-10 m, and pH from 8.0-9.8 (alkaline) during the open water season. The lakes are predominantly magnesium-sodium sulfate lakes. Phytoplankton productivity measured in seven lakes varied from 0.053 g C/sq m/day to 7.968 g C/sq m/day. Only Humboldt and Manito lakes had high productivity; for the others, mean productivity was less than 0.250 g C/sq m/day. Studies have shown that species diversity of vascular hydrophytes in saline lakes is inversely related to salinity. The zooplankter Artemia salina occurs in the most saline waters, while cladocerans are abundant in all lakes up to 53% salinity. Copepods are extremely numerous in some lakes. Rotifers occur in waters of all salinities. Benthic fauna are not found in lakes over 55-121 g/l salinities, but Coleoptera and Diptera occur over the widest salinity range, with the greatest number of species. Bivalvia, Hirudinea, Ephemeroptera, and Trichoptera are generally confined to waters of low salinity; fish do not do well in saline waters. (Lynch-Wisconsin)
W78-04741

SEASONAL VARIATION OF THE CLADOCERA POPULATION AT A COASTAL STATION AT LAKE MANTOVA, (IN ITALIAN),
Bologna Univ. (Italy). Ist. diZoologia.
M. G. Corni, and E. Stranieri.
Boll Pesca Piscic Idrobiol 30(1), p 103-110, 1975.

Descriptors: *Crustaceans, Lakes, A croperus-harpae, Alona-affinis, Alona-guttata, Alona-rectangula, Alonella-rostrata, Camptocercus-rectirostris, Ceratophyllum-demersum, Chydorus-sphaericus-var-coelatus, Chydorus-sphaericus-var-leonardi, Eurycercus-lamellatus, Graptoleberis-testudinaria, Leydigia-leydigi, Peracantha-truncata, Pleuroxus-duncus, *Seasonal, Side-crystallina, Simocephalus-vetulus, Vallisneria-spiralis, Vegetation, *Lake Mantova(Italy).

Populations of coastal cladocera were collected among vegetation in a fixed station on the upper section of Mantova Lake (Italy) named Punta Angeli. Fifteen species (Acroperus Harpae, Alona guttata, A. rectangula, A. affinis, Leydigia leydigi, Graptoleberis testudinaria, Peracnta truncata, Pleuroxus aduncus, Chydorus sphaericus var. coelatus, C. sphaericus var. leonardi, Eurycercus lamellatus, Alonella rostrata, Camptocercus rectirostris, Sida crystallina, Simocephalus vetulus/were classified, among which C. spaericus, P. aduncus and A harpae are particularly abundant. In Nov. 1972 females of P. females of P. aduncus with resting eggs were observed. Almost all the species decrease in Aug. in relation to the decay of Ceratophyllum demersum and Vallisneria spiralis.--Copyright 1977, Biological Abstracts, Inc.
W78-04742

PRIMARY PRODUCTIVITY AND PHYTOPLANKTON OF LAKES ON THE EASTERN CANADIAN SHIELD,
For primary bibliographic entry see Field 5C.
W78-04743

PHYTOPLANKTON IN SEVEN MONOMICTIC LAKES NEAR ROTORUA, NEW ZEALAND,
For primary bibliographic entry see Field 5C.
W78-04749

STUDIES ON THE LORICA STRUCTURE IN CHRYSOPHYCEAE,
Copenhagen Univ. (Denmark). Inst. of Plant Anatomy and Cytology.
For primary bibliographic entry see Field 5C.
W78-04750

THE FINE STRUCTURE OF SOME PELAGIC FRESH WATER DIATOM SPECIES UNDER THE SCANNING ELECTRON MICROSCOPE. I,
Uppsala Univ. (Sweden). Dept. of Quaternary Geology.
M.-B. Florin.
Svensk Botanisk Tidskrift, Vol. 64, No. 1, p 51-64, 1970. 40 fig, 1 tab, 28 ref.

Descriptors: *Diatoms, *Plant morphology, *Melosira granulata, *Lakes, *Cell walls, Australia, New Zealand, Sweden, Lake Okareka(New Zealand), Lake Taupo(New Zealand), Lake Erken(Sweden), Prospect Dam(N.S.W. Australia), Chrysophyta, Electron microscopy, Bacillariophyceae, Silica, Lakes, Pelagic.

The structure of the silicious part of cell walls of the pelagic freshwater diatom genus Melosira was examined, using specimens from four lakes, with diatom asemblages dominated by species of the diatom. The lakes were: Lakes Okareka (March 1968) and Taupo (June 1956) on the North Island, New Zealand; Prospect Dam, New South Wales, Australia (1964), and Lake Erken, Uppland Province, Sweden (October 1961). Through electron microscopy, two types of Melosira granulata were distinguished in Lake Okareka. Type 1 is similar to the typical Melosira granulata specimens dominant in Prospect Dam, but has a larger number of finer spines on the terminal cell halves. Type 2 has broader cells, and resembles M. granulata v. muzzanensis, but the latter is described as having a larger number of pores in the pore rows. Type 2 also is similar to M. agassizii. The dominant species in Lake Okareka is M. granulata, Type 1. Melospira sp., which dominates the diatom assemblages of Lake Taupo, is similar to the description of M. pyxis, but also somewhat resembles M. baikalensis. In Lake Erken, M. granulata is the dominant species; ten other taxa have also been found. Spines at the edge of the disc of M. granulata in Lake Erken are finer and more numerous than individuals at Prospect Dam. (Lynch-Wisconsin)
W78-04751

ROTORUA PHYTOPLANKTON RECONSIDERED (NORTH ISLAND OF NEW ZEALAND),
Vaxtbiologiska Institutionen, Uppsala (Sweden).
For primary bibliographic entry see Field 5C.
W78-04753

FACTORS AFFECTING TRACE ELEMENT DISPERSION IN LAKE SEDIMENTS IN THE YELLOWKNIFE AREA, N. W. T., CANADA,
For primary bibliographic entry see Field 5B.
W78-04758

FACTORS AFFECTING THE STRUCTURE OF LIMNETIC CRUSTACEAN ZOOPLANKTON COMMUNITIES IN CENTRAL ONTARIO LAKES,
For primary bibliographic entry see Field 5C.
W78-04759

PRELIMINARY STUDIES ON THE KINETICS OF UTILIZATION OF ACETATE BY BACTERIOPLANKTON IN MIKOLAJSKIE LAKE,
Warsaw Univ. (Poland). Dept. of Environmental Microbiology.
For primary bibliographic entry see Field 5C.
W78-04760

A HYPOTHESIS TO EXPLAIN THE SUCCESSION FROM CALANOIDS TO CLADOCERANS DURING EUTROPHICATION,
For primary bibliographic entry see Field 5C.
W78-04761

THE DISTRIBUTION OF IRON IN A CLOSED ECOSYSTEM,
For primary bibliographic entry see Field 5B.
W78-04762

NUTRIENT KINETICS AND THE NEW TYPOLOGY,
For primary bibliographic entry see Field 5C.
W78-04763

LAKE EUTROPHICATION AND THE LIMITING CO2 CONCEPT: A SIMULATION STUDY,
For primary bibliographic entry see Field 5C.
W78-04766

CHEMICO-TROPHIC ATTRIBUTES OF DETRITAL AGGREGATES IN A NEW MEXICO ALKALINE RESERVOIR,
For primary bibliographic entry see Field 5C.
W78-04767

PHOSPHORUS SUPPLY IN UNDISTURBED LAKES IN KEJIMKUJIK NATIONAL PARK, NOVA SCOTIA (CANADA),
For primary bibliographic entry see Field 5C.
W78-04768

FLUX OF NUTRIENTS BY DIFFUSION THROUGH THE LAKE SEDIMENT-HYPOLIMNION INTERFACE FOR 9 LAKES IN MAINE, U.S.A.,
For primary bibliographic entry see Field 5C.
W78-04770

PRIMARY PRODUCTION IN FOUR SMALL LAKES IN THE CANADIAN ROCKY MOUNTAINS,
For primary bibliographic entry see Field 5C.
W78-04771

HYDROBIOLOGICAL STATE OF THE NADARBAZEVI RESERVOIR DURING THE FIRST YEARS OF ITS FILLING WITH FRESHWATER, (IN GEORGIAN),
L. E. Kutubidze, V. G. Tkeshelashvili, Z. Kereselidze, N. N. Chikvaidze, and D. D. Kadzhaya.
Soobshch Akad Nauk Gruz SSR 85(1), p 109-112, 1977.

Descriptors: *Hydrobiology, Reservoirs, Alkalinity, Carbon dioxide, Carp, Chironomids, Fish foods, Homoiothermy, Mineralization, Oxygen, Phytoplankton, Transparency, Zoobenthos, *Nadarbazevi reservoir(USSR), Primary productivity.

The Nadarbazevi reservoir (USSR) is characterized by low transparency, homoiothermy, weak alkalinity and normal content of O2. During the summer an increase of CO2 is observed, as well as variable mineralization and low content of biogenic elements. Phytoplankton (184 spp.) was identified in the reservoir. Primary production is minimal. Zooplankton is largely represented by eu-

ryhaline forms, and zoobenthos by chironomids. Mirror carp is the main food fish.--Copyright 1978, Biological Abstracts, Inc.
W78-04773

COMPARATIVE INTERSTITIAL WATER AND SEDIMENT CHEMISTRY IN OLIGOTROPHIC AND MESOTROPHIC LAKES, MAINE, U.S.A.,
For primary bibliographic entry see Field 5C.
W78-04774

THE ABUNDANCE AND SIGNIFICANCE OF PHYTOFLAGELLATES AND NANNOPLANKTON IN THE ST. LAWRENCE GREAT LAKES, I. PHYTOFLAGELLATES,
For primary bibliographic entry see Field 5C.
W78-04775

A MALLOMONAS POPULATION,
Vaxtbiologiska Institutionen, Uppsala (Sweden).
For primary bibliographic entry see Field 5C.
W78-04776

ACTINOTAENIUM COSMARIUM AND STAURODESMUS IN THE PLANKTON OF ROTORUA LAKES,
Vaxbiologiska Institutionen, Uppsala (Sweden).
For primary bibliographic entry see Field 5C.
W78-04777

THE EDGE OF THE ARROWHEAD,
Minnesota Marine Advisory Service, Duluth. Office of Sea Grant.
R. Lydecker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 017, Price codes: A04 in paper copy, A01 in microfiche. April 1976. 60 p, 34 fig.

Descriptors: *Minnesota, *Coasts, *Lake Superior, Lakes, Great Lakes, Economics, Shores, Water pollution, Sewage disposal, Sewage treatment, Water level fluctuations, St. Louis River(MN), Oligotrophy.

The geographical setting, history, economy, problems, and future of the Minnesota Lake Superior coast are described. For most of its length, the coastline forms the south eastern border of the Canadian North Woods, a bnd of boreal forest spilling over into the United States. Seventeen major streams flowing southeastward drain the 2,700 sq mi North Shore into Lake Superior, and there are 600 lakes in the area. More than 80% of the 136,400 inhabitants live in Duluth, the largest of the five cities on the coast. Inadequate sewage disposal systems, especially in non-metropolitan areas, pose a serious threat to water quality. Advanced minicipal waste treatment plants are expected for Two Harbors, Beaver Bay, Silver Bay, and Grand Marais By 1977. Heavy metal and chemical contamination has been detected in Lake Superior, although potential pollutants are not easily absorbed into the lake's very soft water, which on the north sore has a clarity to 65-75 ft. The St. Louis River, a major source of pollution on the coast, receives industrial and municipal effluents; by 1977, however, the Western Lake Superior Sanitary District treatment facility will remove 95% of all pollutants in the river, and will use a unique solid waste incinerator to burn sludge resulting from sewage treatment. The most severe problem for the coast has been extremely high water levels, including flooding and erosion between 1972-75 from above-normal precipitation. (Lynch-Wisconsin)
W78-04784

THE CONTRIBUTION OF AGRICULTURE TO THE EUTROPHICATION OF SWISS WATERS, I. RESULTS OF DIRECT MEASUREMENTS IN THE DRAINAGE AREA OF VARIOUS CHANNELS,
For primary bibliographic entry see Field 5C.
W78-04786

LAKE GEOCHEMISTRY IN THE KAMINAK LAKE AREA, DISTRICT OF KEEWATIN, N.W.T.,
R. A. Klassen, I. Nichol, and W. W. Shilts.
Verhandlungen, Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Vol. 19, p 340-348, October 1975. 5 fig, 3 tab, 14 ref.

Descriptors: *Kaminak Lake(N.W.T., Canada), *Geochemistry, *Sediments, *Lakes, *Metals, Canada, Bedrock, Circulation, Sediment-water interfaces, Keewatin District(N.W.T. Canada), Permafrost, Trace elements, Canadian Shield, Dissolved oxygen, Conductivity, Dispersion.

Geochemical sampling of five large, temperate, dimictic lakes in the Kaminak Lake area, Keewatin District (N.W.T., Canada) showed characteristics that differed from lakes in western and southern parts of the Canadian Shield. These characteristics included: (1) greater depth and thoroughness of water circulation; (2) high summertime oxygenation of both water and sediments; (3) high conductivity (180-360 micro-mho/cm) reflecting high dissolved solids; (4) very low organic carbon levels in the sediment (<1-27%; generally <6%); and (5) iron and manganese precipitate bands at and below the sediment-water interface. Trace metal levels, controlled mainly by organic carbon content, did not obviously reflect mineralized sources in the -210 micrometer fraction. The research is part of a larger study of relationships among bedrock, overburden, sediment, and water composition to assess factors affecting metal dispersion in lake sediments. A basis was needed for evaluating the potential lake sediment geochemistry in reconnaissance exploration; massive copper-zinc and copper-nickel sulfide occurrences are thought to have economic potential. The area is underlain by continuous permafrost 15-200 cm beneath the surface. Mean monthly air temperatures range from +15 to -30C. Water pH was 6.9-7.6 at the surface and 5.9-7.4 at the bottom. Dissolved oxygen at the surface was at or near saturation (9-10 ppm); absolute levels increase with depth and decreasing temperatures. (Lynch-Wisconsin)
W78-04809

SUBSTANTIVE CORRECTIONS TO SIL COMMUNICATIONS (IVL MITTEILUNGEN) NUMBERS 6 AND 20,
Wisconsin Univ.-Milwaukee. Center for Great Lakes Studies.
C. H. Mortimer.
Verhandlungen, Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Vol. 19, p 60-72, October 1975. 5 fig, 1 tab, 17 ref.

Descriptors: *Lakes, *Hydrodynamics, *Rotation(Earth), *Air saturation, *Geostrophic effects, Oxygen, Model studies, Stratification, Coriolis force, Waves(Water), Currents(Water), Limnology.

Corrections are submitted to two earlier papers, IVL Mitteilungen Numbers 6 (1956) and 20 (1974). In No. 6, 'Oxygen content of air-saturated fresh waters,' a set of nomograms and a slide rule were devised to aid calculation of percentage saturation, corrected for atmospheric pressure at the lake surface, when in-situ temperature and oxygen content of a water sample are known. They were based on oxygen solubility determinations published by Truesdale, Downing, and Lowden (1955). Subsequent work proved that the TDL solubility estimates were too low (By 0.45% at 30 C, and 2.9% at zero C in pure water) due to errors in the Winkler titration technique used by TDL. In Mitt. 20, 'Lake hydrodynamics,' the influence of the earth's rotation on internal motions in stratified lakes as treated in terms of the simplest models- rectangular channels and basins of uniform depth with two homogeneous layers, the interface forming the model thermocline. Rotation effects were estimated by computing currents which would arise in the absence of rotation and then imposing a condition of geostrophic equilibrium under which gravity exactly counterbalanced the Coriolis force. However, the necessity of including a term to induce the transverse slope introduces a discrepancy. The author here presents a better model which, instead of concentrating on geostrophic effects on currents, focuses on geostrophic effects on waves. (Lynch-Wisconsin)
W78-04810

A MODELING APPROACH FOR PREDICTING NUTRIENT INFLUENCES ON LAKES AND THEIR WATERSHEDS,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 5C.
W78-04814

MEASUREMENTS OF THE SUMMER CURRENTS IN SAGINAW BAY, MICHIGAN,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
L. J. Danek, and J. H. Saylor.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 65-71, October 1977. 9 fig, 1 tab, 5 ref.

Descriptors: *Currents(Water), *Lake Huron, *Bays, *Michigan, Measurement, Current meters, Model studies, Mathematical models, Circulation, Water circulation, Lakes, Winds, Estuaries, Freshwater, Limnology, Path of pollutants, *Saginaw Bay(Mich), Drogues.

A combination of Lagrangian measurements and fixed current meter moorings was used during the summer of 1974 to determine the circulation patterns of Saginaw Bay. Because the bay is shallow, the water responds rapidly to wind changes. Distinct circulation patterns were determined for a southwest wind and a northeast wind. Speeds measured in the inner bay were of the order of 7 cm/s, whereas in the outer bay the speeds averaged closer to 11 cm/s. A typical water exchange rate between the inner and outer bay for winds parallel to the axis of the bay is 3700 cu m/s, but winds perpendicular to the axis of the bay cause little water to be exchanged. A comparison with the results of a numerical model for the bay indicated that there is good agreement between the data and the simulation of the circulation in the inner bay. However, the agreement is poor in the outer bay, where specification of proper boundary conditions at the open mouth of the bay is important for meaningful model simulations. (Sims-ISWS)
W78-04851

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. GREAT LAKES, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04855

HYDROLOGY OF LAKE PANASOFFKEE, SUMTER COUNTY, FLORIDA,
Geological Survey, Orlando, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04859

WATER POLLUTION STUDIES ON LAKE ILLAWARRA, I. SALINITY VARIATIONS AND ESTIMATION OF RESIDENCE TIME,
Wollongong Univ. (Australia). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-04882

WATER POLLUTION STUDIES ON LAKE ILLAWARRA, II. THERMAL BEHAVIOUR,
Wollongon Univ. (Australia). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-04883

WATER POLLUTION STUDIES ON LAKE ILLAWARRA, III. DISTRIBUTION OF HEAVY METALS IN SEDIMENTS,
Wollongong Univ. (Australia). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-04884

LIMNOLOGY OF SHALLOW WATERS, SYMPOSIA BIOLOGICA HUNGARICA, VOL. 15,
For primary bibliographic entry see Field 5C.
W78-04927

PRELIMINARY DATA ON THE DYNAMICS OF PHYTOPLANKTON DEVELOPMENT IN FISH-BREEDING PONDS OF THE ARARAT PLAIN, (IN RUSSIAN),
A. A. Arutyunyan.
Biol Zh Arm 28(7), p 98-101, 1975.

Descriptors: Algae, Ararat Plain(USSR), Biomass, Breeding, *Carp, Fish, Plankton, Ponds, *Trout, *Phytoplankton.

A study was made of the quantitative and qualitative composition of phytoplankton and the intensity of its development in carp and trout breeding ponds in March-Nov. 1971-1972 and March-Sept. 1973. During the vegetative period 32 genera of algae were found. The phytoplankton of the ponds in the fall was characterized by a decrease of biomass, but its qualitative composition remained unchanged.
W78-04946

SOLUTION, DIFFUSION AND SORPTION IN THE UPPER LAYER OF LAKE SEDIMENTS: V. THE DIFFERENTIATION OF THE PROFUNDAL SEDIMENTS OF AN OLIGOTROPHIC MOUNTAIN LAKE (FELDSEE, HOCHSCHWARZWALD) BY SEDIMENT WATER INTERACTION, (IN GERMAN),
Freiburg Univ. (West Germany). Limnologisches Inst.
For primary bibliographic entry see Field 5B.
W78-05015

ASSESSMENT OF FLOOD AND EROSION ASSISTANCE PROGRAMS, RONDEAU COASTAL ZONE EXPERIENCE, LAKE ERIE,
Waterloo Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 4A.
W78-05037

THE ROLE OF VEGETATION IN STABILIZING THE LOWER GREAT LAKES CANADIAN SHORELINE,
Acres Consulting Services Limited, Niagara Falls (Ontario). Environmental Dept.
For primary bibliographic entry see Field 4D.
W78-05038

NUTRIENTS AND PRODUCTIVITY AS INDICATIONS OF THERMAL EFFLUENT-UPWELLING INTERACTIONS IN LAKE MICHIGAN,
Argonne National Lab., IL.
For primary bibliographic entry see Field 5C.
W78-05039

PSEUDO-LAGRANGIAN DISPERSION ESTIMATES FROM CURRENT METERS,
Ontario Ministry of the Environment, Toronto. Water Resources Branch.
M. D. Palmer.
Journal of Great Lakes Research, Vol 3, No 1-2, p 106-112, October 1977. 7 fig, 3 tab, 20 ref.

Descriptors: *Dispersion, *Currents(Water), *Current meters, *Lake Ontario, Correlation analysis, Analytical techniques, Measurement, Lakes, Coasts, Circulation, Water circulation, Data processing, Limnology, Path of pollutants, Lagrangian processes, Pseudo-Langrangian correlation, Auto-correlation functions, Current-meter records.

A method for computing the Pseudo-Lagrangian auto-correlation function from three concurrent current meter records was discussed. The current meters were separated by approximately 400 m parallel-to-the-bottom contours, 2.4 m above the bottom where the water depth is 11.6 m. Integrating the Pseudo-Lagrangian auto-correlation function, the dispersion coefficients perpendicular to the bottom contours ranged from 3700 sq cm/sec at one hour to 100000 sq cm/sec at 10 hours and parallel to the bottom contours from 52000 sq cm/sec at one hour to 120000 sq cm/sec at 10 hours. Dispersion parallel to the bottom grows with time at a rate 1/3 of the growth rate perpendicular to the bottom contours. Integral space scales determined from the Pseudo-Lagrangian auto-correlation functions have a mean value of 185 and 150 m parallel and perpendicular to the depth contours respectively. The ratio of the Lagrangian and Eulerian scales was found to be between 1.6 and 1.0. (Sims-ISWS)
W78-05040

THERMAL WEDGING IN LAKE MACATAWA, MICHIGAN: LONG-TERM IMPACT OF CHANNELIZATION,
Rice Univ., Houston, TX. Dept. of Geology.
J. B. Anderson, and B. Broekstra.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 159-163, October 1977. 7 fig, 1 tab, 6 ref. NSF GY-11151.

Descriptors: Lakes, *Lake Michigan, *Water circulation, *Channeling, Coasts, Temperature, Water temperature, Turbidity, Sediments, Upwelling, Winds, Measurement, Surveys, Limnology, *Michigan, Water pollution sources, *Lake Macatawa(Mich), *Thermal wedging(Lakes), Coastal lakes.

Bottom wedging of cold Lake Michigan waters into Lake Macatawa, Michigan, through a connecting ship channel occurs frequently during summer months and results from upwelling in Lake Michigan. This thermal wedging causes sporadic flushing of sediment-laden waters into Lake Michigan, pronounced artificial stratification in Lake Macatawa which may lead to anoxic bottom conditions, and pronounced drops in bottom temperature. Since Lake Macatawa, like many other coastal lakes and rivers located along the Great Lakes, has been connected to Lake Michigan via an artificial ship channel, the process of thermal wedging is an unnatural one. Influences of thermal wedging upon the lake environment should be considered in evaluating the long-term effect of channel construction. (Sims-ISWS)
W78-05041

LAKE ERIE BEGINNING-OF-MONTH WATER LEVELS AND MONTHLY RATES OF CHANGE OF STORAGE,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 4A.
W78-05048

EXPERIENCE IN THE REPLACEMENT OF REED AND CATTAIL THICKETS WITH BROAD-LEAVED RICE IN SHALLOWS OF THE KREMENCHUG RESERVOIR, (IN RUSSIAN),
Ministry of Water Conservation Ukranian SSR, Cherkassy (USSR). Hydrogeological Expedition.
M. S. Tryasova.
Gidrobiol Zh 12(4), p 86-88, 1976.

Descriptors: *Rice(Broad-leaved), *Cattail, Fodder, *Kremenchug Reservoir(USSR), *Reed, Reservoirs, Shallows, Thickets, Ukranian-SSR, USSR.

To test the possibility of more effectively using the shallow waters of the Kremenchug Reservoir (Ukranian SSR, USSR) for raising livestock fodder plants, an attempt was made to replace reed and cattail thickets with Zizania latifolia. The rice was planted in the spring (rootstock cuttings) or summer (shoots) on tilled or untilled soil with or without cutting back of renewed reed and cattail shoots. As a result of cutting back, pure rice thickets with a height of up to 2.85 m and a stem density of up to 85/m2 were formed. The average yield of green mass in the 2nd vegetation period was 250-450 centners/ha.--Copyright 1977, Biological Abstracts, Inc.
W78-05063

MATHEMATICAL MODEL OF LAKE FISH COMMUNITY, (IN RUSSIAN),
Vologodskii Gosudarstvennyi Pedagogi-Cheskii Inst. (USSR).
L. A. Zhakov, and V. V. Menshutkin.
Vopr Ikhtiol. 14(3), p 387-395, 1974.

Descriptors: *Computer models, Fish food, Lakes, *Mathematical models, Russian-SFSR, USSR, Fish populations.

A mathematical model of a lake fish community was created and implemented on a digital computer. The model takes into account the food relationships of the fish populations and abiotic factors. The structure and dynamics of fish communities as a function of the food and hydrochemical characteristics of lakes of the Vologada district of the Russian SFSR (USSR) was investigated. The proposed model can be used for solving problems related to the exploitation of fishes of lakes or reservoirs.--Copyright 1975, Biological Abstracts, Inc.
W78-05064

STATISTICAL DISTRIBUTION OF THE RESULTS OF RIVER ZOOPLANKTON SAMPLINGS (IN RUSSIAN),
Gosudarstvennyi Nauchno-Issledovatelskii, Inst. Ozernogo i Rechnogo Rybnogo Khozyaistva, Saratov (USSR).
S. G. Kornilov, and V. P. V'Yushkova.
Zool Zh 55(4), p 600-601, 1976.

Descriptors: *Distribution, Plankton, Rivers, *Samplings, *Statistical methods, *Zooplankton, *Volgograd water reservoir(USSR).

The hypothesis of lognormal distribution of freshwater zooplankton densities was tested by the analysis of 1388 samples collected in the Volgograd Water Reservoir (Russian SFSR, USSR). Calculations carried out for samples collected every month (for several years) basically confirmed by hypothesis.--Copyright 1977, Biological Abstracts, Inc.
W78-05065

A 96-HOUR SEDIMENT BIOASSAY OF DULUTH AND SUPERIOR HARBOR BASINS (MINNESOTA) USING HEXAGENIA LIMBATA, ASELLUS COMMUNIS, DAPHNIA MAGNA, AND PIMEPHALES PROMELAS AS TEST ORGANISMS,
Heidelberg Coll., Tiffin, OH. River Studies Lab.

For primary bibliographic entry see Field 5A.
W78-05066

ALGOLOGIC STUDY OF THE PEAT BOGS OF TURNHOUT (ANTW.), (IN DUTCH),
Ghent Rijksuniversiteit (Belgium). Lab. voor Systematiek Morfologie.
A. Caljon.
Biol Jaarb 43, p 90-115, 1975.

Descriptors: *Algologic studies, Antwerp(Belgium), *Bogs, *Chlamydomonas, Desmids, Peat bogs, *Turnhout(Belgium), Schroevers formula.

Thirteen bogs in the neighborhood of Turnhout (Antwerp, Belgium) were studied. Qualitatively the algal population is dominated by desmids, with about 50 taxa; quantitatively the genus Glamydomonas is the most important. The biological value of the different waters was calculated using the adapted formula of Schroevers (1970).--Copyright 1977, Biological Abstracts, Inc.
W78-05067

STRUCTURE OF POPULATIONS OF THE DOMINATING BENTHIC ORGANISMS OF LAKE DUSYA: 2. CHIRONOMUS ANTHRACINUS ZETT. IN 1969-1972, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius Inst. Zoologii i Parazitologii.
A. I. Grigyalis.
Liet Tsr Mokslu Akad Darb Ser C Biol Mokslai 1, p 95-102, 1975.

Descriptors: Biomass, *Chironomus-anthracinus, Dominating organisms, Hydrachnellae, Lakes, Lithuanian-ssr, USSR, Lake Dunya(USSR), Zoobenthos.

In 1969-1971 the larvae of C. anthracinus Zett. was important in the zoobenthos of Lake Dusia South Lithuania (USSR, the maximum depth of which is 32.4 m and the mean, 14.7 m. At the end of 1966 the number of larvae was 44 individuals/m2 (33.33%) and the biomass. 0.09 g/m2 (16.98%). In 1967 many samples were without larvae. In the 1st half of 1968 the number of larvae increased to 733 individuals/m3 and their biomass to 13.62 g/m2. Afterwards they decreased to 222 individuals/m2 (4.17g/m2). Female chironomids (100%) were infected by Hydrachnellae (group Tromibidiformes) male, 60% (June 21, 1971). Investigations of the biology of C. anthracinus show that the cycle of development is 2 yr and 1 generation.--Copyright 1976, Biological Abstracts, Inc.
W78-05074

EFFECTS OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION AND MORPHOLOGY OF VICTORELLA PAVIDA (ECTOPROCTA) IN LAKE PONTCHARTRAIN, LOUISIANA, AND VICINITY,
New Orleans Univ., LA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W78-05075

INFLUENCE OF A PULP AND PAPER MILL EFFLUENT ON ASPECTS OF DISTRIBUTION, SURVIVAL AND FEEDING OF NIPIGON BAY, LAKE SUPERIOR, LARVAL FISH,
Fisheries and Marine Service, Ottawa (Ontario). Great Lakes Biolimnology Lab.; and Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5C.
W78-05076

ON THE FAUNA AND FLORA IN LAKE KAWAGUCHI IN SUMMER, (IN JAPANESE),
For primary bibliographic entry see Field 5C.
W78-05080

ENVIRONMENTAL CHEMISTRY OF COPPER IN TORCH LAKE, MICHIGAN,
Texas Univ. at Dallas, Richardson. Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W78-05081

THERMAL STABILITY AND PHYTOPLANKTON IN VOLTA LAKE, GHANA,
Nigeria Univ., Nsukka (Nigeria).
For primary bibliographic entry see Field 5C.
W78-05088

THE INFLUENCE OF SUBMERSED AQUATIC PLANTS ON TEMPERATURE GRADIENTS IN SHALLOW WATER BODIES,
Guelph Univ., (Ontario). Dept. of Botany and Genetics.
H. M. Dale, and T. J. Gillespie.
Canadian Journal of Botany, Vol. 55, p 2216-2225, 1977. 1 fig, 5 tab, 22 ref.

Descriptors: *Submerged plants, *Water temperature, *Thermal stratification, *Biomass, *Plant growth, Aquatic plants, Rooted aquatic plants, Pondweeds, Standing crop, Climatology, Solar radiation, Wetlands, Depth, Aquatic environment, Shallow water, Productivity, Growth rates, Biological communities, Plant populations, Lakes, *Lake Opinicon(Ontario Canada).

Field studies examined temperature gradients during similar weather conditions in stands of aquatic macrophytes of varying standing crop sizes. The gradient at midday from 10 cm below the water surface to soil, in clear weather in August, was 32 C degrees/m in shallow water where there was a large macrophyte biomass and only 0.2 C degrees/m in deeper water with few plants. There was a direct correlation between the log of the biomass per cubic meter and the steepness of the gradient. The gradient results from light/heat interception by upper leaf material, shading of the soil substrate, and reduction of water currents. Macrophyte populations of different species had varying gradients under laboratory studies examining the influence of seasonal changes in incoming radiation, wind velocity, and air temperatures. Significant changes were shown in the extent in which growth and development of the macrophyte populations were affected by the gradient they cause, mainly from the contrast of low temperatures at the base of the plant versus the diurnal fluctuations at the top plus the concomitant changes in such factors as gas solubility. (Steiner-Mass)
W78-05091

WETLAND INVENTORY, ONEIDA COUNTY, NEW YORK,
Oneida County Environmental Management Council, Utica, NY.
For primary bibliographic entry see Field 6G.
W78-05099

WATER QUALITY EVALUATION OF A LOWER POOL ELEVATION FOR PROPOSED ARCADIA LAKE, OKLAHOMA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5B.
W78-05107

BIOLOGICAL SURVEY OF WILSON RESERVOIR - SALINE RIVER, KANSAS, AUGUST 1970,
Environmental Protection Agency, Cincinnati, OH. Div. of Field Investigations.
For primary bibliographic entry see Field 5C.
W78-05109

AN INVESTIGATION OF THE NEARSHORE REGION OF LAKE ONTARIO IFYGL.
State Univ. of New York Coll. at Buffalo.
For primary bibliographic entry see Field 5C.
W78-05113

EFFECTS OF THERMAL EFFLUENT AND MACROPHYTE HARVESTING ON THE BENTHOS OF AN ALBERTA LAKE,
For primary bibliographic entry see Field 5C.
W78-05115

LIMITING NUTRIENTS AND MAXIMUM GROWTH RATES FOR DIATOMS IN NARRAGANSETT BAY,
Trondheim Univ. (Norway). Biological Station.
For primary bibliographic entry see Field 5C.
W78-05117

DETERMINATION OF PRIMARY PRODUCTIVITY AND COMMUNITY METABOLISM IN STREAMS AND LAKES USING DIEL OXYGEN MEASUREMENTS,
Geological Survey, Bay Saint Louis, MS. Water Resources, Div.; and National Aeronautics and Space Administration, Bay Saint Louis, MS. National Space Technology Labs.
For primary bibliographic entry see Field 5C.
W78-05119

REMOTE SENSING ANALYSIS OF LAKE LIVINGSTON AQUATIC PLANTS, 1975 FINAL REPORT,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 5A.
W78-05134

PRELIMINARY BIOCHEMICAL OBSERVATIONS OF FISHES INHABITING AN ACIDIFIED LAKE IN ONTARIO, CANADA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W78-05159

DEMONSTRATION OF THE ACTIVITY OF MUREINE HYDROLASE DURING THE BREAKDOWN OF A BLOOM OF ANABAENA SOLITARIA KLEB, (IN GERMAN),
Tuebingen Univ. (West Germany). Inst. fuer Chemische Pflanzenphysiologie.
For primary bibliographic entry see Field 5C.
W78-05160

DISTRIBUTION OF PURPLE PHOTOSYNTHETIC BACTERIA IN WETLAND AND WOODLAND HABITATS OF CENTRAL AND NORTHERN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-05168

2I. Water In Plants

COMPARATIVE STUDIES ON WATER UPTAKE AND WATER PERMEABILITY OF POTATO TISSUE UNDER THE EFFECT OF INDOLEACETIC ACID, CHLORAMPHENICOL AND ACTINOMYCIN D,
Istanbul Univ. (Turkey). Dept. of General Botany.
N. Onder.
Physiol Plant. 31(1), p1-3, 1974.

Descriptors: *Absorption, *Permeability(Plant tissue), *Potatoes, *Indoleacetic acid, *Actinomycin D, *Chloramphenicol, Solanum-tuberosum.

The water uptake of potato (Solanum tuberosum) tuber tissue under the influence of chloramphenicol and actinomycin D was compared with that of IAA. Both antibiotics decreased the water absorption as compared to the effect of indoleacetic acid. This decrease, in the early hours (3-6h), is due to diminished water permeability. In the later period (6-48h), it is instead a result of a reduction in wall extensibility. --Copyright (c) 1975, Biological Abstracts, Inc.
W78-04796

A STUDY ON PERIPHYTON OF PO RIVER WITH ARTIFICIAL SUBSTRATA, (IN ITALIAN),
C. Gemelli, and Z. Zullini.
Ateneo Parmense Acta Nat 12(2), p 111-122, 1976.

Descriptors: *Periphyton, *Artificial substrata, Chondrostoma-soetta, *Food chains, Italy, Leuciscus-cephalus, Limnodrilus-spp, *Po River(Italy), Temperature *Tubifex-tubifex.

The periphytic fauna living in a stretch of the Po river near Piacenza (Italy) was studied by means of artificial substrata consisting of plexiglass slides measuring 15 X 15 cm. Every 40 days such substrata were analyzed and replaced, the whole study lasting 16 mo. The river community of the studied area is poor in species, the main food chain being; organic sediment Tubifex tubifex and Limnodrilus spp. Leucisus cephalus and Chondrostoma soetta. On the artificial substrata a relatively high number of species, difficult to find other wise, was found. Densities of the more important groups of animals are presented as individuals/m2 of substratum area in various months of 2 yr. The monthly mean temperature of the water, measured automatically and continously and the productivity of periphyton (in mg/dm2, day) are given as dry weight and as ash weight. --Copyright (c) 1977, Biological Abstracts, Inc.
W78-04798

THE WATER RELATIONS OF HEMLOCK (TSUGA CANADENSIS): IV. THE DEPENDENCE OF THE BALANCE PRESSURE ON TEMPERATURE AS MEASURED BY THE PRESSURE-BOMB TECHNIQUE,
Toronto Univ. (Ontario). Dept. of Botany.
M. T. Tyree, J. Dainty, and D. M. Hunter.
Can J Bot. 52(5), p 973-978, 1974.

Descriptors: *Balance pressure, *Hemlock, Osmotic pressure(Plants), Plasmolysis, *Plant growth, Technique, *Temperature dependence(Plants), *Tsuga-canadensis, Turgor.

The temperature dependence of the balance pressure is reported for shoots of T. canadensis at constant volume, i.e., when water is neither added to nor removed from the shoot. Since the balance pressure closely equals minus the water potential, the temperature dependence of the balance pressure should reflect the combined temperature dependence of the osmotic and turgor pressures. Both the osmotic and the tugor pressures decline with decreasing temperature; frequently the turgor pressure declines 2-3 times more rapidly than the osmotic pressure, causing the balance pressure to rise with decreasing temperature. Only when the turgor pressure is zero (only beyond incipient plasmolysis) does the temperature dependence of the balance pressure closely follow the temperature dependence of the osmotic pressure; this occurs when the balance pressure equals or exceeds 24 bars. (See also W75-11900-W75-11902)--Copyright 1974, Biological Abstracts, Inc.
W78-04800

MODELING SOIL WATER MOVEMENT INTO PLANT ROOTS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W78-04843

QUANTITY AND QUALITY CONSIDERATIONS FOR WATER USE EFFICIENCY IN IRRIGATION,
Texas Tech Univ., Lubbock. Dept. of Plant and Soil Science; and Texas Tech Univ., Lubbock. Dept. of Biological Sciences.
For primary bibliographic entry see Field 3F.
W78-05054

INVESTIGATIONS ON THE ABUNDANCE, THE BIOMASS AND THE CALORIC EQUIVALENTS OF THE MACROBENTHOS IN A WOODLAND BROOKLET, (IN GERMAN),
Bonn Univ. (West Germany). Inst.fuer Landwirtschaftliche Zoologie und Bienekunde.
N. Caspers.
Int Rev Gesamten Hydrobiol 60(4), p 557-566, 1975.

Descriptors: *Benthos, *Biomass, Brooklet, Caddis-fly, Carbon-14, East Germany, Food, Gammarus-fossarum, Invertebrates, Leptophlebia-marginata, *Primary productivity, Trees, Woodlands, Streams.

From 1972-1974 the invertebrates of a woodland-brooklet of the 'Naturpark Kottenforst-Ville' (Rhineland) (East Germany) were investigated concerning abundance and standing crop at selected sampling stations of the 'epirithron'. In the shaded brooklet the allochthonous autumn-shed leaves were the most important food for the aquatic invertebrates. C-14 radio-isotope tags were used to get data on the primary productivity of the periphyton community, which is less important for the energy balance of the macro-benthic organisms. The most frequent macro-consumers are Gammarus fossarum Koch, Leptophlebia marginata L. and some caddis larvae which feed directly on detritus and decomposing leaves.
W78-05069

EFFECT OF VARIOUS ECOLOGICAL CONDITIONS OF PONDS ON THE REPRODUCTIVE SYSTEM OF THE SILVER CARP, (IN RUSSIAN),
Zh. G. Sarsembaev.
Izv Akad Nauk Kaz Ssr Ser Biol 13(4), p 31-38, 1975.

Descriptors: *Carp, Climates, *Ecological conditions, Foods, *Growth rates, Silver carp, Temperature, *Reproduction.

Histological analyses were made of the gonads of the silver carp cultivated in different regions. The rate of development of the gonads on the temperature regime of the ponds and the fecundity depends on the food base. The problem of the relationship between the growth rate and the rate of development of the reproductive system is examined. A direct relationship between these indices is observed when a high water temperature is combined with a good food base. A change of any of these factors disturbs the relation between growth rate and rate of development of the gonads. Regions most suitable climatically for breeding silver carp are recommended.
W78-05070

THE VEGETATION OF BRITISH INLAND SALT MARSHES,
Manchester Univ. (England) Dept. of Botany.
J. A. Lee.
Journal of Ecology, Vol. 65, p 673-698, 1977. 7 fig, 7 tab, 25 ref, append.

Descriptors: *Salt marshes, *Halophytes, *Vegetation establishment, *Inland waterways, *Spring waters, Wetlands, Marshes, Marsh plants, Plant groupings, Brines, Springs, Saline water, Salts, Dominant organisms, Environmental effects, Plant populations, *Inland salt marshes, Field farm, Brine springs.

A survey of the vegetation of the major inland saline sites in Britain is presented. Marshes are associated either with brine springs from the Keuper Saliferous Beds or with the exploitation of the beds by the salt industry. Areas around brine springs are relatively little disturbed, and are largely colonized by perennial halophyte species. Vegetation of the most important brine-spring site, Fields Farms, is described and analysed by association-analysis. The thirteen groupings produced are used to construct a vegetation map of the marsh. The vegetation at Fields Farm is compared with other British and North European brine-spring habitats. Saline sites created in the Twentieth century are more numerous than the brine-spring sites. However, they have often been formed away from the immediate vicinity of brine springs, and have been colonized by a limited number of annual and short-lived perennial halophytes. A phytosociological survey of these recently-created sites showed that the vegetation could be referred to four associations already recognized from inland salt marshes on the continent. The vegetation of inland saline sites in Britain has close affinities with coastal vegetation, but is poorer in species. (Steiner-Mass)
W78-05100

IMPACT OF WATER LEVEL CHANGES ON WOODY RIPARIAN AND WETLAND COMMUNITIES. VOLUME I: PLANT AND SOIL RESPONSES TO FLOODING,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 6G.
W78-05101

IMPACT OF WATER LEVEL CHANGES ON WOODY RIPARIAN AND WETLAND COMMUNITIES. VOLUME II: THE SOUTHERN FOREST REGION,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 6G.
W78-05102

IMPACT OF WATER LEVEL CHANGES ON WOODY RIPARIAN AND WETLAND COMMUNITIES. VOLUME III: THE CENTRAL FOREST REGION,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 6G.
W78-05103

2J. Erosion and Sedimentation

NON-POINT SOURCE POLLUTION SEMINAR, SECTION 108(A) DEMONSTRATION PROJECTS PROGRESS REPORTS, HELD AT CHICAGO, NOVEMBER 20, 1975. POLLUTION CONTROL IN GREAT LAKES.
Environmental Protection Agency, Chicago, IL. Office of the Great Lakes Coordinator.
For primary bibliographic entry see Field 5G.
W78-04719

STREAM STABILIZATION,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W78-04728

SEDIMENT TRAP MEASURING BED LOAD MOVEMENT IN BLACK CREEK,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W78-04729

COMPARATIVE INTERSTITIAL WATER AND SEDIMENT CHEMISTRY IN OLIGOTROPHIC AND MESOTROPHIC LAKES, MAINE, U.S.A.,
For primary bibliographic entry see Field 5C.
W78-04774

LAKE GEOCHEMISTRY IN THE KAMINAK LAKE AREA, DISTRICT OF KEEWATIN, N.W.T.,
For primary bibliographic entry see Field 2H.
W78-04809

COMPETENCE OF HOPE RIVER, JAMAICA: A REAPPRAISAL OF R AS A FUNCTION OF D,
University of the West Indies, Kingston (Jamaica). Dept. of Geology.
P. A. Wood.
Water Resources Research, Vol 13, No 6, p 1013-1014, December 1977. 2 fig, 3 ref.

Descriptors: *River flow, *Shear stress, *On-site investigations, *Hydraulic radius, Hydraulics, Depth, Tractive forces, Water levels, Particle size, Bed load, *Sediment transport, Foreign research, Foreign countries, *Jamaica, *Hope River(Jamaica).

Shear stress and competence determinations for the Hope River, Jamaica, indicated that widely different values are obtained with different equations. Field measurements of hydraulic radius, R, depth, D, and slope, S, of the energy gradient were undertaken at a study section so that shear stress could be determined. The data suggested that for multichannel streams, R can be approximated by D/2, so that shear stress = specific weight times (D/2)S. (Humphreys-ISWS)
W78-04837

WIND EROSION RESEARCH ACCOMPLISHMENTS AND NEEDS,
Agricultural Research Service, Big Spring, TX.
D. W. Fryrear, and L. Lyles.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 5, p 916-918, September-October 1977. 51 ref.

Descriptors: *Wind erosion, *Reviews, *Soil erosion, Erosion, Soils, Environment, Environmental effects, Land management, Winds, Research priorities, *Research needs(Wind erosion).

Past wind erosion research has provided many valuable tools for identifying wind erosion losses and practices to decrease the wind erosion hazard. Major needs are the development of soil flux models for predicting erosion from single events, more dependable field wind erosion sampling equipment, identification of the impact of continued erosion on soil productivity, extension of benefit of emergency tillage, and optimization of barrier influence by designing the height-density-spacing of multiple barriers. (Humphreys-ISWS)
W78-04842

SEDIMENT DEPOSITION PATTERNS IN SIMULATED GRASS FILTERS,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W78-04846

FLOW CHARACTERISTICS IN LOCAL SCOUR AT BRIDGE PIERS,
Auckland Univ. (New Zealand). School of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-04849

A GUIDE FOR APPLICATION OF THE COMPUTER PROGRAM FOR THE MODIFIED EINSTEIN METHOD OF COMPUTING TOTAL SEDIMENT DISCHARGE (MODEIN),
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04860

ANALYSIS OF BOTTOM MATERIAL FROM THE WILLAMETTE RIVER, PORTLAND HARBOR, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-04874

RAINFALL PARAMETERS FOR SOIL LOSS ESTIMATION IN A SUBTROPICAL CLIMATE,
Rhodesia Dept. of Conservation and Extension, Salisbury.
For primary bibliographic entry see Field 2G.
W78-04894

A GEOGRAPHICAL APPRAISAL OF THE EXPANSION AND DETERIORATION OF THE INDIAN DESERT,
Central Arid Zone Research Inst., Jodhpur (India).
A. K. Sen, and H. S. Mann.
Annals of Arid Zone Vol 16, No 3, p 281-289, September 1977. 20 ref.

Descriptors: *Deterioration, *Deserts, Dune sands, Weathering, Land use, Drainage patterns(Geologic), Topography, Soil conservation, Geomorphology, Physiography, Terrain analysis, Dune succession, Arid lands, India(Rajasthan), Great Indian Desert(India).

An attempt was made to examine the creep and deterioration of the Indian desert on the basis of some physiographic and topographic parameters. The extents of the great Indian desert and its geographical limits were defined. The creep of the desert was then considered in relation to the increase and decrease of desertic sands, the extent of sand dunes, water table and climatic phenomena, and drainage system and soil. A note on the causes of interior desert deterioration cities the rising of the Himalayas and lowering of the Aravallis, which led to the shifting and desiccation of rivers, and the uplift of the Putwar plateau during the late Pleistocene. Also listed as causes: recent physiographic changes, exploitation of resources, cultivation on dunes and increased salinity of groundwater. (Payton-Arizona)
W78-04932

TSUNAMI INUNDATION PREDICTION,
Hawaii Univ., Honolulu. Dept. of Ocean Engineering.
For primary bibliographic entry see Field 2L.
W78-04966

A STUDY OF BEAUFORT SEA COASTAL EROSION NORTHERN ALASKA,
R. Lewellen.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977. Vol 15. Transport, p 491-528, March 1977. 8 fig, 35 ref.

Descriptors: *Baseline studies, *Resources development, *Erosion, *Hazards, Sedimentation, Geomorphology, Alaska, *Outer Continental Shelf, Beaufort Sea, Pollutant transport.

Rapid erosion and depositional rates are geological hazards to proposed industrial activities. Coastal erosion rates of greater than 20 meters per thaw season were measured. Ironically, the geomorphic form remains essentially the same from season to season; to the untrained observer the erosion appears nil since the form remains relatively constant. Rapid sedimentation and aggradation can trigger rapid permafrost aggradation, soil heave, and related phenomena. The study determined that it is impossible (1) to indicate where coastal morphology is likely to be changed by man's activity, (2) to indicate the relative erosional susceptibility of the different coastal geomorphic areas, and (3) to evaluate the effects of coastal morphology changes which are man induced. The variations encountered were complex and interrelated with other complex factors. No specific guides or formulas will satisfy the entire Beaufort Sea coast. However, the study did determine that specific sites can be studied adequately from the existing data bases for problem solutions or for determining what specific field work will be required. (Sinha-OEIS)
W78-04995

HYDROLOGY AND SEDIMENTOLOGY OF THE COLORADO RIVER IN GRAND CANYON,
Arizona Univ., Tucson. Dept. of Ecology and Evolutionary Biology.
M. Laursen, and E. Silverston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 735, Price codes: A03 in paper copy, A01 in microfiche. National Park Service, Grand Canyon National Park Report Series, Colorado River Research Program, Technical Report No. 12, Dec 1976. 27 p, 18 fig, 3 ref.

Descriptors: Photography, Beach erosion, Beaches, Monitoring, Environmental effects, Camp sites, Sedimentology, Deposition(Sediments), *Sediment transport, Sedimentation rates, Streams, Testing, Hydraulic models, Hydrologic models, National Parks, *Colorado River, *Arizona, *Recreation facilities, *Grand Canyon National Park, Lake Powell, Lee's Ferry area.

Photographic studies conducted to evaluate beach changes in the Lee's Ferry Area of the Colorado River showed extensive beach and river bed degradation which will probably proceed downstream at the rate of one mile per year. This is a result of Lake Powell acting as an enormous super-efficient sand trap, plus loss of sediment flow to beaches caused by river bed degradation. The controlled flow from Glen Canyon Dam is less able to remove boulders from the existing stream areas which may affect rapids. A laboratory experiment was conducted in order to simulate and more carefully evaluate the stream effects. (Payton-Arizona)
W78-05002

ALTERATIONS OF TERRACE DEPOSITS AND BEACHES OF THE COLORADO RIVER IN GRAND CANYON,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
A. D. Howard, and R. Dolan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 766, Price codes: A03 in paper copy, A01 in microfiche. National Park Service, Grand Canyon National Park Report Series, Colorado River Research Program, Final Report, Technical Report No. 7, July 1976. 29 p, 4 tab, 7 fig, 7 ref.

Descriptors: Sediments, *Beach erosion, Recreation, *Recreational facilities, *Colorado River, Flow control, Alteration of flow, Environmental sanitation, Runoff, Wind erosion, Projections, *Arizona, National Parks, Environmental effects, Recreation wastes, *Camp sites, Beaches, Glen Canyon Dam, *Grand Canyon National Park, Human impact.

The beaches along the Colorado River are being significantly altered by wind and side canyon runoff as well as by human usage. Since the completion of the Glen Canyon Dam, these beaches are not being replenished periodically as they are now positioned well above the high-water stage. As a

result, the predominant eolian process is diminishing the number of campable beaches. This process is further aggravated by human impact which has caused destruction or inhibition of the vegatative cover over an appreciable area. The incorporation of human waste and debris into campsites is nearly as serious a problem - leading, at the most heavily camped sites, to a condition in which human waste is incorporated into sand/silt deposits at rates that exceed natural purging capacities. (Payton-Arizona)
W78-05004

MOBILE CONTROLS FOR WATER RESOURCES PROJECTS,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W78-05024

SEDIMENT FROM DRAINAGE SYSTEMS FOR CLAY SOILS,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W78-05030

WIND EROSION: PROCESSES AND EFFECT ON SOIL PRODUCTIVITY,
Agricultural Research Service, Manhattan, KS. North Central Region.
L. Lyles.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 5, p 880-884, September-October 1977. 1 fig, 6 tab, 29 ref.

Descriptors: *Wind erosion, *Soil erosion, *Crop production, *Great Plains, Erosion, Soils, Movement, Air, Cultivated lands, Topsoil, Soil texture, Soil types, Sediment transport, Sediment yield, Wheat, Sorghum, Crops, Rotation, Corn(Field), Erosion processes.

Part one of this report concerned basics of the erosion process in terms of particle dynamics, threshold conditions, particle flux, and the protective role of nonerodible elements. Part two was a procedure for evaluating wind erosion effects on soil loss and, subsequently, on crop yields. In the procedure, a wind-erosion equation was used to predict potential annual loss, which was converted to crop-yield reduction per cm of erosion for wheat, grain sorghum, and corn. Where applied in the Oklahoma Panhandle, the procedure resulted in estimated annual yield reductions of wheat and grain sorghum equivalent to a total crop failure on about 4,530 ha of the cultivated sandy surface soils in the selected area. Wind erodes land every year in the United States, especially in the Great Plains and Far West and where there are coastal sands, organic soils, and interior sandy soils. Additional research on 'benchmark' soils of the Great Plains in controlled studies should be directed toward obtaining precise yield-soil thickness data. Data also are needed on distribution of soils by wind erodibility groups (WEG) and land use plus crop distributions according to WEG on cultivated land on a county or land resource area basis for areas susceptible to wind erosion. (Humphreys-ISWS)
W78-05031

FINE PARTICULATE EMISSIONS DUE TO WIND EROSION,
National Center for Atmospheric Research, Boulder, CO.
D. A. Gillette.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 5, p 890-897, September-October 1977. 5 fig, 2 tab, 18 ref, 1 append.

Descriptors: *Soil erosion, *Dusts, *Wind erosion, *On-site tests, *Texas, On-site investigations, Movement, Settling velocity, Suspension, Testing procedures, Soil texture, Wind velocity, Weathering, Mineralogy, Soils, Air pollution, Suspended solids, Particle size, Distribution, Dust generation, Airborne dust.

The ratios of emission of fine particles (d less than 0.02 mm) by wind erosion to total soil movement were measured and related to empirical Agricultural Research Service (ARS) work relating total soil movement to wind and soil parameters. Ratios of fine particulate emission to total soil movement are a function of soil texture, wind speed, mineralogy, and possibly soil moisture-wind history. Fine particles are produced by the sandblasting effect of saltation, which acts to disaggregate fine particles on the surfaces of larger particles and to emit fine particles by 'splashing' of the saltating particle into a reservoir of fine particles. Fine-textured soils tend to emit more fine particles upon unit soil movement unless the structure of the soil aggregates is highly resistant to breakage. Total soil movement measurements show good agreement with values computed from formulas derived from ARS studies and from data herein reported. It was concluded that the ratio of fine particle emission to total soil movement is dependent on soil texture, windspeed, mineralogy, and possibly physical weathering. (Humphreys-ISWS)
W78-05032

SEDIMENT YIELD PREDICTION BASED ON WATERSHED HYDROLOGY,
Agricultural Research Service, Temple, TX.
For primary bibliographic entry see Field 4D.
W78-05036

THERMAL WEDGING IN LAKE MACATAWA, MICHIGAN: LONG-TERM IMPACT OF CHANNELIZATION,
Rice Univ., Houston, TX. Dept. of Geology.
For primary bibliographic entry see Field 2H.
W78-05041

DECREASE IN HARBOR MAINTENANCE DREDGING THROUGH THE USE OF PILE DIKES AND RELATED STRUCTURES TOGETHER WITH AN ANALYSIS OF ESTUARINE SEDIMENTATION PROBLEMS,
Naval Academy Annapolis, MD. Dept. of Oceanography.
For primary bibliographic entry see Field 8B.
W78-05050

NOTES ON SEDIMENTATION ACTIVITIES, CALENDAR YEAR 1974.
Water Resources Council, Washington, DC. Sedimentation Committee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 377, Price codes: A14 in paper copy, A01 in microfiche. Report, 1974. 320 p, 1 fig, 4 tab, 2 append.

Descriptors: *Sedimentation, *Research and development, *Projects, Research facilities, Federal government, Sediment transport, Suspended solids, Erosion, Sedimentation rates, Sediments, Sedimentology, Reviews.

Information is presented which was furnished by Federal agencies conducting sedimentation investigations on (1) work in progress or planned, (2) important findings, on new methods, (3) new publications and (4) laboratory and other research activities. The material is organized by major drainage regions in the conterminous United States, Alaska, Hawaii, Puerto Rico, and foreign. Major headings includes Laboratory and Other Research Activities. An excerpt from the Catalog of Information on Water Data, Index to Water Quality Stations, 1974 edition, compiled by the Geological Survey, Office of Water Data Coordination, is included. this excerpt is a list, as of January 1974, of long-term (3 years or more) water quality sites at which sediment data have been collected. Agency addresses by departments where information on agency activities can be obtained are listed. (See also W74-04916 and W70-10318) (Froehlich-ISWS)
W78-05057

MERCURY DISPERSAL FROM LODE SOURCES IN THE KUSKOKWIM RIVER DRAINAGE, ALASKA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 5B.
W78-05060

INTERACTIONS BETWEEN ZINC AND SUSPENDED SEDIMENTS IN THE FRASER RIVER ESTUARY, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5A.
W78-05061

LEAD CONCENTRATIONS IN ALGAE AND PLANTS GROWN OVER LEAD CONTAMINATED SEDIMENTS TAKEN FROM SNOW DUMPS IN OTTAWA, CANADA,
Ottawa Univ. (Ontario). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-05071

ENVIRONMENTAL CHEMISTRY OF COPPER IN TORCH LAKE, MICHIGAN,
Texas Univ. at Dallas, Richardson. Center for Environmental Studies.
For primary bibliographic entry see Field 5B.
W78-05081

2K. Chemical Processes

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER: PART II, SOIL PHYSICAL AND CHEMICAL CHANGES,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-04705

THE KINETICS OF MINERAL DISSOLUTION IN CARBONATE AQUIFERS AS A TOOL FOR HYDROLOGICAL INVESTIGATIONS,. II. HYDROGEOCHEMICAL MODELS,
Tahal-Water Planning for Israel Ltd., Tel Aviv.
For primary bibliographic entry see Field 2F.
W78-04716

SUBSTANTIVE CORRECTIONS TO SIL COMMUNICATIONS (IVL MITTEILUNGEN) NUMBERS 6 AND 20,
Wisconsin Univ.-Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 2H.
W78-04810

LONG TERM PEACE RIVER CHARACTERISTICS AS A MEASURE OF A PHOSPHATE SLIME SPILL IMPACT,
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-04850

GROUND-WATER RESOURCES OF POSEY COUNTY, INDIANA,
Geological Survey, Mineola, NY. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04862

SURFACE-WATER AND GROUND-WATER FEATURES, CLAY COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-04870

ANALYSIS OF BOTTOM MATERIAL FROM THE WILLAMETTE RIVER, PORTLAND HARBOR, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
S. W. McKenzie.
Open-file report 77-740, 1977. 8 p, 5 tab, 6 ref.

Descriptors: *Bottom sampling, *Bottom sediments, *Rivers, *Oregon, Data collections, Particle size, Moisture content, Oxygen demand, Chemical analysis, Dredging, Aquatic productivity, *Willamette River(Ore), *Portland Harbor(Ore).

The bottom material of the Willamette River, Portland Harbor, Oregon, was sampled in duplicate on February 1, 1977. Results are reported on the following analyses of the material: immediate and long-term oxygen demand; particle size; percent moisture; residue, loss on ignition; and chemical. The U.S. Geological Survey (USGS), in cooperation with the U.S. Army Corps of Engineers, Portland District (Corps), collected and analyzed duplicate samples of bottom material from Portland Harbor. The analyses were selected jointly by the Corps and USGS and include chemical, oxygen-demand, and particle-size analyses of the bottom material. The National Maine Fisheries Service (NMFS) indicated that, at present, the Columbia River downstream from Bonneville Dam receives very little organic material. The bottom material is 5 to 8 percent organic, and NMFS indicated that this material could stimulate the Columbia River aquatic system, with the dumping sites serving as feeder sites for aquatic organisms. (Woodard-USGS)
W78-04874

SURFACE CHEMICAL PROCESSES IN GROUND-WATER SYSTEMS,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-04877

SURVEY OF BACTERIA, PHYTOPLANKTON, AND TRACE CHEMISTRY OF THE LOWER COLORADO RIVER AND TRIBUTARIES IN THE GRAND CANYON NATIONAL PARK,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5A.
W78-04999

DETERMINATION OF NITRATE BY ANION EXCHANGE WITH ULTRAVIOLET DETECTION,
Iowa State Univ., Ames. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-05011

THE USE OF MAGNESIUM CARBONATE IN CHLOROPHYLL DETERMINATIONS,
Geological Survey, Atlanta, GA. National Water Quality Lab.
For primary bibliographic entry see Field 5A.
W78-05029

SOIL SALINITY- FOUR-ELECTRODE CONDUCTIVITY RELATIONSHIPS FOR SOILS OF THE NORTHERN GREAT PLAINS,
Agricultural Research Service, Sidney, MT.
For primary bibliographic entry see Field 2G.
W78-05046

2L. Estuaries

LIGHT-SATURATED PHOTOSYNTHESIS BY PHYTOPLANKTON SIZE FRACTIONS IN THE NEW YORK BIGHT, USA,
Lamont-Doherty Geological Observatory, Palisades, NY
For primary bibliographic entry see Field 5C.
W78-04738

WATER QUALITY DATA DURING SEPTEMBER 16-19, 1974 AT SILVER BAY, SAWMILL COVE, AND EASTERN CHANNEL, SITKA, ALASKA.
Environmental Protection Agency, Seattle, WA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W78-04756

EFFECTS OF CADMIUM, MERCURY, AND SILVER ON MARINE ANIMALS,
National Marine Fisheries Service, Milford, CT. Milford Lab.
For primary bibliographic entry see Field 5C.
W78-04757

EFFECTS OF ENVIRONMENTAL CHANGES ON MARSH VEGETATION WITH SPECIAL REFERENCE TO SALINITY,
Tulane Univ., New Orleans, LA.
For primary bibliographic entry see Field 5C.
W78-04785

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970, INTRODUCTION,
Uppsala Univ. (Sweden). Inst. of Plant Ecology.
For primary bibliographic entry see Field 5C.
W78-04787

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 1, OUTFLOW STUDIES,
Uppsala Univ. (Sweden). Inst. of Plant Ecology.
For primary bibliographic entry see Field 5C.
W78-04788

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 2, PHOSPHATE, NITRATE AND AMMONIUM IN THE ARCHIPELAGO DURING 1970,
Uppsala Univ. (Sweden). Inst. of Plant Ecology.
For primary bibliographic entry see Field 5C.
W78-04789

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 3, DETERMINATION OF TOTAL PHOSPHORUS IN NATURAL WATERS,
Uppsala Univ. (Sweden). Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 5B.
W78-04790

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 4, PHYTOPLANKTON DISTRIBUTION IN THE ARCHIPELAGO MEASURED AS CHLOROPHYLL A,
Uppsala Univ. (Sweden). Inst. of Plant Ecology.
For primary bibliographic entry see Field 5B.
W78-04791

ORGANIC CARBON AND DEOXYGENATION IN THE PAMLICO RIVER ESTUARY,
East Carolina Univ., Greenville, SC. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-04816

LABORATORY STUDIES OF THE INFLUENCE OF THE VELOCITY OF WIND ON THE MOVEMENT OF OIL SLICKS,
Queen Mary Coll., London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-04847

DEVELOPMENT OF MODELS FOR PREDICTION OF SHORT-TERM FATE OF DREDGED MATERIAL DISCHARGED IN THE ESTUARINE ENVIRONMENT,
Tetra Tech, Inc., Pasadena, CA.
For primary bibliographic entry see Field 5B.
W78-04854

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. ATLANTIC COAST, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04856

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. GULF COAST, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04857

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. PACIFIC COAST, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04858

WATER POLLUTION STUDIES ON LAKE ILLAWARRA, I. SALINITY VARIATIONS AND ESTIMATION OF RESIDENCE TIME,
Wollongong Univ. (Australia). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-04882

WATER POLLUTION STUDIES ON LAKE ILLAWARRA, II. THERMAL BEHAVIOUR,
Wollongon Univ. (Australia). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-04883

WATER POLLUTION STUDIES ON LAKE ILLAWARRA, III. DISTRIBUTION OF HEAVY METALS IN SEDIMENTS,
Wollongong Univ. (Australia). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-04884

TRACE METALS IN SCALLOPS FROM WITHIN AND AROUND TWO OCEAN DISPOSAL SITES,
Environmental Protection Agency, Narragansett, RI.
For primary bibliographic entry see Field 5C.
W78-04887

TOLERANCE OF ESTUARINE BENTHIC DIATOMS TO HIGH CONCENTRATIONS OF AMMONIA, NITRITE ION, NITRATE ION AND ORTHOPHOSPHATE,
Groningen Rijsuniversiteit (Netherlands). Dept. of Systematic Botany.
For primary bibliographic entry see Field 5C.
W78-04889

THE COMMON MUSSEL MYTILUS EDULIS AS AN INDICATOR OF TRACE METALS IN SCANDINAVIAN WATERS. I. ZINC AND CADMIUM,
Uppsala Univ. (Sweden). Inst. of Zoology.
For primary bibliographic entry see Field 5A.
W78-04890

GROWTH OF THE CARRAGEENAN-PRODUCING TROPICAL RED SEAWEED HYPNEA MUSCIFORMIS IN SURFACE WATER, 870 M DEEP WATER, EFFLUENT FROM A CLAM MARICULTURE SYSTEM, AND IN DEEP WATER ENRICHED WITH ARTIFICIAL FERTILIZERS OR DOMESTIC SEWAGE,
Lamont-Doherty Geological Observatory, Palisades, NY.
For primary bibliographic entry see Field 5C.
W78-04902

ON THE DISTRIBUTION OF PARTICULATE METALS, CHLOROPHYLL AND SESTON IN THE BALTIC SEA,
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 5B.
W78-04904

THE PERSISTENCE OF CHRONICALLY ACCUMULATED HYDROCARBONS IN THE HARD SHELL CLAM MERCENARIA MERCENARIA,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W78-04905

ZINC AND CADMIUM IN THE PACIFIC HAKE MERLUCCIUS PRODUCTUS OFF THE WESTERN U.S. COAST,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5C.
W78-04907

DEVELOPMENT OF NORTH SEA COASTAL PLANKTON COMMUNITIES IN SEPARATE PLASTIC BAGS UNDER IDENTICAL CONDITIONS,
Central Lab. TNO., Helder (Netherlands). Dept. of Marine Ecology.
For primary bibliographic entry see Field 5C.
W78-04910

TSUNAMI INUNDATION PREDICTION,
Hawaii Univ., Honolulu. Dept. of Ocean Engineering.
C. L. Bretschneider, and P. G. Wybro.
Sea Grant Reprint No. UNIHI-SEAGRANT-CP-77-02, Reprinted from: Proceedings 15th Coastal Engineering Conference held Honolulu, Hawaii, July 11-17, 1976. (ASCE), Chap 60, p 1006-1024. 14 fig, 3 tab, 10 ref.

Descriptors: *Tsunamis, *Coastal plains, *Surges, *Hawaii, Erosion, Flooding, *Coastal zone.

This paper concerns the run-up and inundation characteristics of tsynami surges. The forces and moments produced by the waves are not discussed, however, the proposed technique does provide the necessary information for their determination. The method relies on the knowledge of the wave elevation at the coast (as determined from historical data or other means) and an estimation of the bed roughness. The considerations and calculations involved in determining these parameters are discussed in detail. Twenty-four observed run-ups on the island of Hawaii in the case of the 1946 Aleutian tsunami, and 18 run-ups on the island of Maui for the Chilean 1960 tsunami are used to illustrate the technique. Methods are also presented to predict the shoreline heights and extent of inundation of tsunami surges where historical data is not available. (NOAA)
W78-04966

NEAR-BOTTOM WATER MOTION UNDER OCEAN WAVES,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-04967

HURRICANE WIND AND WAVE FORECASTING TECHNIQUES,
Hawaii Univ., Honolulu. Dept. of Ocean Engineering.
C. L. Bretschneider, and E. E. Tamaye.
Sea Grant Reprint No. UNIHI-SEAGRANT-CP-77-01, Reprinted from: Proceedings 15th Coastal Engineering Conference held Honolulu, Hawaii, July 11-17, 1976. (ASCE), Chap 13, p 202-237. 15 fig, 5 tab, 24 ref.

Descriptors: *Hurricanes, *Forecasting, *Winds, *Ocean waves, *Hawaii, Shore protection, Erosion, Sedimentation, *Ocean wave spectra, Water waves, Wave forecasting, Wind forecasting, Hurricane Camille.

The various methods of wave forecasting are summarized briefly including wave spectra and its application to hurricane waves. A method is presented for determining hurricane wind fields and resulting deep water wave field. As a hurricane approaches the land, the winds are reduced by 1% per mile within 10 miles of the coast and correspondingly the waves are decreased in height, except very close to shore where the waves begin to break. However, the effect of the Islands is fairly negligible since their extent is small compared to that of the hurricane. Therefore, it is reasonable to expect significant waves of up to 30 feet and greater in height with 60 knot (69 mph) winds. In addition, instantaneous gusts of 84 knots (97 mph) may occur, and individual maximum waves could exceed 50 feet in height. Winds in the usually windy Pali (cliff) on the Island of Oahu can be expected to exceed 87 knots (100 mph). (NOAA)
W78-04968

PROJECT DEVELOPMENT AND TECHNICAL DEVELOPMENT PLAN. NEW YORK BIGHT PROJECT.
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 5G.
W78-04969

COASTAL LAGOON PLANKTON II. ANNUAL CYCLE IN YAVAROS LAGOON (1969-1970), (IN SPANISH),
Universidad Nacional Autonoma de Mexico, Mexico City. Lab. Plancton y Prod.
S. G. Aguirre, H. Santoyo, and A. Martinez.
An Inst Biol Univ Nac Auton Mex SER Zool 45(1), p 1-30, 1974. (Engl. summ.).

Descriptors: Annual cycles, *Coastal lagoons, Density, *Mexico, *Phytoplankton, Plankton, Salinity, Temperature, Tidal rhythms, *Zooplankton, *Yavaros Lagoon(Mexico), Summer.

A study of the plankton of Yavaros Lagoon, Sonora, Mexico was undertaken during 1969-1970 at 4 fixed stations. Estimates of the density of phytoplankton (cells/l) were made by the Utermohl method and zooplankton were sampled by net. The composition of phyto- and zooplankton and their relative daily and annual variations with respect to temperature and salinity were also studied. Plankton density was regulated by tidal rhythms. Summer was the time of greatest hydrological stability in the lagoon.--Copyright 1977, Biological Abstracts, Inc.
W78-04970

REPORT TO THE CONGRESS ON OCEAN POLLUTION, OVERFISHING, AND OFFSHORE DEVELOPMENT.
National Oceanic and Atmospheric Administration, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-04972

FRESHWATER AND THE FLORIDA COAST: SOUTHWEST FLORIDA,
State Univ. System of Florida Sea Grant Program, Gainesville; and Southwest Florida Water Management District, Brooksville.
W. Seaman, Jr., and R. McLean.
Sea Grant Program Report No 22, October 1977. Proceedings of a Seminar held in Tampa, Florida on May 26-27, 1977. 234 p. Also as Southwest Florida Water Management District Report No. 1977-1.

Descriptors: *Coasts, *Florida, *Estuaries, *Water management(Applied), *Groundwater, *Freshwater, Mathematical models, Ecosystems, Economics, *Conferences, Resources management.

Thirteen papers constitute the proceedings of the Seminar on Freshwater and the Florida Coast sponsored by the Southwest Florida Water Management District, held in Tampa, Florida on May 26-27, 1977. The subjects encompassed are reflected in the following topics: General description and water requirement of the District; an overview of the estuaries within the District; development and the hydrology and geohydrology of coastal drainage basins; a review and evaluation of selected numerical models for coastal zone water management; freshwater and the Florida coast; groundwater flow; the marine ecosystem from an engineering viewpoint; the role of freshwater in an estuary; the estuary--what's it to you,; the estuary viewed as a dynanmic system; some relationships between river flow, estuarine characteristics, and economics in a Florida Gulf coast region; the coastal zone: multi-use resource allocation and intitutional failure, and economics of water problems. (NOAA)
W78-04973

DEVELOPMENT AND OPERATION OF HF OCEAN CURRENT MAPPING RADAR UNITS,
National Oceanic and Atmospheric Administration, Seattle, WA. Wave Propagation Lab.
D. E. Barrick.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 14. Transport, p 1-9, March 1977. 2 fig.

Descriptors: *Ocean currents, *Mapping, *Baseline studies, Florida, Alaska, *Outer Continental Shelf, Current measurements, Gulf stream.

The first simultaneous two-site data were obtained in mid-October of 1976. Surface currents maps were generated by combining the data from the two sites, one at Fort Lauderdale and one at South Mission Beach. This map shows surface currents consistent with previously measured Gulf-Stream flows in the area off the southern coast of Florida. To this date, two-site data have been taken on October 19, 20, 26, 27, 28, 29, 30 and December 14.

At this time, there is no direct supporting surface current measurements made during radar operations. However, the results are consistent with the general magnitudes, directions, and shear of the Gulf Stream in that area, giving confidence that the radar system and data processing techniques are working properly. (Sinha-OEIS)
W78-04974

SURFACE CURRENTS OF THE NORTHEAST CHUKCHI SEA,
Bureau of Land Management, Groton, CT.
For primary bibliographic entry see Field 5B.
W78-04975

CURRENT MEASUREMENT IN POSSIBLE DISPERSAL REGIONS OF THE BEAUFORT SEA,
Washington Univ., Seattle. Dept. of Oceanography; and Washington Univ., Seattle. Applied Physics Lab.
For primary bibliographic entry see Field 5B.
W78-04976

GULF OF ALASKA STUDY OF MESOSCALE OCEANOGRAPHIC PROCESSES (GAS-MOP),
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W78-04978

NUMERICAL STUDIES OF ALASKAN REGION,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W78-04979

BRISTOL BAY OCEANOGRAPHIC PROCESSES (B-BOP),
National Oceanic and Atmospheric Administration, Boulder, CO. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W78-04980

STD MEASUREMENTS IN POSSIBLE DISPOERSAL REGIONS OF THE BEAUFORT SEA,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-04981

YUKON DELTA COASTAL PROCESSES STUDY,
Houston Univ., Houston, TX. Dept. of Geology.
W. R. Dupre.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 14. Transport, p 580-553, March 1977. 10 fig, 31 ref.

Descriptors: *Deltas, *Tectonics, *Baseline studies, *Resources development, Marine geology, Alaska, Volcanoes, Oil pollution, Coasts, Pollutant transport, Outer Continental Shelf, Yukon Delta.

The Yukon-Kuskokwim delta region is characterized by widespread Quaternary tectonism. Northwest- and northeast-trending faults and structurally-controlled volcanic vents are mainly restricted to the onshore extension of the Nunivak Arch. Many of the northeast-trending faults may actually represent the slivering of the Kaltag fault, previously projected to the north of the delta. At least some of these faults appear to have had Holocene movement. The age of the volcanism is less certain, but most, if not all, of the activity appears to be pre-Holocene. The presence of extensive permafrost is evident by an abundance of geomorphic criteria as well as in field investigations. Flooding and river bank erosion along both the Yukon and Kuskokwim Rivers is strongly affected by the climatic extremes of this subpolar region. The largest floods are associated with ice breakup on the river, often accentuated by the effects of breached ice jams which form locally. Extreme floods may actually result in the complete diversion of the Yukon River, with disastrous consequences. Such events have occurred repeatedly during the Pleistocene; the most recent may have occurred only 1200 years ago. (Sinha-OEIS)
W78-04982

LAGRANGIAN SURFACE CURRENT MEASUREMENTS ON THE OUTER CONTINENTAL SHELF,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 5B.
W78-04983

EXPERIMENTAL MEASUREMENTS OF SEA ICE FAILURE STRESSES NEAR GROUNDED STRUCTURES,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W78-04987

BEAUFORT SEA, SHUKCHI SEA, AND BERING STRAIT BASELINE ICE STUDY,
Alaska Univ., College.
For primary bibliographic entry see Field 2C.
W78-04988

OPERATION OF AN ALASKAN FACILITY FOR APPLICATIONS OF REMOTE-SENSING DATA TO OCS STUDIES,
Alaska Univ., College. Geophysical Inst.
A. E. Belon.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 15. Transport, p 242-269, March 1977. 10 fig.

Descriptors: *Baseline studies, *Resources development, *Remote sensing, *Data processing, Alaska, Sea ice, Geomorphology, Sediment transport, Photography, *Outer Continental Shelf.

The principal objective of the project was to make remote-sensing data, processing facilities and interpretation techniques available to the OCS investigators so that the promising applications and cost effectiveness of remote-sensing techniques can be incorporated in their disciplinary investigations. The principal result of the project is that there now exists at the University of Alaska an operational facility for applications of remote-sensing data to OCS studies. It consists of: (1) A remote-sensing data library which routinely acquires, catalogs and disseminates information on Landsat and NOAA satellite imagery and aircraft imagery of the Alaskan continental shelf. (2) A remote-sensing data processing laboratory which provides specialized instrumentation for the photographic reproduction and optical or digital analysis of remote-sensing data of various types and formats. (3) A team of specialists that generates and develops techniques of remote-sensing data analysis and interpretation which appear to be particularly well-suited for OCS studies. (4) A staff that is continually available to OCS investigators for consultation and assistance in searching for, processing and interpreting remote-sensing data for their disciplinary investigations. (Sinha-OEIS)
W78-04990

CIRCULATION AND WATER MASSES IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science
T. C. Royer.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977. Vol 15. Transport, p 270-378, March 1977. 58 fig, 2 tab, 14 ref, 2 append. 03-5-022-56.

Descriptors: *Baseline studies, *Resources development, *Water masses, Circulation, Water pollution, *Outer Continental Shelf, *Gulf of Alaska, Pollutant transport, Oil and gas resources

To define the physical-chemical environment, transports of pollutants and to establish the long-term monitoring of the physical-chemical environment in the Gulf of Alaska were the objectives of this study. The main conclusion from this year's work is that the shelf region around the Gulf of Alaska has many identifiable local circulation regimes, that is, distinctions in shelf flow can be made from one location to another. Four different regimes have been identified in the Northeast Gulf of Alaska. The implications of the findings of this research with respect to oil and gas development are that the shelf flows in the Gulf of Alaska are spatially variable but yet interconnected. This variability allows currents in excess of 2 knots to be found in the vicinity of countercurrents of low speed. Since regions of low flow are often identified with high biological productivity and long residence times, these represent especially critical regions in terms of oil and gas development. (Sinha-OEIS)
W78-04991

MARINE CLIMATOLOGY OF THE GULF OF ALASKA, THE BERING AND BEAUFORT SEAS,
Alaska Univ., Anchorage. Arctic Environmental Information and Data Center.
For primary bibliographic entry see Field 2B.
W78-04992

CLIMATIC ATLAS OF THE OUTER CONTINENTAL SHELF WATERS AND COASTAL REGIONS OF ALASKA,
Alaska Univ., Anchorage. Arctic Environmental Information and Data Center; and National Climatic Center, Ashville, NC.
For primary bibliographic entry see Field 2B.
W78-04993

NEAR-SHORE METEOROLOGY,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 2L.
W78-04994

NEAR-SHORE METEOROLOGY,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
R. M. Reynolds, and B. Walter.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977. Vol 15. Transport, p 406-490, March 1977. 19 fig, 4 tab, 18 ref, append.

Descriptors: *Baseline studies, *Resources development, *Meteorology, Winds, Meteorological data, Alaska, Model studies, Outer Continental Shelf, Surface winds, Pollutant transport, Gulf of Alaska.

Many near-surface meteorological processes act to modify the surface winds in the coastal regions of Alaska. The modification is generally extensive enough to seriously affect any attempts at relating synoptic weather maps to surface conditions.

Further from shore, the lower continental air becomes modified by both the warmer seas and upper-level entrainment of the air above, thus altering its speed and direction. The oceanic water near the surface is strongly influenced by the surface stress. As the wind makes a change in speed or direction, the water near the surface is strongly affected almost immediately. Then, with time, the momentum change diffuses downward, modifying the interior flow on a much larger time scale. The flow at depth in the oceanic mixed layer is thus related to a weighted average of past winds; in effect, its response is analogous to a low-pass filter whose cutoff frequency increases as the surface is approached. A thorough knowledge of coastal wind conditions are an important consideration in offshore industrial development through its effects both on mean flow and the trajectory of surface contaminants. This study is designed to define which processes are acting to modify coastal winds, how prevalent they are, and how far off shore they act. In addition, a study of computer simulation of coastal meteorological conditions has been undertaken to assess the applicability of a numerical model in making predictions of coastal winds. (Sinha-OEIS)
W78-04994

A STUDY OF BEAUFORT SEA COASTAL EROSION NORTHERN ALASKA,
For primary bibliographic entry see Field 2J.
W78-04995

MODELING OF TIDES AND CIRCULATIONS OF THE BERING SEA,
Rand Corp., Santa Monica, CA.
J. J. Leendertse, and S. K. Liu.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977. Vol 15. Transport, p 529-537, March 1977. 6 fig, 3 ref.

Descriptors: *Baseline studies, *Resources development, Circulation, Tides, *Model studies, Alaska, *Outer Continental Shelf, *Bering Sea, Pollutant transport.

The work pertains mainly to setting up of a model of the Eastern Bering Sea, developing the programs to effectively run the model, and making some initial adjustments to obtain an approximate agreement of water levels and flows in the model and in nature. It was determined that a model of the Bering Sea as a whole is probably too coarse to resolve the circulation in Bristol Bay and Norton Sound, where proposed oil-lease areas are located. It appears more desirable to model these areas separately. The model to be used in this study is a three-dimensional finite difference model. It computes water levels, currents, salinity distributions and temperature distributions from boundary data inputs and initial conditions on a three-dimensional grid system. (Sinha-OEIS)
W78-04996

NORTON SOUND/CHUKCHI SEA OCEANOGRAPHIC PROCESSES (N-COP),
Washington Univ., Seattle. Dept. of Oceanography; and National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
L. K. Coachman, R. L. Charnell, J. D. Schumacher, K. Aagaard, and R. D. Muench.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977. Vol 15. Transport, p 579-660, March 1977. 45 fig, 3 tab, 10 ref.

Descriptors: *Baseline studies, *Resources development, *Circulation, *Advection, *Diffusion, Oceanography, Water pollution, Alaska, Oil pollution, *Outer Continental Shelf, Norton Sound, Chukchi Sea, Pollutant transport, Petroleum development.

The circulation in Norton Sound was analyzed from the cruise data of 26 September to 6 October. The general flow in the western two-thirds of the Sound was cyclonic, and the bathymetry appears to be important in guiding the flow. There was inflow from the west near bottom in the two deeper troughs, and strong vertical mixing particularly in the northern trough off Nome where there was concentrated an intense westerly outflow. A two-layered density system reflected presence of upper and lower turbulent boundary layers. The pycnocline suppressed vertical heat flux, and in the eastern basin isolated the coldest bottom water. Water exchange with the western basin was very slow and appeared to be lateral diffusion rather than advection. Four anchored 24-hour stations including direct current measurements showed (1) the strong relationship between flow and the local winds and (2) internal waves on the pycnocline of 2-3 m amplitude and of tidal and higher frequencies. Preliminary analysis of Kotzebue Sound showed similarities to Norton Sound. (Sinha-OEIS)
W78-04998

SEA-SURFACE TEMPERATURE AND SALINITY MAPPING FROM REMOTE MICROWAVE RADIOMETRIC MEASUREMENTS OF BRIGHTNESS TEMPERATURE,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
H.-J. Blume, B. M. Kendall, and J. C. Fedors.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA TP-1077, Price codes: A03 in paper copy, A01 in microfiche. Report No. NASA TP-1077, December 1977. 26 p, 9 fig, 4 tab, 16 ref.

Descriptors: *Salinity, *Microwaves, *Radiometer, Surface waters, *Remote sensing, Estuarine environment, Chesapeake Bay, Atlantic Ocean, Oceanography, Water temperature, *Sea-surface temperature, *Brightness temperature, *Radiometer.

A remote dual-frequency microwave radiometer was utilized in flight measurements from an aircraft at an altitude of 1.4 km over the lower Chesapeake Bay and coastal areas of the Atlantic Ocean. The radiometers, operating at 1.43 GHz (optimal frequency for salinity measurements) and 2.65 GHz (optimal for temperature measurements), comprise a third-generation system using null balancing and feedback noise injection. The use of a dual-frequency microwave radiometer was advantageous since it could operated at night and probe through clouds. Accuracies in temperature of 1 degree and in salinity of 1 part per thousand for salinity greater than 5 parts per thousand were attained after correcting for the influence of extraterrestrial background radiation, atmospheric radiation and attenuation, sea-surface roughness, and antenna beamwidth. (Seip-IPA)
W78-05017

DECREASE IN HARBOR MAINTENANCE DREDGING THROUGH THE USE OF PILE DIKES AND RELATED STRUCTURES TOGETHER WITH AN ANALYSIS OF ESTUARINE SEDIMENTATION PROBLEMS,
Naval Academy Annapolis, MD. Dept. of Oceanography.
For primary bibliographic entry see Field 8B.
W78-05050

TRACE METALS IN ORGANISMS FROM OCEAN DISPOSAL SITES OF THE MIDDLE EASTERN UNITED STATES,
National Marine Fisheries Service, Milford, CT. Milford Lab.
For primary bibliographic entry see Field 5A.
W78-05059

INTERACTIONS BETWEEN ZINC AND SUSPENDED SEDIMENTS IN THE FRASER RIVER ESTUARY, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
For primary bibliographic entry see Field 5A.
W78-05061

THE INVASION OF SAURIDA UNDOSQUAMIS (RICHARDSON) INTO THE LEVANT BASIN: AN EXAMPLE OF BIOLOGICAL EFFECT OF INTEROCEANIC CANALS,
Fisheries Technology Unit, Haifa (Israel).
For primary bibliographic entry see Field 5C.
W78-05062

HEAVY METALS FROM WASTE DISPOSAL IN CENTRAL PUGET SOUND,
Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 5B.
W78-05073

EFFECTS OF SALINITY AND ILLUMINATION ON PHOTOSYNTHESIS AND WATER BALANCE OF SPARTINA ALTERNIFLORA LOISEL,
Duke Univ., Durham NC. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-05077

AN ECOLOGICAL SURVEY OF THE HEAVY METAL CONTAMINATION OF THE EDIBLE CLAM PAPHIA SP. ON THE IRON-ORE TAILINGS OF TOLO HARBOUR, HONG KONG,
Chinese Univ. of Hong Kong. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-05078

POLYCHLORINATED BIPHENYLS IN COTTIDS, MUSSELS, AND SEDIMENT IN SOUTHERN PUGET SOUND, WASHINGTON,
Evergreen State Coll., Olympia, WA.
For primary bibliographic entry see Field 5C.
W78-05084

ECOLOGICAL COMPARISONS BETWEEN A FRESH-WATER TIDAL MARSH AND ADJOINING IMPOUNDMENT IN SOUTHEASTERN PENNSYLVANIA,
Pennsylvania State Univ., University Park. School of Forestry.
C. W. Schwartz.
M.S. Thesis, November, 1976. 77 p, 6 fig, 20 tab, 28 ref.

Descriptors: *Tidal marshes, *Wildlife management, *Waterfowl, *Productivity, *Recreation, *Habitat improvement, *Marsh management, Wetlands, Marshes, *Pennsylvania, Impoundments, Fish management, Black duck, Mallard duck, Canada goose, Shore birds, Water birds, Game birds, Water quality, Nitrogen, Nesting, Nesting cover, Recreation demands, Aesthetics, *Tinicum Marsh, Tinicum National Environmental Center.

Tinicum Marsh is Pennsylvania's largest tidal marsh and is located in a heavily urbanized area. A study was initiated to evaluate the marsh prior to management and provide a base line for monitoring future changes. Six water quality parameters (temperature, oxygen, pH, orthophosphate, nitrates, nitrites) were measured. Orthophosphate and nitrite were greater in the tidal marsh than in the impoundment due to large amounts of sewage released into the area. All other parameters were similar. Neither area is capable of supporting a healthy, diverse fishery. Recorded waterfowl production was not extensive in either area and has been decreasing since 1958. Small numbers of

Canada geese, mallards, and black ducks continue to reproduce there. The major waterfowl use occurs in the impoundment during the winter, nearly all wintering birds were dabbling ducks. Summer waterfowl use was equally divided between the impoundment and tidal marsh. Use by water birds was greater in the impoundment while shorebird use was higher in the marsh due to the greater abundance of mud flats. Most use occurred in the early morning and late evening when human use was light. (Steiner-Mass)
W78-05090

ECOLOGY OF A NEW ENGLAND SALT MARSH,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W78-05093

MEASUREMENTS BY GEOMAGNETIC INDUCTION OF VOLUME TRANSPORT IN A SALT MARSH DRAINAGE CHANNEL,
Woods Hole Oceanographic Institution, MA.
T. B. Sanford.
Limnology and Oceanography, Vol 22, No 5, p 1082-1089, December, 1977. 5 fig, 15 ref.

Descriptors: *Salt marshes, *Drainage, *Flow measurement, *Magnetic studies, Wetlands, Tidal marshes, Drainage water, Nutrients, Cycling nutrients, Volumetric analysis, Sea water, Channels, Zeta potential, Water measurement, Current meters, *Geomagnetic induction.

Volume transport of seawater through a salt marsh drainage channel is obtained by geomagnetic induction. The electric potential difference across the channel is interpreted in terms of water motion through the vertical component of the earth's magnetic field. A model is formulated relating volume transport to induced potential differences and a salt bridge technique described for measuring weak voltages. Calibration requires independent measurements of the volume transport. Using surface flow, rather than volume transport, for calibration results in method errors as large as 25%. Calibration against directly measured volume transport would reduce these errors. (Steiner-Mass)
W78-05094

AN OUTDOOR MODEL SIMULATING A BALTIC SEA LITTORAL ECOSYSTEM,
Swedish Water and Air Pollution Research Lab. Stockholm.
For primary bibliographic entry see Field 5C.
W78-05096

WETLAND INVENTORY, ONEIDA COUNTY, NEW YORK,
Oneida County Environmental Management Council, Utica, NY.
For primary bibliographic entry see Field 6G.
W78-05099

THE VEGETATION OF BRITISH INLAND SALT MARSHES,
Manchester Univ. (England) Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-05100

BARATARIA BASIN EUTROPHICATION CASE HISTORY,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
For primary bibliographic entry see Field 5C.
W78-05108

GROUNDWATER AND NEARSHORE HYPOSALINE CONDITIONS AT FANNING ISLAND DURING A PERIOD OF HIGHER THAN NORMAL RAINFALL,
Hawaii Univ., Honolulu. Dept. of Zoology.
For primary bibliographic entry see Field 2F.
W78-05110

PRELIMINARY REPORT TO INTERNATIONAL DECADE OF OCEAN EXPLORATION (IDOE) ON THE POSSIBLE EFFECTS OF THE CERATIUM TRIPOS BLOOM IN THE NEW YORK BIGHT, MARCH-JULY 1976,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
For primary bibliographic entry see Field 5C.
W78-05126

APONIN, A CYTOLYTIC FACTOR TOWARD THE RED TIDE ORGANISM, GYMNODINIUM BREVE. BIOLOGICAL ASSAY AND PRELIMINARY CHARACTERIZATION,
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W78-05128

THE ISLAND MASS EFFECT ON THE PHYTOPLANKTON AND PRIMARY PRODUCTION OF THE HAWAIIAN ISLANDS,
Australian Inst. of Marine Sciences, Townsville.
For primary bibliographic entry see Field 5C.
W78-05158

FACTORS AFFECTING THE SEASONAL ABUNDANCE, COMPOSITION AND DIVERSITY OF FISHES IN A SOUTHEASTERN NEW ENGLAND ESTUARY,
Southeastern Massachusetts Univ., North Dartmouth.
J. G. Hoff, and R. M. Ibara.
Estuarine and Coastal Marine Science, Vol 5, p 665-678, 1977. 9 fig, 1 tab, 22 ref.

Descriptors: *Seasonal, *Annual succession, *Salinity, *Biological communities, *Fish population, *Water temperature, *Estuaries, Sampling, Temperature, Massa drusetts, Annual populations, Marine fish, *Estuarine fisheries, Slocum River, Buzzards Bay, Mid-Atlantic states.

Fish communities in the Slocum River, Buzzards Bay, Massachusetts were sampled over a 2-year period. Physical variables were measured when each of the 221 seine hauls were taken. The measures of species diversity were computed for each month and the physical and biological data were subjected to factor analysis. Temperature was overall the most important physical factor while salinity was most important within seasons. The other physical variables measured were generally intercorrelated with temperature of with salinity and had by themselves no discernible effect on the abundance, composition, or diversity of the fishes. (Katz)
W78-05179

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

WATER: THE WELLS NEED NEVER RUN DRY,
For primary bibliographic entry see Field 4B.
W78-04929

3B. Water Yield Improvement

EVALUATION OF WATER APPLICATION AND TRAFFICABILITY OF CENTER-PIVOT IRRIGATION SYSTEMS,
Oklahoma State Univ., Stillwater Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W78-04706

3C. Use Of Water Of Impaired Quality

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER: PART I. SOIL-WATER QUALITY AND VEGETATIVE RESPONSES,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-04704

EFFECT OF FUNGICIDE RATE, SPRAY INTERVAL; TIMING OF SPRAY APPLICATION, AND PRECIPITATION IN RELATION TO CONTROL OF PHYTOPHTHORA LEAF BLIGHT OF TARO,
Hawaii Univ., Honolulu. Dept. of Plant Pathology.
R. R. Bergquist.
Ann Bot (Lond). 38(154), p 213-221, 1974.

Descriptors: *Carbamates, *Colocasia-esculenta, *Fungicides, *Hawaii, *Leaf bight, M-45, *Phytophthora leaf bight, Phytophthora-colocasiae, *Rainfall, Spray application, Temperature.

Three fungicide rates 4.48, 2.24, and 1.12 kg/ha, and 4 spray intervals, 5-,7-,10- and 14-day intervals, were investigated for the control of Phytophthora (colocasiae) leaf blight of taro (Colocasia esculenta) in a subtropical field environment in Hawaii. The fungicide rate was studied in 2 separate locations on the windward sides of the island of Kauai. The fungicide utilized in these experiments was a co-ordination product of Zn ion and Mn ethylene bisdithiocarbanmate (Dithane M-45, 80% WP). In the lower rainfall location, there was no difference due to different fungicide rates while in the wetter location, the 4.48 kg/ha rate gave better control than the 1.12 kg/ha rate. There was no difference between the 5-, 7-, and 10-day spray intervals but when compared with the 14-day interval, the 5-day interval was superior. Periods of increased rainfall were reflected in the following wk by increased lesion counts. Present data indicate that rainfall is a major factor to consider as a basis for predicting disease occurrences and may be utilized for planning interval of fungicide application. The amount of disease was a function of initial disease levels, rainfall, temperature, relative humidity, fungicide rate and spray interval between fungicide applications. Applications of fungicide at weekly intervals when weekly rainfall accumulation exceeded 1 cm/wk and/or when lesion counts exceeded more than 1/plant gave substantial disease control. Thus, once these parameters of disease have been established, fungicide application could be governed conveniently by monitoring rainfall and disease incidence to achieve practical Phytophthora leaf blight control. The 2.24 and 4.48 kg ha -1 rates gave significant yield increases over the 1.12 and check (no fungicide) treatments where Phytophthora leaf blight occurred in epidemic proportions.--Copyright 1974, Biological Abstracts, Inc.
W78-04764

AN ECONOMIC ANALYSIS OF OPTIMAL INVESTMENT SCHEDULING FOR SALINITY CONTROL IN THE COLORADO RIVER,
California Univ., Berkeley. Dept. of Civil Engineering: California Univ., Berkeley. Graduate School of Management.
For primary bibliographic entry see Field 5G.
W78-04817

ARID ZONE IRRIGATION, ECOLOGICAL STUDIES: ANALYSIS AND SYNTHESIS, VOL. 5,
For primary bibliographic entry see Field 3F.
W78-04926

GENOTYPIC RESPONSES TO SALINITY,
California Univ., Davis. Dept. of Land, Air and Water Resources.
D. W. Rush, and E. Epstein.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 720, Price codes: A02 in paper copy, A01 in microfiche. Plant Physiology, Vol 57, p 162-166, 1976. 2 fig, 5 tab, 13 ref.

Descriptors: *Salt tolerance, *Tomatoes, *Ecotypes, *Plant growth, Salinity, Growth rates, Saline water, Plant physiology, Biochemistry, Sea water, Potassium, Amino acids, Sodium, Galapagos Islands, Lycopersicon cheesmanii, Lycopersicon esculentum, Sugars, Electrical conductivity.

A study was made of the differences between salt-sensitive and salt-tolerant genotypes of the tomato. Four ecotypes of the species Lycopersicon cheesmanii, ssp. minor (Hook) C.H. Mull. from the Galapagos Islands were compared with L. esculentum Mill cv. VF 36 with respect to salt tolerance. The L. cheesmanii ecotype that proved most salt tolerant was selected for detailed comparison with the L. esculentum cultivar. Growth rates under saline conditions were examined and amino acid, sugar, total amino nitrogen, free acidity, and Na and K levels in the tissues of the most and least tolerant plants were measured under salt stress and non-stress conditions. Results indicate that all Galapagos ecotypes were far more salt-tolerant than was the esculentum cultivar. They could survive in full strength seawater nutrient solution while the esculentum cultivar could not in most cases survive levels higher than 50%. (Castricone-Arizona)
W78-04928

WATER QUALITY AND SOIL PROPERTIES: WATER QUALITY AND ITS EFFECT ON THE PROPERTIES OF LIGHT TEXTURED SOILS,
Rajasthan Coll. of Agriculture, Jaipur (India). Dept. of Soil Science and Agricultural Chemistry.
For primary bibliographic entry see Field 2G.
W78-04930

LIMNOLOGIC STUDIES ON THE COLORADO RIVER FROM LEE'S FERRY TO DIAMOND CREEK,
Arizona State Univ., Tempe. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-05003

WATER SUPPLY DILEMMAS OF GEOTHERMAL DEVELOPMENT IN THE IMPERIAL VALLEY OF CALIFORNIA,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 4B.
W78-05028

SOIL SALINITY- FOUR-ELECTRODE CONDUCTIVITY RELATIONSHIPS FOR SOILS OF THE NORTHERN GREAT PLAINS,
Agricultural Research Service, Sidney, MT.
For primary bibliographic entry see Field 2G.
W78-05046

QUANTITY AND QUALITY CONSIDERATIONS FOR WATER USE EFFICIENCY IN IRRIGATION,
Texas Tech Univ., Lubbock. Dept. of Plant and Soil Science; and Texas Tech Univ., Lubbock. Dept. of Biological Sciences.
For primary bibliographic entry see Field 3F.
W78-05054

3D. Conservation In Domestic and Municipal Use

ACHIEVING URBAN WATER CONSERVATION--A HANDBOOK,
Colorado Univ., Boulder. Dept. of Civil, Environmental and Architectural Engineering.
J. E. Flack, W. P. Weakley, and D. W. Hill.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 174, Price codes: A10 in paper copy, A01 in microfiche. Colorado Water Resources Research Institute, Environmental Resources Center, Ft. Collins, Completion Report No. 80 (Part I), September 1977. 207 p, 11 fig, 43 tab, 113 ref, 5 append. OWRT A-030-COLO(Part I) (3).

Descriptors: Cities, *Planning, *Water supply, Costs, Economics, Prices, Conservation, Demand, *Utilities, *Water conservation, Direct reuse, Water consumption, Water requirements, *Cost comparisons, Elasticity of demand, Water rates, Water reuse, *Water demand, *Colorado, *Feasibility studies, *City planning, Denver(Colo), Lyons(Colo), *Water utilization.

This study concerned the feasibility of using various water conservation measures to reduce urban water demand. Focusing on residential water use, ten conservation techniques were found to be relevant. Structural means such as meters, recycle systems, water saving devices and flow and pressure reducers were evaluated. System and household leakage and water use restrictions were among the operations means investigated. Codes, public education, pricing, and horticultural changes were social and economic means studied. Water demand reductions of up to 35 to 40% were possible using combinations of these water conservation methods. A procedure for determining a technically feasible program of conservation acceptable to water users was developed. Application of these procedures by a water utility will permit design of an acceptable water conservation program whose implementation will result in predictable water savings. (See also W78-04703)
W78-04702

ACHIEVING URBAN WATER CONSERVATION: TESTING COMMUNITY ACCEPTANCE,
Colorado State Univ., Fort Collins. Dept. of Political Science.
R. W. Snodgrass, and D. W. Hill.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 189, Price codes: A10 in paper copy, A01 in microfiche. Colorado Water Resources Research Institute, Environmental Resources Center, Ft. Collins, Completion Report No. 81 (Part II), September 1977. 205 p, 15 fig, 21 tab, 83 ref. A-030-COLO(3) (Part II).

Descriptors: Cities, Planning, *Water supply, Costs, Economics, Prices, Conservation, Demand, *Utilities, Direct reuse, Surveys, Water consumption, Water requirements, *Cost comparisons, Elasticity of demand, Water rates, *Colorado, *Attitudes, *Water conservation, *Water demand, Water reuse, Water utilization, *City planning, Denver(Colo), Lyons(Colo), Social participation, Community development, Public participation.

Employing a Q-Sort Factor Analytical Design, this study sought to develop a system for parametric representation of non-linear data structures using data acquired from representative samples of entire communities. The representations are specified in terms of a spatial metric 'social space,' an analog of psychological space. The defined social space is then characterized and used to define the community action zone which is hypothesized to a zone of community acceptance for those policies falling within its bounds. Such a zone for the communities of Lafayette and Louisville, Colorado was used to define socially and politically feasible water conservation policies for the communities. Policies with the highest feasibility for acceptance were legal restrictions on water use and restrictions on growth and development. The next most feasible were horticultural techniques and economic solutions. Reuse for agricultural purposes also appeared to have some political feasibility. This study demonstrated the usefullness of survey research in delineating viable water conservation programs. (See also W78-04702)
W78-04703

RAPID CITY COMBATS THE EFFECTS OF URBAN RUNOFF ON SURFACE WATER,
Environmental Protection Agency, Pierre, SD.
For primary bibliographic entry see Field 5B.
W78-05044

3E. Conservation In Industry

DECISION STRUCTURE FOR ASSESSMENT OF THE ECONOMIC IMPACT OF WATER QUALITY STRATEGIES IN AN INDUSTRIAL WATERSHED,
Wisconsin Univ.-Madison Dept. of Real Estate and Urban Land Economics.
For primary bibliographic entry see Field 5G.
W78-04701

GROUND-WATER RESOURCES OF COLQUITT COUNTY, GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04875

GRANULATION OF COMPLEX FERTILIZERS CONTAINING AMMONIUM SULFATE BY MELT TECHNOLOGY,
Ferguson Industries, Dallas, TX.
For primary bibliographic entry see Field 5G.
W78-05118

3F. Conservation In Agriculture

EVALUATION OF WATER APPLICATION AND TRAFFICABILITY OF CENTER-PIVOT IRRIGATION SYSTEMS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
A. D. Barefoot.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 173, Price codes: A03 in paper copy, A01 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, January 1978. 42 p, 7 fig, 8 tab, 16 ref. OWRT A-062 OKLA(1), 14-34-0001-6037.

Descriptors: *Spray nozzle, *Center-pivot irrigation, Pressure, *Evaporation, Low trajectory, *Irrigation practices, *Irrigation efficiency, Application rates, *Sprinkler irrigation, Reduced pressure.

Spray distribution obtained from a single stationary sprinkler head was utilized to determine the effects of reduced operating pressure on evaporation loss, uniformity of application, sprinkler spacing, and application rate of a center-pivot sprinkler

irrigation system. Patterns obtained from a spray nozzle, part circle sprinkler, 26 degree trajectory full circle sprinkler, and 6 degree trajectory full circle sprinkler were simulated to moving patterns. The 6 degree trajectory full circle sprinkler had uniformities comparable to the 26 degree trajectory full circle sprinkler with about 24 percent less evaporation loss and about seven percent less wetted diameter on the average of the four pressures. A recommendation for sprinkler spacing was made which would provide satisfactory sprinkler performances at reduced pressure. Application rates were much higher for the spray nozzle than the sprinklers.
W78-04706

EVENT-BASED FORMULATION OF WATERSHED MANAGEMENT,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 4D.
W78-04712

CONSERVATION FARM PLANNING,
Soil Conservation Service, Fort Wayne, IN.
For primary bibliographic entry see Field 4D.
W78-04723

TILLAGE AND SIMULATED RAINFALL STUDIES,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-04725

SOIL HYDRAULIC PROPERTIES DETERMINED BY INFILTRATION EXPERIMENTS AND SIMULATION,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2G.
W78-04812

EXPERIMENTAL EVALUATION OF THEORETICAL SOLUTIONS FOR SUBSURFACE DRAINAGE AND IRRIGATION,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-04828

THE POTENTIAL WIND EROSION PROBLEM IN THE UNITED STATES,
Soil Conservation Service, Washington, DC. Ecological Sciences and Technology Div.
For primary bibliographic entry see Field 4D.
W78-04838

MINIMUM TILLAGE FALLOW SYSTEMS FOR REDUCING WIND EROSION,
Nebraska Univ. Panhandle Station at Scottsbluff.
For primary bibliographic entry see Field 4D.
W78-04840

REDUCING WIND EROSION WITH BARRIERS,
Agricultural Research Service, Manhattan, KS. North Central Region.
For primary bibliographic entry see Field 4D.
W78-04841

MODELING SOIL WATER MOVEMENT INTO PLANT ROOTS,
Minnesota Univ., St. Paul. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W78-04843

IRRIGATION IN THE ALLUVIAL PLAIN OF NORTHWESTERN MISSISSIPPI, 1975,
Geological Survey, Jackson, MS. Water Resources Div.
J. A. Callahan.
Mississippi Board of Water Commissioners, (Jackson), Bulletin 77-1, 1977. 61 p, 7 fig, 20 tab, 8 ref.

Descriptors: *Irrigation, *Rice, *Agriculture, *Mississippi, *Deltas, Water yield, Groundwater, Surface waters, Water quality, Water utilization, Irrigation wells, Well data, Aquifers, *Row crops.

The alluvial plain in the northwestern part of Mississippi, commonly referred to as the 'Delta,' produces essentially all the rice and a large percentage of the row crops grown in the State. More than 95 percent of the State's irrigation is in the Delta rice is one of the main crops, and in 1975, 175,000 acres were planted. The water requirement for rice (about 6 feet) is by far the largest of any crop. It is estimated that about 1,945 mgd of water from all sources was used for rice farming in 1975. About 82 percent of the water was produced by wells, and surface water accounted for 18 percent. Irrigation of row crops was estimated at 94 mgd, of which 60 percent was ground water and 40 percent was surface water. The ground-water withdrawal rate in 1975 was 1,595 mdg for rice, 56 mgd for row crops, and 182 mgd for other purposes-- about 35 percent of the 5,200 mgd for row crops, and 182 mgd for other purposes-- about 35 percent of the 5,200 mgd which has been estimated to be available during the 122-day growing season from the Mississippi River Valley alluvial aquifer in the Yazio basin. The dissolved solids in the ground water are generally less than 500 mg/liter, but in places exceed 700 mg/liter. The water has a low sodium hazard and low to medium salinity hazard. (Woodard-USGS)
W78-04861

ESTIMATION OF DRY SEASON RUNOFF FROM RAINFALL FOR SELECTED DIVERSION IRRIGATION SYSTEM,
Govind Ballah Pant Univ. of Agriculture and Technology, Pantnagar (India). Dept. of Agricultural Engineering.
M. R. De Vera.
Philipp Agric. 56(9/10), p 340-352, 1973.

Descriptors: Diversion, *Dry season runoff, *Irrigation systems, *Rainfall, *Regression analysis, Runoff, Seasonal, Model studies, Phillipines, Estimating.

Two multiple regression models are used to relate antecedent rainfall to dry season flow of 14 rivers serving diversion irrigation systems in the Philippines. The 1st model expresses runoff as a function of the bimonthly rainfall totals in centimeters from the preceding 8 mo. and the 2nd model relies on the 2 bimonthly totals most highly correlated to flow and the number of rainy days with 25 mm or more rainfall from the preceding 6 mo. period. The models have little difference in their predictive accuracy. Although the standard error of estimate is relatively high, equations for half of the rivers studied could explain more than 60% of the variation in runoff, and for some rivers over 80% in the 2nd model. Copyright 1974, Biological Abstracts, Inc.
W78-04925

ARID ZONE IRRIGATION, ECOLOGICAL STUDIES: ANALYSIS AND SYNTHESIS, VOL. 5,
43p. Springer-Verlag: New York, N. Y., Heidelberg, W. Ger. 1973. Yaron, B., Danfors, E., Vaadia, Y. (Ed.).

Descriptors: Crops, *Ecological studies, Forage crops, Fruit crops, *Irrigation, Vegetable crops, *Arid lands, *Arid-zone soils, *Climates(Arid lands), Soils, *Soil-water-plant relationships.

Climate and arid-zone soils, Arid-zone hydrology and management of water resources are discussed. Water transport processes in the soil-plant-atmosphere continuum are described. Theoretical and practical aspects of the chemistry of irrigated soils are covered, such as nutrient supply to irrigated crops, solute movement in soils, and ion-exchange in irrigated soils. Soil survey, measurement of water status in soils, important soil characteristics relevant to irrigation, and evapotranspiration estimation are discussed in relation to irrigation design and control. Salinity problems in irrigation of arid and semi-arid zones are studied. The sprinkler, gravity and trickle irrigation systems are described. Crop water requirement, e.g. irrigation of field, fruit, vegetable and forage crops and the efficient use of water in irrigation are examined.—Copyright 1974, Biological Abstracts, Inc.
W78-04926

SOIL MOISTURE SENSING WITH AIRCRAFT OBSERVATIONS OF THE DIURNAL RANGE OF SURFACE TEMPERATURE,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 2G.
W78-05027

SEDIMENT FROM DRAINAGE SYSTEMS FOR CLAY SOILS,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W78-05030

WIND EROSION: PROCESSES AND EFFECT ON SOIL PRODUCTIVITY,
Agricultural Research Service, Manhattan, KS. North Central Region.
For primary bibliographic entry see Field 2J.
W78-05031

ESTIMATING RUNOFF FROM FURROW IRRIGATION,
Kansas State Univ., Garden City. Garden City Experiment Station.
F. E. Ohmes, and H. L. Manges.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 6, p 1089-1092, November-December 1977. 3 fig, 2 tab, 6 ref. EPA 13040DAT.

Descriptors: *Runoff, *Furrow irrigation, *Kansas, *Hydrographs, On-site tests, Theoretical analysis, Analytical techniques, Inflow, Model studies, Mathematical models, Hydrograph analysis, Infiltration rates, Return flow.

Inflow into and outflow from furrows during irrigation were measured. Both theory and field measurements showed that runoff rates from a graded furrow can be expressed as a function of time for the rising portion of the runoff hydrograph and then becomes constant. At a minimum, only two runoff rate readings during the rising portion of the runoff hydrograph and one during the period of constant runoff rate, plus the initial runoff time, are required to evaluate the constants in the equations. The volume of runoff during furrow irrigation can be determined by integrating the two runoff rate equations with time elapsed after runoff began. (Humphreys-ISWS)
W78-05034

INCREASING WATER UTILIZATION EFFICIENCY OF A PASTURE GRASS BY INCREASING AFTERMATH THROUGH PLANT SELECTION,
South Dakota State Univ., Brookings. Dept. of Plant Science.
J. G. Ross.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 686, Price codes: A03 in paper copy, A01 in microfiche. Completion Report for Phase I and Phase II, September 1977. 45 p, 22 tab, 13 ref. OWRT A-039-SDAK(1) and A-056-SDAK(1), 14-31-0001-4042, 14-34-0001-7078.

Descriptors: *Water utilization, Land use, Plant breeding, *Forage grasses, *Bromegrass, Vegetative regrowth, *Efficiencies, *Consumptive use, Crop production, *Plant growth, Aftermath, South Dakota, Smooth bromegrass.

Maximum land utilization requires that maximum production be obtained throughout the growing season. Perennial crops such as forage grasses have the potential for production during an entire grazing season. However, most grasses have requirements for growth that limit them to early or late or part of mid-season growth. Cool season grasses now grown in the upper Great Plains area produce little forage during warm summer months even though favorable moisture and fertility conditions prevail. The reason is that these grasses have been selected naturally for summer dormancy since moisture is normally lacking under dry-land conditions. This project sought a grass which would give the greatest amount of aftermath under favorable moisture conditions. Selection has been achieved of a variety of smooth bromegrass, SD 5, which is superior in regrowth and, therefore, in water utilization efficiency, to the variety Lincoln, now recommended in South Dakota. Stand persistence of this variety under an intensive cutting regime with alfalfa would also be expected to be superior as indicated in a persistence study. This variety can be expected to increase summer yields under irrigation and under dry-land when sufficient moisture is present. Seed yield of this variety appears to be sufficient to ensure its success. (Wiersma-So Dak St)
W78-05052

QUANTITY AND QUALITY CONSIDERATIONS FOR WATER USE EFFICIENCY IN IRRIGATION,
Texas Tech Univ., Lubbock. Dept. of Plant and Soil Science; and Texas Tech Univ., Lubbock. Dept. of Biological Sciences.
D. R. Krieg, J. R. Goodin, and R. G. Stevens.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 665, Price codes: A04 in paper copy, A01 in microfiche. Final Report, August 1, 1977. 61 p, 1 fig, 19 tab, 29 ref. C-6273(No. 5225)(3).

Descriptors: *Irrigation efficiency, *Water utilization, *Irrigation scheduling, *Water use efficiency, Plant development, *Leaf water potential, Water quality, Brackish water, Salinity, Stomata, Transpiration, Water stress, Salt stress, *Plant growth, Impaired water use, *Crop production, Saline soils, Sorghum, Corn(Field), Cotton, Potatoes, Alfalfa, Atriplex, *Forage crops.

Leaf water potential can be used as a tool in irrigation scheduling to maintain high production potential and increase water use efficiency in agronomic and horticultural crops, provided crop type and stage of development are considered. Water conservation through stomatal closure was not evident in sorghum, corn, and cotton. Leaf water potential does not appear to be a useful criterion for irrigation scheduling in potato, since stomatal closure occurs under slight stress. For forage crops such as alfalfa or Atriplex, yields were reduced in proportion to increasing plant stress. Atriplex could tolerate much drier soil conditions than could alfalfa. Brackish water may represent a feasible alternative for irrigation of agronomic crops if properly managed. The duration of this project was not sufficient to determine the real significance of the use of salt water, although in the first year yield increases were observed in salt treatments compared with fresh water treatments. In the second year, yield reductions were observed, primarily due to poor seedling establishment. The perennial forage crops tolerated high soil salinities very well. Crop quality was not changed significantly by water or salt stress.
W78-05054

AIR TEMPERATURE AND VAPOR PRESSURE CHANGES CAUSED BY SPRINKLER IRRIGATION,
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.
For primary bibliographic entry see Field 2D.
W78-05086

SOIL-PLANT-WATER ASPECTS OF OZONE PHYTOTOXICITY IN TOMATO PLANTS,
Guelph Univ. (Ontario). Dept. of Horticultural Science.
For primary bibliographic entry see Field 5C.
W78-05154

POSSIBLE ENERGY SAVINGS IN IRRIGATION,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4B.
W78-05191

SUN SHINES ON A NEW IRRIGATION PROJECT.
Ground Water Age, Vol 12, No 6, p 28-29, February, 1978.

Descriptors: *Irrigation systems, *Pumping, *Solar radiation, Irrigation engineering, Costs, Nebraska.

A solar array recently constructed near Mead, Nebraska became the largest such system in the world, and will be used to power a redesigned automatic gated pipe irrigation unit that will water 80 acres of corn and soybeans. This photovoltaic system differs from the solar thermal systems utilizing organic Rankine cycle turbines which are being tested elsewhere. The array consists of two 325-foot-long rows, incorporating 120,000 individual solar cells and capable of generating 25,000 watts at the unit's peak. Large lead acid batteries will be used to store 85 kilowatts of power for off-peak operation. It is expected that the system will at times, generate more power than can be used. Plans are to hook up another load at such times or go to a power dump (large resistor bank) to dissipate surplus energy. Future plans call for testing thin solar collector ribbons which can be mounted at greater density than silicon wafers, thus helping bring costs down. Prospects for solar grain drying are also being reviewed. This project is joint effort of the University of Nebraska and Massachusetts Institute of Technology's Lincoln Laboratory. (Eberle-NWWA)
W78-05198

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

EFFECTS OF PHYTOPLANKTON ON DISSOLVED OXYGEN CONCENTRATION IN CATFISH PONDS,
Auburn Univ., AL. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W78-04710

EFFECTS OF DESTRATIFICATION ON DEPTH DISTRIBUTION OF FISH,
Oklahoma Cooperative Fishery Research Unit., Stillwater.
For primary bibliographic entry see Field 5C.
W78-04713

THE U.S. GEOLOGICAL SURVEY AND LAND USE MAPPING,
Geological Survey, Reston, VA.
For primary bibliographic entry see Field 7B.
W78-04718

TEST PLAN FOR THE LARGE-SCALE OPERATIONS MANAGEMENT TEST OF THE USE OF THE WHITE AMUR TO CONTROL AQUATIC PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
E. E. Addor, and R. F. Theriot.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 197, Price codes: A04 in paper copy, A01 in microfiche. Instruction Report A-77-1, Final report, January 1977. 67 p, 41 fig, 4 tab. A-77-1.

Descriptors: *Lake Conway(FL), *White amur, *Aquatic weed control, *Biocontrol, *Hydrilla verticillata, Florida, Ctenopharyngodon idella, Fish, Carp, Monosex fish, Ecosystem, Environmental effects.

Plans have been completed for an operational-scale test using the white amur fish (Ctenipharyngodon idella) to control the aquatic Hydrilla verticilatta. This fish, known also as the Asian grass carp, is a voracious feeder--apparently exclusively vegetarian--which shows a decided preference for hydrilla. The site chosen for the experiment is a chain of three small natural lakes collectively referred to as Lake Conway, south of Orlando in Orange County, Florida. The lakes are intensively used for fishing and water sports, but hydrila occupies 10-20% of the surface area. Middle Pool, the largest component of the chain, has an average diameter of 1.2 mi; the entire complex measures 1.9 by 2.8 mi, with a maximum depth of about 35 ft. To prevent reproduction, a monosex population (female) developed at the U.S. Department of the Interior Fish Farming Experiment Station in Stuttgart, Arkansas will be stocked. The first introduction of the fish is scheduled for March-April 1977, and background gathering of data at the stocking site is currently in progress, and will be continued for three years after stocking of the fish. The life span of the white amur is estimated at 12-15 years, and it is thought that as few as 12,000 fish will suffice to maintain desired plant control levels, which may be achievable in 3-5 years. A predictive model for environmental effects is currently being developed. (Lynch-Wisconsin)
W78-04747

CHEMICALS USED TO CONTROL FISH AND AQUATIC PLANTS IN ILLINOIS, I. AN EVALUATION OF FISH TOXICANTS.
Illinois Natural History Survey, Urbana. Aquatic Biology Section.
For primary bibliographic entry see Field 5G.
W78-04779

CHEMICALS USED TO CONTROL FISH AND AQUATIC PLANTS IN ILLINOIS, A REVIEW OF THE AQUATIC HERBICIDES USED IN ILLINOIS,
Illinois Natural History Survey, Urbana. Aquatic Biology Section.
For primary bibliographic entry see Field 5G.
W78-04780

PROBLEMS RELATED TO WATER QUALITY AND ALGAL CONTROL IN LOPEZ RESERVOIR, SAN LUIS OBISPO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 5G.
W78-04802

WATER SUPPLY AND WATER QUALITY CONTROL STUDY, STONEWALL JACKSON RESERVOIR, WEST FORK RIVER BASIN, WEST VIRGINIA.
Department of Health, Education, and Welfare, Wheeling, WV.; Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 5G.
W78-04807

WATER SUPPLY AND WATER QUALITY CONTROL STUDY, BUCK CREEK RESERVOIR, MIAMI RIVER BASIN, OHIO,
Public Health Service, Charlottesville, VA. Region III.
For primary bibliographic entry see Field 5G.
W78-04808

THE SAMPLING ERROR OF STORAGE SIZE,
Monash Univ., Clayton (Australia). Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W78-04829

THE SMALL SAMPLE EXPECTATION OF POPULATION AND ADJUSTED RANGES,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulics and Water Power.
For primary bibliographic entry see Field 2E.
W78-04830

THE SMALL SAMPLE EXPECTATION OF RESCALED POPULATION AND RESCALED ADJUSTED RANGES,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulics and Water Power.
For primary bibliographic entry see Field 2E.
W78-04831

THE LOG PEARSON TYPE 3 DISTRIBUTION: THE T-YEAR EVENT AND ITS ASYMPTOTIC STANDARD ERROR BY MAXIMUM LIKELIHOOD THEORY,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2E.
W78-04832

OHIO RIVER POWER CURVE REGRESSION EQUATIONS,
Missouri Univ., St. Louis. Dept. of Physics.
For primary bibliographic entry see Field 2E.
W78-04835

PORTABLE, ADJUSTABLE FLOW-MEASURING FLUME FOR SMALL CANALS,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
For primary bibliographic entry see Field 8B.
W78-04844

BIG THOMPSON FLOOD EXPOSES NEED FOR BETTER FLOOD REACTION SYSTEM TO SAVE LIVES,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 6F.
W78-04852

BIG THOMPSON FLOOD DAMAGE WAS SEVERE, BUT SOME COULD HAVE BEEN PREVENTED,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6F.
W78-04853

WETLAND CLASSIFICATION AND MAPPING IN WESTERN TENNESSEE,
Geological Survey, Reston, VA. Water Resources Div., and Tennessee Valley Authority, Chattanooga.
V. Carter, A. Voss, D. Malone, and W. Godsey.
In: Proceedings of the 2nd Annual William T. Pecora Memorial Symposium, held in Sioux Falls, South Dakota, October 25-29, 1976: American Society of Photogrammetry, p 213-234, 1976. 4 fig, 6 tab, 15 ref.

Descriptors: *Wetlands, *Mapping, *Tennessee, *Aerial photography, *Classification, Remote sensing, Vegetation, Water levels, Marshes, Swamps, Analytical techniques, Tennessee Valley Authority, Tennessee Valley Region, Reelfoot Lake, Hatchie River, Duck River, White Oak Swamp.

The U.S. Geological Survey and the Tennessee Valley Authority are presently conducting a cooperative wetland mapping project in western Tennessee. Existing wetland classification systems were considered too general to supply needed management information, so a new system has been developed based primarily on vegetation, and frequency and duration of inundation. There are five forested wetland subclasses and seven nonforested wetland subclasses in the new system. High-altitude color infrared photography was acquired by the National Aeronautics and Space Administration during several seasons. This photography supplied the information on hydrologic boundaries and vegetation that is needed for classification and mapping. Seasonal informatiion was required to map the maximum number of categories. The methodology for separating and delineating classes was carefully documented. The stage (water level) was determined for the time of overflights for sites where gage stations are in operation. (Woodard-USGS)
W78-04863

PROGRESS REPORT TO THE ARKANSAS STATE HIGHWAY AND TRANSPORTATION COMMISSION FOR YEAR ENDING SEPTEMBER 30, 1977,
Geological Survey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 8B.
W78-04868

SURFACE-WATER AND GROUND-WATER FEATURES, CLAY COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
C. B. Bentley.
Available from National Technical Information Services, Springfield, VA 22161 as PB-276 119, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-87, August 1977. 59 p, 22 fig, 11 tab, 44 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater resources, *Hydrology, *Florida, Hydrologic data, Water quality, Hydrogeology, Aquifer characteristics, Water wells, Water yield, Drawdown, Water levels, Groundwater recharge, Potentiometric level, Rainfall-runoff relationships, Streamflow, Flow rates, Water supply, Water users, Clay County(Fla).

Clay County is a rapidly growing area in northeastern Florida. Surface water largely is undeveloped except for recreational use. Black Creek is the largest fresh-water stream in the country and has an average discharge of about 515 cubic feet per second However, excessive color, iron concentration, hardness, and pH often make the water objectionable for many asses Water from the lakes and streams in the Istonia Creek basin in southwestern Clay County generally is of good chemical quality. Ground water occurs in the county in a water-table aquifer, secondary artesian aquifers, and the Floridan aquifer Large withdrawals of water from the Floridan aquifer since the 1940's, especially in nearby metropolitan Jacksonville, have caused a decline of the potentiometric surface of up to 30 feet in the northeast corner of Clay County to less than 5 feet in the western part. The rate of decline in recent years at Orange Park has been about 0.7 of a foot per year. Ground water in the county generally is of good chemical quality and is suitable for most uses. (Woodard-USGS)
W78-04870

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 3. SOUTHWEST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04871

A BRIEF INVESTIGATION OF THE SURFACE-WATER HYDROLOGY OF YEMEN ARAB REPUBLIC,
Geological Survey, Reston, VA. Water Resources Div.
H. C. Riggs.
Open-file report 77-150, 1977. 37 p, 16 fig, 3 tab, 16 ref.

Descriptors: *Hydrology, *Surface waters, *Foreign research, *Arid lands, *Ephemeral streams, Hydrologic data, Floods, Streamflow, Precipitation(Atmospheric), Alluvial channels, Investigations, Surveys, Evaluation, *Arabian Peninsula, *Yemen Arab Republic, Wadis.

Yemen, near the southwest tip of the Arabian Peninsula, is a mountainous country bordered by a desert on the east and a coastal plain on the west. Rainfall is low and seasonal; consequently, most streams (wadis) are ephemeral. The natural flow regimens of many of the smaller wadis are modified by terracing for agriculture. The only streamflow data available in Yemen are short records on four large wadis. A brief field investigation and application of reconnaissance techniques are the bases for the largely qualitative description of the hydrology, and for the proposal to collect streamflow data needed for orderly development of the expanding economy. (Woodard-USGS)
W78-04872

WATER RESOURCES OF THE BARONA, CAPITAN GRANDE, AND SYCUAN INDIAN RESERVATIONS, SAN DIEGO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04876

CAP UPDATE,
Bureau of Reclamation, Phoenix, AZ. Arizona Projects Office.
C. A. Pugh.
In: Proceedings of the 20th Annual Arizona Watershed Symposium, Arizona Water Commission, Report No 8, September 15, 1976, p 51-55. 14 ref, 1 append.

Descriptors: *Arizona, *Water supply, *Water resources development, *Water resources, Colorado River, Water rights, Competing uses, *Central Arizona Project, *Orme Dam, Indian water rights.

Progress on the Central Arizona Project is discussed. The various components of the project and their current status are presented. By 1977, $390 million had been appropriated for construction of the Central Arizona Project. This is approximately 25 percent of the total project cost at current price levels. The decision of the Secretary of the Interior to allocate Central Arizona Project water to central Arizona Indian tribes is cited as the most important single decision affecting the project. It paved the way for negotiations for the sale of CAP water to municipal, industrial, agricultural and other water-user agencies. The Orme Dam and Reservoir and its possible exclusion from the project is discussed. Negative publicity towards certain aspects of the CAP is described as a powerful weapon against the project. (See also W78-04934) (Jamail-Arizona)
W78-04940

THE ANALYSIS OF SMALL WATER DISTRIBUTION SYSTEMS,
Guam Univ., Agana. Water Resources Research Center.
For primary bibliographic entry see Field 8B.
W78-04943

EFFECTS OF SEASONABILITY AND VARIABILITY OF STREAMFLOW ON NEARSHORE COASTAL AREAS,
Alaska Univ., Inst. of Water Resources.
R. Seifert, and D. Kane.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 14. Transport, p 96-250, March 1977. 63 fig, 10 tab, 21 ref. 05-3-022-56.

Descriptors: *Baseline studies, *Resources development, *Streamflow, *Sea ice, Climate, Coasts, Oil pollution, Alaska, *Outer Continental Shelf, Seasonal variations, Pollutant transport.

This study examines the variability of streamflow in all gaged Alaskan rivers and streams which terminate in the ocean. The primary objective was the development of a characterization of coastal streams in Alaska which is relevant for engineering applications, useful to the imminent OCS petroleum development, and which may also be generally useful to as many other agencies, individuals, and commercial interest as may have need for such information. Presentation of the results of the statistical analyses and supplementary information is graphical wherever possible. Freeze-up and break-up information is tabulated. (Sinha - OEIS)
W78-04977

SNOW MAPPING, AND LAND USE STUDIES IN SWITZERLAND,
Zurich Univ. (Switzerland). Dept of Geography.
For primary bibliographic entry see Field 2C.
W78-05012

LAND USE CHANGE DETECTION WITH LANDSAT-2 DATA FOR MONITORING AND PREDICTING REGIONAL WATER QUALITY DEGRADATION,
Arkansas Univ., Fayetteville. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-05018

THE ROLE OF MINIMUM VARIANCE THEORY IN DEFINING THE REGIME CHARACTERISTICS OF THE LOWER NAMOI-GWIDIR DRAINAGE BASIN,
Macquarie Univ., Ryde (Australia). School of Earth Sciences.
For primary bibliographic entry see Field 2E.
W78-05019

A SIMPLE HYDRAULIC SIMULATOR,
Mekoroth Water Co. Ltd., Tel Aviv (Israel). Engineering Div.
For primary bibliographic entry see Field 8B.
W78-05020

A UNIFYING SET OF PROBABILITY TRANSFORMS FOR STOCHASTIC HYDROLOGY,
Agriculture Research Service, Athens, GA. Southeast Watershed Lab.
For primary bibliographic entry see Field 2E.
W78-05023

HICKORY CREEK DRY RESERVOIR: A COMPROMISE DESIGN FOR BOTH FLOOD CONTROL AND NATURAL AREA PROTECTION,
Illinois State Dept. of Transportation, Springfield. Div. of Water Resources.
D. T. Bell, and R. H. Smith.
Water Resources Bulletin, Vol. 14, No. 1, p 119-132, February 1978. 4 fig, 3 tab, 17 ref.

Descriptors: *Flood control, *Control structures, *Forests, *Illinois, Reservoirs, Design, Environment, Environmental effects, Trees, Floods, Flood damage, Water levels, Regime, Projects, Hydrology, *Will County(Ill), Dry reservoirs, Flood duration.

The proposed Hickory and Spring Creek Flood Control and Recreation Project of the Illinois State Division of Water Resources and the Will County Forest Preserve District was designed to provide flood control for Joliet, Illinois, and areas of the watershed to the east of the city and to provide open-space recreational land upstream from the Hickory Creek Dry Reservoir embankment. A viable forest ecosystem in the reservoir flood pool following construction was of major importance to the project. Factors of the environment influencing tree distribution and flood tolerance and a process for determining the best operational design to provide both flood control and the maintenance of a natural streamside forest ecosystem were described. (Sims-ISWS)
W78-05026

TRANSIENT DRAINAGE EQUATIONS FOR NON-HOMOGENEOUS SOILS,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-05033

ESTIMATING RUNOFF FROM FURROW IRRIGATION,
Kansas State Univ., Garden City. Garden City Experiment Station.
For primary bibliographic entry see Field 3F.
W78-05034

ASSESSMENT OF FLOOD AND EROSION ASSISTANCE PROGRAMS, RONDEAU COASTAL ZONE EXPERIENCE, LAKE ERIE,
Waterloo Univ. (Ontario). Dept. of Geography.
J. C. Day, J. A. Fraser, and R. D. Kreutzwiser.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 38-45, October 1977. 2 fig, 4 tab, 16 ref.

Descriptors: *Floods, *Erosion, *Coasts, *Programs, *Lake Erie, *Canada, Coastal structures, Flood protection, Flood control, Government supports, Government finance, Projects, Levees, Evaluation, Social aspects, Agriculture, Hazards, Flood waves, Lakes, Coastal engineering, *Ontario.

This paper evaluated the performance of major Canada and Ontario coastal hazard assistance programs applied during the 1972 and 1975 high-water period. Seven programs were described, and their effectiveness in helping residents and municipalities alleviate flooding and erosion in the Rondeau coastal zone along Lake Erie was examined. Data were obtained from a field survey designed to measure shore-dwellers' actions toward and adjustment to coastal hazards and their knowledge about an evaluation of assistance programs. Analysis revealed that while government actions reduced damages and maintained essential services, both the programs themselves and institutional arrangements governing their administration resulted in serious deficiencies: gross discrimination in assistance obtainable; widespread ignorance of programs available; over-emphasis on massive structural devices; over-reliance on stop-gap repair works; and piecemeal protection of shoreline reaches. Specific suggestions to help overcome the existing deficiencies and general approaches to improve the performance of future coastal hazard programs were recommended. (Sims-ISWS)
W78-05037

SHALLOW WAVE PROPAGATION IN OPEN CHANNEL FLOW,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-05045

LAKE ERIE BEGINNING-OF-MONTH WATER LEVELS AND MONTHLY RATES OF CHANGE OF STORAGE,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
F. H. Quinn, and J. A. Derecki.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 816, Price codes: A03 in paper copy, A01 in microfiche. Report No. TR ERL 364-GLERL 9, February 1976. 38 p, 8 fig, 4 tab, 1 ref, 1 append.

Descriptors: *Lake Erie, *Great Lakes, *Water levels, Storage, Rates, Networks, Gages, Mathematical studies, Graphical analysis, Lakes, Water storage, Water resources, Water supply, Data processing, Water level fluctuations, Data collections, Monthly changes.

This report described the results of a study of Lake Erie beginning-of-month water levels and monthly changes of storage. The study established that the number and distribution of water level gages in the presently existing gage network are adequate for the computation of beginning-of-month water levels. Computed beginning-of-month water levels and changes of storage for the period 1900-1974 were listed for use in scientific and planning studies. (Froehlich-ISWS)
W78-05048

WETLAND INVENTORY, ONEIDA COUNTY, NEW YORK,
Oneida County Environmental Management Council, Utica, NY.
For primary bibliographic entry see Field 6G.
W78-05099

IMPACT OF WATER LEVEL CHANGES ON WOODY RIPARIAN AND WETLAND COMMUNITIES. VOLUME II: THE SOUTHERN FOREST REGION,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 6G.
W78-05102

IMPACT OF WATER LEVEL CHANGES ON WOODY RIPARIAN AND WETLAND COMMUNITIES. VOLUME III: THE CENTRAL FOREST REGION,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 6G.
W78-05103

AN OVERVIEW OF THE EFFECT OF LAKE POWELL ON COLORADO RIVER BASIN WATER SUPPLY AND ENVIRONMENT,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
G. C. Jacoby, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 748, Price codes: A03 in paper copy, A01 in microfiche. Report NSF-RA-E-75-182, Lake Powell Research Project Los Angeles, Calif., Bulletin, No. 14, November 1975. 31 p, 4 fig, 21 ref. NSF/RANN GI-34840.

Descriptors: *Lake Powell(UT AZ), *Colorado River Basin, *Reservoirs, *Environmental effects, *Water storage, *Water supply, *Recreation, Utah, Arizona, Multiple-purpose reservoirs, Lakes, Hydroelectric power, River basin development, Glen Canyon(UT), Water demand, Regional development, Rivers, Cost-benefit analysis.

An analysis of the effects of Lake Powell reservoir in southeastern Utah on water supply in the Colorado River Basin and on the environment is given. The multiple-purpose reservoir was created in 1963 for water storage, hydroelectric power generation, and recreation, and is capable of containing 80% of the total Upper Colorado River Basin water storage of 33.6 million acre-feet. In assessing environmental impact, three zones must be distinguished: (1) the local area around the lake; (2) the Upper Basin above Lee Ferry, Arizona; and (3) the Lower Basin below Lee Ferry. Initial local impact has been very great in terms of noise, air, and water pollutin due to recreational use and because of inundation of scenic areas. But the most significant long-term effects will be on the growth of the rest of the basin as a result of the lake's influence on water supply. In the Upper Basin the maor effect will be construction of various facilities for production of food, fiber, and energy, with associated increases in energy-related pollution and in salination from agriculture. After about ten years of rapid development surface water resources will be spent, and growth may be sharply curtailed. Upper Basin consumptive uses will reduce releases to the Lower Basin to the legal minimum. A nongrowth, static situation could develop in the Lower Basin unless there is more efficient management of current water supplies or development of alternative sources. (Lynch-Wisconsin)
W78-05131

MANAGEMENT OF SCIENTIFIC COLLABORATION IN THE LAKE POWELL RESEARCH PROJECT,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
O. L. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 747, Price codes: A03 in paper copy, A01 in microfiche. Report NSF-RA-E-75-180, Lake Powell Research Project Bulletin, October 1976. 19 p, 4 tab, 7 ref. NSF AEN72-3470-A03.

Descriptors: *Lake Powell(UT AZ), *Scientific personnel, *Management, *Lake Powell Research Project, *Reservoirs, *Multidisciplinary research, *Research priorities, Utah, Arizona, Multiple-purpose reservoirs, Energy, Water management(Applied), Lakes, Colorado River Basin, Environmental effects, Regional planning, Water utilization.

An evaluation of problems of operating a multidisciplinary research consortium dealing with regional environmental impact discusses advantages and disadvantages of vesting policy-making power in a steering committee rather than a project director. The Lake Powell Research Project (LPRP) is concerned with energy and water management problems in the Colorado River Basin in the Four Corners region. A major difficulty of such a consortium was establishing and maintaining a balance between social science and natural science disciplines. Problems to be overcome included selection of disciplines, setting priorities in disciplines, establishing the multidisciplinary peer group, communication of research results, and integration of disciplines. The LPRP steering committee is composed of selected senior investigators of the project, and although first-year funding (summer 1971) was granted only to the natural sciences, an early committee decision was to strive for equal representation of natural and social science disciplines in the project, a goal achieved by 1973 with 13 scientists from each roup. Three committee members are appointed to solve day-to-day problems: Coordinator of Natural Sciences, Coordinator of Social Sciences, and Executive Secretary. The Committee itself assumed responsibility for guiding the evolution of the project; approving new senior personnel on existing subprojects; realigning old subprojects; and controlling publications and publicity. (Lynch-Wisconsin)
W78-05132

SYMPOSIUM ON WATER RESOURCES MANAGEMENT IN A CHANGING WORLD, INTRODUCTION: WORLD TRENDS AND NEED,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 6E.
W78-05133

GROUND WATER 'FLOOD' POSSIBLE IN DOWNTOWN LOUISVILLE, KENTUCKY.
Water Well Journal, Vol. 32, No. 2, p 60, February, 1978.

Descriptors: *Water levels, *Water table, Floods, Pumping, Observation wells, Ohio River, *Kentucky, New York, Missouri.

Ground water levels in downtown Louisville, Kentucky have risen as much as 32 feet in the past five years according to USGS hydrologists. The rise, which is attributed to recent decreases in ground water pumping and use combined with unusually wet winters and leaking sewer and water mains, could lead to flooded basements and cause structural damage by 1982. The situation is further aggravated by the 25-foot increase in the 'pool level' of the Ohio River created by navagitional locks and dams. If ground water levels continue to rise, they will be within 20 feet of the land surface by 1982, as compared to 80 feet below land surface during the late 1950's. The Kentucky Geological Survey, in conjunction with the USGS, has established 16 observation wells to monitor the situation. Currently water levels are 40 feet below land surface. Possible solutions include increased pumping of ground water and construction and maintenance of wells and pumps in affected buildings to handle individual problems that arise. The situation is similar to that of Long Island and Brooklyn, New York where pumping reductions have resulted in flooding and foundation damage. St. Louis, Missouri has experienced over one million dollars in damage to sewer lines since 1973 because of rising ground water levels. USGS Water Resources Investigation Report No. 77-92 by Kernodle and Whitesides further details Louisville's plight. (Palmer-NWWA)
W78-05196

4B. Groundwater Management

WELL INJECTION INTO A TWO-PHASE FLOW FIELD: A HELE-SHAW MODEL INVESTIGATION,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5E.
W78-04709

EVALUATION OF GROUNDWATER RESERVES IN THE SANTA CRUZ VALLEY AREA, PIMA AND SANTA CRUZ COUNTIES, ARIZONA,
Arizona Univ., Tucson. Dept. of Geosciences
J. S. Sumner
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 372, Price codes: A02 in paper copy, A01 in microfiche. Completion Report, January 1978. 4 p, 5 ref. OWRT A-078-ARIZ(1), 14-34-0001-7005 and -7006.

Descriptors: *Gravity, *Geophysical exploration, *Groundwater resources, Evaluation, *Arizona, *Santa Cruz Valley(Ariz).

The gravity method of geophysical exploration was used to determine the groundwater potential in the upper Santa Cruz Valley, in Santa Cruz County, Arizona. The northern part of this valley has a north-south trend, but the southern part trends south-southeasterly. Mountain ranges border the valley both to the east and to the west. Interpretation of the reduced gravity data reveals three anomalous low gravity areas along the main Santa Cruz Valley. The northernmost low, near Amado, is part of the Tucson basin gravity anomaly. Preliminary modeling of the southerly anomalies indicates a depth to bedrock of approximately 3000 feet. Additional modeled profiles will reveal the subsurface structure more accurately for the purpose of evaluating groundwater resources. The Santa Cruz river is the largest drainage system which empties into the Tucson basin. The City of Tucson is totally dependent on groundwater to supply its water needs, and it is important to assess any contributing underflow into the Tucson basin. The gravity method of geophysical exploration has relatively efficient in the search for water resources. In the Basin and Range physiographic province of the southwestern United States, gravity surveys have indicated the presence of the buried scarps which define the course of deep alluvial valleys. The more porous valley-fill alluvium has a lower density than the impermeable bedrock; thus gravity mapping can reveal the depth to higher density bedrock.
W78-04819

A MODIFIED OPTIMIZATION METHOD OF ESTIMATING AQUIFER PARAMETERS,
United Nations Centre for Natural Resources, Energy, and Transport, New York. Dept. of Economic and Social Affairs.
For primary bibliographic entry see Field 2F.
W78-04826

EXPERIMENTAL EVALUATION OF THEORETICAL SOLUTIONS FOR SUBSURFACE DRAINAGE AND IRRIGATION,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W78-04828

IRRIGATION IN THE ALLUVIAL PLAIN OF NORTHWESTERN MISSISSIPPI, 1975,
Geological Survey, Jackson, MS. Water Resources Div.
For primary bibliographic entry see Field 3F.
W78-04861

GROUND-WATER RESOURCES OF POSEY COUNTY, INDIANA,
Geological Survey, Mineola, NY. Water Resources Div.
T. M. Robison.
Indiana Department of Natural Resources (Indianapolis), Bulletin No 39, 1977. 27 p, 6 fig, 4 plates, 2 tab, 18 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Groundwater availability, *Water quality, *Indiana, Hydrogeology, Observation

wells, Water levels, Water yield, Groundwater movement, Groundwater recharge, Rainfall, Water analysis, Chemical analysis, Posey County(Ind).

Glacial sand and gravel deposits in and near the Wabash and Ohio River valleys of Posey County, Ind., are capable of yieling from 50 to more than 1,000 gallons per minute of water to individual wells. In the tributary valleys as much as 80 gallons per minute has been obtained from small, isolated sand and gravel deposits. In the remainder of the county, wells in sandstones of Pennsylvanian age yield from 5 to 25 gallons per minute. Natural discharge from sand and gravel into the Wabash and Ohio Rivers is estimated to be 40 million gallons per day, far exceeding the 6 million gallons per day estimated usage of ground water in the county. The shallow ground water is normally of the calcium bicarbonate type and has a dissolved-solids concentration of less than 500 parts per million. In deep bedrock wells, the water is of the sodium bicarbonate sodium chloride type and has a dissolved-solids concentration of more than 500 parts per million. (Woodard-USGS)
W78-04862

GROUND-WATER RESOURCES OF CHESTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
L. J. McGreevy, and R. A. Sloto.
Water-Resources Investigations 77-67 (open-file report), September 1977. 76 p, 14 fig, 6 plates, 8 tab, 51 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Surface-groundwater relationships, *Remote sensing, *Pennsylvania, Hydrologic data, Hydrogeology, Water quality, Aerial photography, *Mapping, Well data, Water yield, Hydrologic budget, Chester County(Pa), LANDSAT imagery.

Fifty gallons per minute (3 liters per second) or more may be obtained from wells in most parts of Chester County, Pa. Five hundred gallons per minute (30 liters per second) or more may be obtained from some of the carbonate rocks. Linear features, but not all, have geologic or hydrologic significance, and some may indicate fractured rock that might be tapped by wells. Dissolved-solids concentration of most groundwater in the county is less than 500 milligrams per liter. Chemical-quality problems are predominantly caused by acidity, iron and manganese, or nitrate. Base (ground-water) runoff during a near-average year, 1968, was about 420 million gallons per day (18 cubic meters per second). (Woodard-USGS)
W78-04869

SURFACE-WATER AND GROUND-WATER FEATURES, CLAY COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-04870

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 3. SOUTHWEST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04871

HYDROLOGIC EVALUATION OF THE ARIKAREE FORMATION NEAR LUSK, NIOBRARA AND GOSHEN COUNTIES, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
M. A. Crist.
Water-Resources Investigations 77-111 (open-file report), October 1977. 23 p, 9 fig, 3 plates, 13 ref.

Descriptors: *Aquifer characteristics, *Groundwater resources, *Hydrogeology, *Wyoming, *Water utilization, Water wells, Model studies, Pumping, Water yield, Groundwater recharge, Water levels, Potentiometric level, Irrigation wells, Surface-groundwater relationships, Transmissivity, Drawdown, Mapping, Contours, Evaluation, Groundwater availability, *Computer models, *Arikaree Formation(Wyo).

The Arikaree Formation of early Miocene age is an aquifer of large areal extent and is composed of very fine grained, poorly bedded, loosely to moderately cemented sandstone and interbedded silt, limestone, and many concretionary layers. The area studied is about 800 square miles in southern Niobrara and northern Goshen Counties of Wyoming. Long-term average annual recharge to the aquifer from streams and precipitation is estimated to total about 24,270 acre-feet. Pumpage from public-supply and irrigation wells is estimated to have totaled about 48,000 acre-feet from 1938 through 1972. This pumpage did not cause any noticeable decrease in natural discharge and it is assumed there has been no significant change in ground-water storage. Pumpage is estimated to total about 39,500 acre-feet for the 3-year period 1973 through 1975. A digital model was developed to simulate the ground-water system in the Arikaree Formation. The model can be used to indicate the general effect of applying hydraulic stresses to the aquifer. (Woodard-USGS)
W78-04873

GROUND-WATER RESOURCES OF COLQUITT COUNTY, GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
E. A. Zimmerman.
Open-file report 77-56, June 1977. 41 p, 10 fig, 6 tab, 23 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Water yield, *Water quality, *Georgia, Surveys, Water supply, Water wells, Irrigation, Groundwater availability, Planning, Water demand, Water resources development, Water analysis, Chemical analysis.

Colquitt County, Georgia, is predominantly agricultural, but has some light industry. Anticipated growth in industrial activity and an increase in irrigation will impose some additional strains on the water supply. Streams in the county generally are undependable as sources of water, so wells are the principal source for domestic, municipal, and industrial uses. The abundant supply of ground water is generally of good quality. The most productive sources are limestone beds of Eocene, Oligocene, and Miocene age that make up the principal artesian aquifer. These beds can yield in excess of 1,000 gal/min of water to wells. The ability to transmit water to wells is modified by a structural, or a paleogeographic feature called the Suwannee strait, which extends from near the southwest corner through the northeast part of Colquitt County. In this strait limestone beds seem to be partly replaced by marl, which greatly impairs their transmissivity. Aquifer tests suggest that the transmissivity of the principal artesian aquifer is as much as 10 times as great southeast of the strait as it is to the northwest. A shallow depression in the potentiometric surface of the principal artesian aquifer near the center of heaviest pumping at Moultrie seems to parallel the hypothesized northeast-trending Ochlockonee fault, and may reflect enhanced anisotropic transmissivity. (Woodard-USGS)
W78-04875

WATER RESOURCES OF THE BARONA, CAPITAN GRANDE, AND SYCUAN INDIAN RESERVATIONS, SAN DIEGO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
W. R. Moyle, Jr., and R. L. Blazs.
Open-file report 77-289, October 1977. 33 p, 1 fig, 3 plates, 11 tab, 10 ref.

Descriptors: *Groundwater resources, *Streamflow, *Water quality, *Indian reservations, *California, Hydrologic data, Basic data collections, Chemical analysis, Water wells, Water levels, Drillers logs, Reservoirs, Evaluation, *Barona Indian Reservation, *Capitan Grande Indian Reservation, Sycuan Indian Reservation, *San Diego County(Calif).

The Barona and Capitan Grande Indian Reservations, California, have sufficient water to satisfy present (1976) domestic and stock needs; however, the Sycuan Indian Reservation is experiencing a shortage of water for domestic supply because of the decline of the water table beneath the reservation well field and a general decline of the water table surrounding the reservation. The water quality on the three reservations is generally good; however, the water is at or near land surface in several areas. This shallow water could be subject to contamination by animal waste, septic tanks, or farming operations. Historical hydrologic data were obtained from government agencies and private individuals, and all wells and springs on the reservations were visited. This report summarizes the data collected and the findings of the study. (Woodard-USGS)
W78-04876

SURFACE CHEMICAL PROCESSES IN GROUND-WATER SYSTEMS,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-04877

WATER-LEVEL DECLINES, LAND SUBSIDENCE AND EARTH FISSURES IN SOUTH-CENTRAL ARIZONA,
Geological Survey, Phoenix, AR. Water Resources Div.
R. L. Laney.
In: Arizona Water Commission Report No 8; Proceedings of 20th Annual Arizona Watershed Symposium, September 15, 1976, Phoenix, Arizona: Arizona Water Commission, p 30-39, 1976. 8 fig, 5 ref.

Descriptors: *Alluvial aquifers, *Drawdown, *Land subsidence, *Fissures(Geologic), *Arizona, Groundwater, Withdrawal, Irrigation, Water levels, Groundwater recharge, South-central Arizona, *Salt River Valley(Ariz), *Lower Santa Cruz River basin(Ariz).

The Salt River Valley and the lower Santa Cruz River basin have the largest concentrations of agricultural land and population in the State of Arizona. More than 109 million acre-feet of ground water was withdrawn from the underlying alluvial deposits in 1915-75. The volume of water pumped greatly exceeds the volume of natural recharge. As a result, water levels have declined in most places. In 1923-72 water levels declined more than 300 feet in most of the report area, and the greatest amount of decline was 460 feet near Stanfield. In 1972-76 water levels declined about 100 feet near Queen Creek. The land surface has subsided and earth fissures have formed as a result of the water-level declines. Land-surface level data for 1948-67 show as much as 7 feet of subsidence near Eloy; more than 3 feet near Stanfield, east of Mesa, and at Queen Creek; 2 feet west of Luke Air Force Base; and about 0.5 foot in Scottsdale. Earth fissures have formed in the alluvial deposits near the areas of large waterlevel decline. The fissures may be less than 1 inch wide when first formed but may widen to a few tens of feet owing to erosion by overland flow. The fissures are particularly well developed between the Casa Grande and Picacho Mountains; near the Picacho Mountains, differential subsidence of more than 1.5 feet has been measured on either side of a prominent fissure.

Land subsidence and earth fissures have damages roads, streets, railroads, canals, irrigation-distribution systems, wells, and farmland. (See also W78-04934) (Woodard-USGS)
W78-04878

GROUNDWATER FLOW IN WEATHERED GRANITE IN THE TAMNE BASIN, NORTH EAST GHANA,
Council for Scientific and Industrial Research, Accra (Ghana).
T. T. Akiti.
February, 1977. 16 p, 8 fig, 12 ref.

Descriptors: *Groundwater, *Base flow, *Groundwater movement, *Africa water sources, Water supply, Subsurface waters, Irrigation, Mathematical models, Groundwater potential, Potential flow, Piezometry, Hydrogeology, Groundwater availability, Tamne Basin, Ghana.

Groundwater flow studies have been found to aid in predicting the response of the groundwater regime and hydrogeologic environment to superimposed natural and artificial stresses. This study makes use of fluid potential distribution in wells in the analysis of groundwater flow in a weathered zone in granite in a subsahel region of Africa, the Tamne Basin in northeastern Ghana. The theory to be applied in the study is described in a mathematical model. Depth to water level from the ground surface in a number of wells of depth range from 80 feet to 90 feet have been plotted and contoured. The mathematical model as a useful tool in mapping groundwater is discussed. It is concluded that groundwater flow in the weathered granites of the Tamne Basin is generated by differences in fluid potential and the flow follows approximately the topographic surface. Since the movement of groundwater is away from the land surface in a recharge area and is towards the land surface in a discharge area, the most probable areas for groundwater exploitation would be the areas of upward flow of groundwater. (Jamail-Arizona)
W78-04923

WATER: THE WELLS NEED NEVER RUN DRY,
A. van Dam.
The Futurist, Vol XI, No 3, p 163-167, June 1977.

Descriptors: *Subsurface waters, *Water quality, *Water supply, *Groundwater resources, *Water distribution, *Water management, *Water shortage, Water allocation, Water storage, Reclaimed water, Arid lands.

Because water is unevenly distributed, critical shortages occur in many countries, especially in arid and semi-arid regions. The author, who recently attended the United Nations Water Conference in Mar del Plato, Argentina, believes the trend of the future and solution to the water crisis will come primarily from increasing emphasis placed on tapping underground reservoirs and desalination of seawater. The solution will also involve judicious water management, Several examples of water management projects and policies are surveyed and discussed. (Castricone-Arizona)
W78-04929

GEOPHYSICAL INVESTIGATIONS OF GROUNDWATER RESOURCES IN THE KALAHARI BASIN,
Council for Scientific and Industrial Research, Pretoria (South Africa), National Physical Research Lab.
F. Worthington.
Geophysics, Vol 42, No 6, p 838-849, June 1977. 9 fig, 4 tab, 20 ref.

Descriptors: *Borehole geophysics, *Electrical studies, Surveys, *Aquifers, Geology, Groundwater availability, *Groundwater resources, Boreholes, Africa, *Kalahari Basin(So Afr), Dar Zarrouk Parameters.

A regional geoelectric survey of a semiarid region 4000 Km2 and approximately 300 km NNE of windhoek was conducted to establish a basis for the siting of boreholes in the area to contribute to a controlled development of existent and needed groundwater resources. The geoelectrical data obtained added to groundwater head levels, degree of penetration, production characteristics of the boreholes, and chemical analyses of water samples indicated that the calcareous sands and sandstones of assumed middle Kalahari age constitute a major aquifer in terms of higher sustained yields of good quality water. By correlating a major aquifer in terms of higher sustained yields of good quality water. By correlating these characteristics with geoelectrically derived thickness, resistivity and transverse resistance, it was possible to delineate the most promising areas for future groundwater development. In addition, Dar Zarrouk Parameters were shown to form the basis of a suggested procedure for optimizing initial groundwater exploration in similar regions lacking lithostratigraphic information (Payton-Arizona)
W78-04931

PROCEEDINGS OF THE 20TH ANNUAL ARIZONA WATERSHED SYMPOSIUM,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 4D.
W78-04934

ARIZONA'S GROUNDWATER RESOURCES, SUPPLIES AND PROBLEMS,
Arizona Water Commission, Phoenix.
P. C. Briggs.
In: Proceedings of the 20th Annual Arizona Watershed Symposium, Arizona Water Commission, Report No 8, September 15, 1976, p 11-21. 9 fig, 1 tab.

Descriptors: *Arizona, *Groundwater mining, *Groundwater movement, *Groundwater availability, Groundwater barriers, Groundwater, Groundwater basins, Groundwater resources, Groundwater potential, Aquifers, Water supply, Water sources, Water storage, Arid lands, Alluvial aquifers.

A discussion of the general occurrence, movement and nature of groundwater, the characteristics of Arizona's groundwater supplies, and the problems arising from its use are presented. The areas and amounts of groundwater in Arizona are described. Arizona's economy would have been limited to a much lower level of activity were it not for the ready availability of groundwater resources. In many areas, groundwater is the only supply. Although Arizona's groundwater reserves are large in aggregate, there are many limiting factors to their utilization as supplies. The problems of groundwater mining and discussed. Arizona's principal and most fundamental water problem is that of imbalance between supply and use. For years Arizonas have been using water more rapidly than it is being replenished. (See also W78-04934) (Jamail-Arizona)
W78-04936

THE SIGNIFICANCE OF GROUNDWATER LEVEL DECLINES IN EASTERN PIMA COUNTY, ARIZONA,
Tucson Water and Sewers Dept., AZ.
J. J. Wright, and R. B. Johnson.
In: Proceedings of the 20th Annual Arizona Watershed Symposium, Arizona Water Commission Report, No 8, September 16, 1976, p 22-29. 5 fig, 1 ref.

Descriptors: *Groundwater, *Groundwater mining, *Groundwater availability, *Groundwater resources, Water supply, Arizona, Subsurface waters, Water levels, Water table, Groundwater, Basins, Wells, Pumping, Land subsidence, Subsidence, *Tucson(Ariz).

The city of Tucson, Arizona is one of the largest cities in the United States that is totally dependent on groundwater. There are no surface waters from which the Tucson water utility may draw to meet the needs of the people. The decline of groundwater in the eastern portion of Pima County, in which Tucson is located, is discussed. The locations of water table decline in various portions of Tucson are charted and the significance of this decline explained. One of these is that as pumping levels are lowered, the costs associated with lifting any given quantity of water increase. Another consideration is the possibility of encountering deep groundwater with higher ionic concentrations and elevated temperatures in some areas when these deep zones are penetrated. Groundwater declines in the Tucson basin are now beginning to approach those magnitudes outlined by the U.S. Geological Survey as being potential for land surface subsidence. This is a major reason why the pattern of water withdrawal must be shifted by increasing the percentage of water pumped in the nearby Avra Valley and decreasing the amount pumped from the interior well field subjacent to the main city area. Future projected water declines until 1980 are presented. The period from 1977 to 1982 will be an extremely critical period for the water utility in Tucson. (See also W78-04934) (Jamail-Arizona)
W78-04937

GEOTHERMAL ENERGY IN THE PACIFIC REGION,
Colorado School of Mines, Golden.
L. L. Gross, and G. V. Keller.
Available from the National Technical Information Service, Springfield, VA 22161 as ADB-006 304, Price codes: A09 in paper copy, A01 in microfiche. May, 1975. 171 p, 1 fig, 1 tab, 17 pl, 111 ref, 3 append. N00014-71-A-0430-0004.

Descriptors: *Geothermal studies, *Thermal springs, Heatflow, Volcanoes, Maps, Exploration, Energy, Geology, Geophysics, Geochemistry, Electric power production, Thermal powerplants, Costs, Pacific region, United States Naval research, Tectonics, *Geothermal reservoirs.

A study of the Intra - and Circum - Pacific region was made for delineation of areas that appear to warrant exploration for geothermal energy sources which may be utilized by the United States Navy. As part of the study, basic tectonic, volcanic, heat flow, and thermal spring data were plotted on regional Pacific quadrant maps which have been included in this final report. Several areas were located which suggest potential. The roles of geology, geophysics, and geochemistry in geothermal energy exploration are briefly described. It is pointed out that geothermal energy is presently being converted to electricity at eight sites in the Pacific Region. In addition, costs for geothermal exploration, development, and electricity generation are outlined. (Castricone-Arizona)
W78-04942

WATER SUPPLY DILEMMAS OF GEOTHERMAL DEVELOPMENT IN THE IMPERIAL VALLEY OF CALIFORNIA,
California Univ., Livermore. Lawrence Livermore Lab.
D. W. Layton.
Water Resources Bulletin, Vol. 14, No. 1, p 133-143, February 1978. 4 fig, 22 ref. ERDA W-7405-ENG-48.

Descriptors: Water resources, *Geothermal studies, *Thermal powerplants, *California, Powerplants, *Cooling water, *Water supply, Water requirements, Consumptive use, Rivers, Groundwater, Brackish water, Water policy, *Imperial Valley(Calif), *Salton Sea(Calif), Geothermal development, Geothermal energy.

There are four known geothermal resource areas in the Imperial Valley that have a combined potential of over 4,000 megawatts of electrical energy for 25 years. Water resources available to support geothermal energy development are imported Colorado River water, agricultural waste waters, Salton Sea water, and groundwater. In addition, geothermal power plants can produce their own cooling water from steam condensate. Nevertheless, the relatively high water requirements of geothermal facilities along with a series of real and potential constraints may cause water supply dilemmas involving both the acquisition and use of cooling water. Important constraints are institutional policies, water supply costs, technical problems, and impacts upon the Salton Sea. These constraints and related dilemmas were examined in light of relevant information on the valley's water resources, geothermal resources and energy technologies, cooling water requirements, and water supply options. (Sims-ISWS)
W78-05028

DETERMINATION OF TRANSPORT MODEL PARAMETERS IN GROUNDWATER AQUIFERS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soil and Water Engineering.
For primary bibliographic entry see Field 5B.
W78-05043

RESULTS OF INTERFERENCE TESTS FROM TWO GEOTHERMAL RESERVOIRS,
California Univ., Berkeley. Lawrence Berkeley Lab.
P. A. Witherspoon, T. N. Narasimham, and D. G. McEdwards.
Journal of Petroleum Technology, Vol 30, No 1, p 10-16, January, 1978. 10 fig, 3 tab, 7 ref.

Descriptors: *Interference tests, *Geothermal studies, Thermal water, Reservoirs, Water pressure, Pressure head, Pressure measuring instruments, Artesian wells, Boundaries(Surfaces), Drawdown, Gravity, Earth tides.

This paper reviews the results of interference tests performed with a highly sensitive pressure measuring device. The interference tests involved fluid production from geothermal wells and the measure of pressure transents in nearby observation wells at two sites: the Raft River Valley Field in Idaho and the East Mesa Field in the Imperial Valley of California. A key piece of equipment used in the tests was a downhole quartz pressure gauge capable of measuring in-situ absolute pressure with an accuracy of 0.01 psi ranging from 0 to 10,000 psi. The high resolution of pressure data collected made various noise effects noticeable; effects of earth tides had to be taken into account at Raft Rivrr, while nonlinear regression techniques were necessary to smooth out noise at East Mesa before assessing reservoir performance. Major emphasis was placed on drawdown data as opposed to pressure buildup, with type curves and the asymptotic solution employed for analysis. Experience gained in these tests indicates future promise for accurate long-range estimates of geothermal reservoir parameters and determination of reservoir geometry. (Eberle-NWWA)
W78-05183

WATER ALLOCATION BILLS PASSED BY SOUTH DAKOTA LEGISLATURE.
For primary bibliographic entry see Field 6E.
W78-05186

HOW MUCH IS ENOUGH. A MINIMUM WELL FORMULA,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 8B.
W78-05190

POSSIBLE ENERGY SAVINGS IN IRRIGATION,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
J. R. Gilley, and D. G. Watts.
American Society of Civil Engineers Journal of the Irrigation and Drainage Division, Vol. 103, No. IR4, p 445-457, December, 1977. 3 fig, 6 tab, 20 ref, 2 append.

Descriptors: *Irrigation practices, *Irrigation efficiency, *Pumping, Energy, Sprinkler irrigation, Water reuse, Center pivot systems, Water pressure, Farm equipment, Fertilizers, Nitrogen compounds, Nebraska.

Studies in Nebraska have shown that over 40% of all the energy consumed by production agriculture is used for pumping water from wells, which supply about 80% of the irrigation water requirements. Reduction of energy used in irrigation pumping would thus have significant impact. Six procedures, utilized singly or in various combinations, show strong energy-saving potential: (1) increased irrigation efficiency--better design and management of center pivot and surface systems; greater use of trickle, subsurface, runoff reuse systems as rising fuel prices make them cost effective; (2) improved pumping plant efficiency; (3) reduced water pumping--advances in irrigation scheduling; (4) lowering pressure of sprinkler systems; (5) scheduling to decrease electric peak demand, and; (6) minimizing nitrogen fertilizer losses due to deep percolation--fertilizer is conserved through irrigation scheduling, thus conserving the energy used in its manufacture. Energy savings of 40%-50% are considered attainable through these procedures. (Eberle-NWWA)
W78-05191

CASING STORAGE CAN AFFECT PUMPING TEST DATA,
Universal Oil Products, St. Paul, MN. Johnson Div.
For primary bibliographic entry see Field 8B.
W78-05193

DRINKING WATER AND HUMAN HEALTH,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 5A.
W78-05195

GROUND WATER 'FLOOD' POSSIBLE IN DOWNTOWN LOUISVILLE, KENTUCKY.
For primary bibliographic entry see Field 4A.
W78-05196

REGIONAL GEOLOGY SERIES: PART 2, HIGH PLAINS GROUND WATER REGION,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 2F.
W78-05199

4C. Effects On Water Of Man's Non-Water Activities

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER: PART I. SOIL-WATER QUALITY AND VEGETATIVE RESPONSES,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-04704

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER: PART II, SOIL PHYSICAL AND CHEMICAL CHANGES,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-04705

INFLUENCE OF ROAD SALTING ON THE NUTRIENT AND HEAVY METAL LEVELS IN STREAM WATER,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-04708

EFFECTS OF AN URBAN ROAD SYSTEM ON LEAD CONTENT OF AN URBAN WATER SUPPLY SOURCE,
Massachusetts Univ., Amherst. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-04711

GRASSED WATERWAY DESIGN,
Soil Conservation Service, Kendallville, IN. Area II.
For primary bibliographic entry see Field 4D.
W78-04730

PROGRESS REPORT TO THE ARKANSAS STATE HIGHWAY AND TRANSPORTATION COMMISSION FOR YEAR ENDING SEPTEMBER 30, 1977,
Geological Survey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 8B.
W78-04868

APPLICATION OF RESIDUALS MANAGEMENT FOR ASSESSING THE IMPACTS OF ALTERNATIVE COAL-DEVELOPMENT PLANS ON REGIONAL WATER RESOURCES,
Geological Survey, Reston, VA. Water Resources Div.; and Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 6A.
W78-04879

IRRATIONAL LAND USE AND DESERTIFICATION IN RAJASTHAN DESERT,
Central Arid Zone Research Inst., Jodhpur (India).
H. S. Mann, S. P. Malhotra, and R. A. Shankarnarayon.
Annals of Arid Zone, Vol. 16, No. 3, p 387-394, September 1977. 4 tab, 6 ref.

Descriptors: *Deserts, *Land use, *Deterioration, Land management, Soil conservation, Cultivated lands, Farm management, Erosion control, Agricultural engineering, Livestock, Ecosystems, Conservation, Arid lands, India(Rajasthan).

Existing land use practices in the Rajasthan are discussed. Soil fertility, agricultural patterns, livestock population and grazing pressure and fuel consumption are seen to provide ample evidence to illustrate how the arid eco-system is slowly but inexorably degrading beyond ecological capability and resilience, leading to a state of eutropy in the arid regions of Rajasthan. Conservation of land resources is urged. (Payton-Arizona)
W78-04924

FRESHWATER AND THE FLORIDA COAST: SOUTHWEST FLORIDA,
State Univ. System of Florida Sea Grant Program, Gainesville; and Southwest Florida Water Management District, Brooksville.
For primary bibliographic entry see Field 2L.
W78-04973

THE ROLE OF VEGETATION IN STABILIZING THE LOWER GREAT LAKES CANADIAN SHORELINE,
Acres Consulting Services Limited, Niagara Falls (Ontario). Environmental Dept.
For primary bibliographic entry see Field 4D.
W78-05038

1975 WORLD SURVEY OF CURRENT RESEARCH AND DEVELOPMENT ON ROADS AND ROAD TRANSPORT.
International Road Federation, Washington, DC.
Prepared for Dept. of Transportation, Federal Highway Administration, Washington, D.C., December 1975. 744 p, 110 fig, 9 tab, 56 ref, 1 append. DOT-FH-11-7656.

Descriptors: *Highways, *Roads, *Transportation, *United States, Surveys, Research and development, Reviews, Foreign countries, Foreign research, Projects, Programs, *International.

An annual report was presented by the International Road Federation (IRF) for the year 1975 on its continuing international survey of current research and development on roads and road transport. The report now covers 73 countries. The report this year, for the first time, included data on research and development in the United States, making it truly a 'World Survey.' It is the tenth in a series started in 1967. Again this year IRF included indexes of the research projects by 'subject area.' The subject areas are the general categories to which the Highway Research Information Service of the Transportation Research Board assigns individual projects, shown in Figure 1 of Chapter I and identified by the first two digits of the 'HRIS' number accompanying each listed project. This general classification provides a useful guide in the search for projects in broad fields of interest. Two indexes were included: one for overseas reported countries, and one for the United States. (Froehlich-ISWS)
W78-05049

THE IMPACT OF DEVELOPMENT PROJECTS ON ESTUARINE AND OTHER WETLAND ECOSYSTEMS,
Transport and Environment Studies. London (England).
For primary bibliographic entry see Field 6G.
W78-05095

4D. Watershed Protection

EVENT-BASED FORMULATION OF WATERSHED MANAGEMENT,
Arizona Univ., Tucson. School of Renewable Natural Resources.
M. Fogel, L. Duckstein, and A. Musy.
In: Environmental Aspects of Irrigation and Drainage. Proceedings of A Specialty Conference, University of Ottawa, Ontario, July 21-23, 1976. Irrigation and Drainage Division, American Society of Civil Engineers, New York, N. Y., p 349-373, 1976. 8 fig, 41 ref. OWRT B-032-ARIZ(28).

Descriptors: *Watershed management, *Simulation analysis, *Precipitation, *Irrigation, *Scheduling, *Tile drains, *Design, *Stochastic processes, Hydrology, Optimization, Natural resources, Equations, Decision making, Methodology, Seasonal, Rainfall, Flood control, Storm runoff, Sediment yield, Forecasting, Snowmelt, Groundwater recharge, Soil moisture, Mathematical models, Systems analysis, Reservoirs, *Event-based approach, Benefit maximization, Natural uncertainties.

Watershed management relates to a wide range of activities resulting from man's efforts to protect natural resources as well as to use them in production processes. University of Arizona-initiated research on event-based approach is highly versatile, effective in both design and operational phases. Presented is a variety of applications of the methodology. It is shown that the design of floodwater retarding structures and tile drainage systems both require stochastic inputs to determine the most economic design. Similarly, an optimal policy for operating reservoirs and irrigation systems requires that the uncertainties attributed to natural phenomena, model choice, and sample record length all be considered. The methodology is useful primarily for semiarid conditions; it has the advantage of facilitating the use of probabilistic models. It is believed that modeling hydrologic variables on an even basis presents a more realistic interpretation and is more suitable to evaluating man's attempt at modifying the environment of the natural system than the equal-time interval approach is applicable also to humid regions. Most importantly, it lend itself to the management of natural resources for optimal benefit. (Bell-Cornell)
W78-04712

NON-POINT SOURCE POLLUTION SEMINAR, SECTION 108(A) DEMONSTRATION PROJECTS PROGRESS REPORTS, HELD AT CHICAGO, NOVEMBER 20, 1975. POLLUTION CONTROL IN GREAT LAKES.
Environmental Protection Agency, Chicago, IL. Office of the Great Lakes Coordinator.
For primary bibliographic entry see Field 5G.
W78-04719

CONSERVATION FARM PLANNING,
Soil Conservation Service, Fort Wayne, IN.
T. D. McCain.
In: Non-Point Source Pollution Seminar, Section 108 (a) Demonstration Projects Progress Reports, Held at Chicago, November 20, 1975. Report EPA-905/9-75-007, (1975). p 19-25, 1 tab. EPA G005103, G005139, G005140.

Descriptors: *Planning, *Black Creek Sediment Control Project(IN), *Soil conservation, *Erosion control, *Farm management, Conservation, Decision-making, Indiana, Maumee River Basin, Rotations, Crop production, Farms, Nonpoint pollution, Soil erosion, Agriculture, Cost sharing, Demonstration projects, Universal Soil Loss Equation.

Comprehensive soil conservation planning methodology used for the Black Creek Sediment Control Project, Allen County, Indiana, is discussed. The 12,000-acre Black Creek watershed discharges sediment and nutrients into the Maumee River, a Lake Erie tributary. The five-year project, begun in 1972, was designed to analyze each of 200 farms over five acres and to apply all needed land treatments to reduce erosion and soil loss. Planning goals included: (1) erosion and sedimentation control; (2) balanced crop rotation; (3) planned fertility; (4) manged water disposal; (5) reorganized field layout; (6) improved livestock programs; (7) farm ponds; and (8) improved land value and beauty. Aerial photographs and individualized soil maps provided basic planning data. On each farm soils were classified by degree of hazard. Treatment alternatives for cropland with erosion hazard were formulated through use of the Universal Soil Loss Equation (USLE), A=RKLSCP, which is described in full with examples in this paper. Management and mechanical practices included crop rotation, residue use, minimum tillage, contouring, and strip cropping; mechanical methods included diversion, terracing, and grassed waterways. If landowners were agreeable to the plans presented, a contract was drawn up between the landowner and the Allen County Soil and Water Conservation District, which provided for cost-sharing and technical assistance. (See also W78-04719) (Lynch-Wisconsin)
W78-04723

TILLAGE AND SIMULATED RAINFALL STUDIES,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 5G
W78-04725

USES OF PESTICIDES AND FERTILIZERS IN THE BLACK CREEK WATERSHED,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-04726

SEDIMENT CONTRIBUTIONS TO THE MAUMEE RIVER,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
E. J. Monke, D. B. Beasley, and A. B. Bottcher.
In: Non-Point Source Pollution Seminar, Section 108(a) Demonstration Projects Progress Reports, Held at Chicago, November 20, 1975. Report EPA-905/9-75-007, (1975). p 71-85, 4 fig, 4 tab, 12 ref. EPA G005103, G005139, G005140.

Descriptors: *Black Creek watershed(IN), *Maumee River, *Sediment yield, River basins, Watersheds(Basins), Indiana, Ohio, Agriculture, Sediment control, Black Creek Sediment Control Project(IN), Land use, Discharge(Water), Model studies, Eutrophication, Soil erosion, Lake Erie.

Sediment yields from the Maumee River into Lake Erie, and from the Black Creek watershed in Allen county, Indiana, into the Maumee River are analyzed, and an evaluation is made of factors causing erosion in the watershed. An erosion-sedimentation model is also proposed for relating this process to land use. For a 12-month period in 1974-75 sediment yield from the Black Creek watershed into the Maumee River was 1750 kg/ha, over half of which resulted from one major storm. The primary contributor to erosion in the watershed was the large amount of bare soil exposed to late May and early June storms. Three automated pumping samplers were installed on the large Smith-Fry and Driesbach tributary drains into Black Creek (890 and 735 ha watersheds, respectively), and on Black Creek's main stem near its confluence with the Maumee River. Sediment yield for each drain was 1750 kg/ha during the study period; at the Smith-Fry drain, total precipitation was 1090 mm, with a discharge volume of 350 mm (33% ratio). At the Driesbach drain, precipitation was 1100mm, and discharge was 290mm (26% ratio). The sediment yield from the Maumee River into Lake Erie is estimated at 1,8 million tons annually (about 1000 kg/ha in terms of the basin) which, although not particularly detremental to the agricultural lands, adversely affects water quality in Lake Erie. Phosphorus transported by the colloidal sediments contributes to eutrophication. (See also W78-04719) (Lynch-Wisconsin)
W78-04727

STREAM STABILIZATION,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
R. Z. Wheaton.
In: Non-Point Source Pollution Seminar, Section 108(a) Demonstration Projects Reports, Held at Chicago, November 20, 1975. Report EPA-905/9-75-007, (1975). p 86-92, 2 tab. EPA G005103, G005139, G005140.

Descriptors: *Black Creek watershed(IN), *Stream stabilization, *Stream erosion, *Erosion control, *Slope stabilization, Indiana, Black Creek Sediment Control Project(IN), Streams, Channel erosion, Channel improvement, Sediment control, Vegetation establishment, Mulching, Riprap, Soil conservation, Bank stabilization, Watersheds(Basins).

Four aspects of streambank erosion in the Black Creek watershed in Allen County, Indiana, are under study: (1) streambank stabilization soil

mechanics; (2) effects of streambank slope and mulch on vegetation establishment; (3) structural measures for reduction of stream channel erosion; and (4) naturally-occurring changes in channel cross-section. Soil analyses at five sites in the watershed showed that upland and transition zone channels in the lakebed area, with lower channel gradients and more cohesive soils, are more stable. Stream channels generally were safe from failure by shear at slopes as steep as 1:1. The more cohesive soils were generally found near the surface, and the least cohesive near channel bottoms. Fifty-foot reaches on two channels were reshaped to 2:1, 3:1, and 4:1 slopes, and, after seedijng with Kentucky No. 31 tall fesque, were treated with straw, wood chips, stone, sawdust, Aquatain (a chemical soil stabilizer), or no mulch. All mulches effectively controlled erosion and helped greatly to establish early cover; stone mulch was slightly superior for erosion control. While the 4:1 slope showed no advantages, the 3:1 slope was easier to mow than 2:1. Three structural measures to reduce channel erosion are described: (1) rock-drop structures; (2) a sheet piling weir; and (3) armoring the toe of a slope with small rock. (See also W78-04719) (Lynch-Wisconsin)
W78-04728

SEDIMENT TRAP MEASURING BED LOAD MOVEMENT IN BLACK CREEK,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
R. E. Land, and R. Z. Wheaton.
In: Non-Point Source Pollution Seminar, Section 108(a) Demonstration Projects Progress Reports, Held at Chicago, November 20, 1975. Report EPA-905/9-75-007, (1975). p 93-98, 3 fig, 2 tab. EPA G005103, G005139, G005140.

Descriptors: *Black Creek Sediment Control Project(IN), *Sediments, *Sediment traps, *Bed load, Indiana, Sedimentation, Suspended sediments, Sediment control, Streams, Channels, Particle size, Black Creek(IN).

A flow-through sedimentation trap for particle of high specific gravity was installed in the main stream of Black Creek (Allen County, Indiana) to determine bed-load movement in the channel. This study was part of the Black Creek Sediment Control Project. Work on the basin was completed in September 1974; a cross-sectional survey in July 1975 indicated that 980 cu yds of sediment had been collected. The 400-ft-long basin was situated below the entrance of major Black Creek tributaries and above backwater effects of the Maumee River. The existing channel was widened to 80 ft and deepened to 15 ft, which decreased stream velocity and created plain sedimentation. All particles with a specific gravity over 2.65 and falling rate of 0.0625 ft/sec were probably trapped, as well as, for example, 50% of those with a falling velocity of 0.312 ft/sec. For the July 1975 survey three cross-sections were made in the first 100 ft, and sections were made every 50 ft thereafter. Most of the sediment dropout, and deposition of particles with the highest settling velocity, occurred in the upstream portion of the basin. The sections indicated a meandering stream flow. On several occasions the actual flow far exceeded the design flow, which may have caused a flushing action. Based on the amount of sediment trapped and observation of sand bars downstream from the basin, it was concluded that the bed-load movement in Black Creek is considerable. (See also W78-04719) (Lynch-Wisconsin)
W78-04729

GRASSED WATERWAY DESIGN,
Soil Conservation Service, Kendallville, IN. Area II.
C. F. Poland.
In: Non-Point Source Pollution Seminar, Section 108(a) Demonstration Projects Progress Reports, Held at Chicago, November 20, 1975. Report EPA-905/9-75-007, (1975). p 99-104, 1 fig, 4 ref. EPA G005103, G005139, G005140.

Descriptors: *Grassed waterways, *Runoff, *Erosion control, *Rainfall, Soil conservation, Design, Surface runoff, Vegetation establishment, Tile drainage.

A general description is given of grassed waterways as used for deversion or terrace outlets, disposal of water collected in road ditches or discharged through culverts, and rehabilitation of natural draws carrying runoff. Natural or constructed, they are shaped to required dimensions and vegetated for safe disposal of runoff, and are employed when rainfall exceeds the ability of the soil to absorb or store the moisture. Use of grassed waterways enables removal of surplus water without undue erosion. The following procedures are advised: (1) construction of the water before any other channels that will discharge it; (2) establishment of vegetitive cover by means of mulching, sodding, and irrigation; (3) conveying prolonged flow in a subsurface drainage system; (4) use of stable natural waterways where possible; and (5) maintenance of cover through mowing and fertilization; parabolic design, the shape most often found in nature, is the most satisfactory, although trapezoidal and V-shaped designs are also used. Small flows are least likely to meander in a parabolic waterway. The waterway should be located in a well-vegetated natural draw, which provides the flattest grade, most stable channel, adequate capacity, soil and moisture most favorable to vegetation, and sufficient depth for outletting diversions, terraces, and rows at grade. A tile system providing drainage and protecting the center of the waterway should be included where prolonged low flows or wet conditions prevail. (See also W78-04719) (Lynch-Wisconsin)
W78-04730

NUTRIENT CONTRIBUTIONS TO THE MAUMEE RIVER,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-04731

EFFECTS OF LAND TREATMENT ON THE AQUATIC ENVIRONMENT,
Illinois Univ. at Urbana-Champaign. Dept. of Ecology, Ethology, and Evolution.
For primary bibliographic entry see Field 5G.
W78-04732

COMPUTER MONITORING OF ENVIRONMENTAL CONDITIONS IN A WATERSHED,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
L. F. Huggins.
In: Non-Point Source Pollution Seminar, Section 108(a) Demonstration Projects Progress Reports, Held at Chicago, November 20, 1975. Report EPA-905/9-75-007, (1975). p 151-161, 2 fig, 1 tab, 3 ref. EPA G005103, G005139, G005140.

Descriptors: Computers, *Data processing, *Monitoring, *Automation, *ALERT computer system, *Black Creek Sediment Control Project(IN), Indiana, Watersheds(Basins), Data collections, Automatic control, Hydrologic aspects, Meteorological data, Sensors, Environmental control, Microprocessors, Transducers.

General trends in automated environmental data collection are reviewed, and the ALERT system being used for the Black Creek Sediment Control Project (Allen County, Indiana) is described. Field-base instrumentation, based on microprocessors and low-power integrated circuits, and designed to automatically acquire, monitor, and file environmental data, is increasingly replacing traditional systems. The latter utilize sensors connected mechanically or electrically to an individual strip-chart recorder; transcription of analog strip charts into computer-compatible format for analysis and permanent storage is laborious, costly, and error-prone. Automated data acquisition systems can be classified as (1) data logging, or (2) computer controlled. The first type provides periodic scanning of multiple sensors (transducers); resulting data is stored on computer-compatible media and subsequently transported to a remote (off-line) computer for analysis and filing. Prices range from $2,500-10,000. Computer-controlled systems essentially differ in employing a full-scale on-line computer remote to the field transducers to control acquisition, analysis, and filing of the data. ALERT, a computer-controlled system, also includes a data logging component. It was designed to collect hydrometeorological data from the Black Creek catchment as a data base for hydrologic simulation of watershed responses concurrently with naturally occurring storm events. (See also W78-04719) (Lynch-Wisconsin)
W78-04733

PROJECT MANAGEMENT AND LAND TREATMENT COSTS,
Allen County Soil and Water Conservation District, IN.
For primary bibliographic entry see Field 5G.
W78-04734

SYNOPSIS OF THE RED CLAY PROJECT,
Western Lake Superior Basin Erosion and Sediment Control Program, Superior, WI.
S. C. Andrews.
In: Non-Point Source Pollution Seminar, Section 108(a) Demonstration Projects Progress Reports, Held at Chicago, November 20, 1975. Report EPA-905/9-75-007, (1975). p 217-244, 2 fig. EPA G005103, G005139, G005140.

Descriptors: *Erosion control, *Sediment control, *Water quality control, *Red Clay Project(WI MN), *Demonstration projects, Wisconsin, Minnesota, Sedimentation, Lake Superior, Streams, Lakes, Grants, Nonpoint pollution, Suspended solids, Water pollution control.

The Red Clay Project, funded by a research and demonstration grant from EPA to the Soil and Water Conservation Districts of Ashland, Bayfield, Douglas, and Iron Counties in Wisconsin, and Carlton County, Minnesota, was designed to evaluate methods for controlling erosion and sedimentation in streams and lakes on the southern shore of Lake Superior. Sedimentation of lakes and streams was long a concern in this area, but in 1970 the suspended red clay was first identified as a pollutant, and nutrients entering Lake Superior were linked to the area. Several sites were chosen to demonstrate techniques for reducing sedimentation and improving water quality. (1) Skunk Creek, a Nemadji River tributary; application of structural erosion control measures, such as flood-retarding and grade stabilization structures, riprapping of channel banks, and installation of drains on slopes; (2) Little Balsam Creek, also a Nemadji River tributary; application of upland treatment practices, roadside erosion control, and structural control; (3) Pine Creek, a tributary of Fish Creek; applied land treatment and land use management; (4) Ashland shoreline; protective shoreline devices, including riprapping and Longard tubes; and (5) Oronto-Parker watershed; single-purpose sediment basin. A project-related information dissemination and education program is also described, along with institutional and internal management systems, and analysis and evaluation methods. (See also W78-04719) (Lynch-Wisconsin)
W78-04735

BACKGROUND, DEVELOPMENT, AND OBJECTIVES OF THE WASHINGTON COUNTY PROJECT,
Wisconsin Univ.-Madison. Dept. of Soil Sciences.
T. C. Daniel.
In: Non-Point Source Pollution Seminar, Section 108(a) Demonstration Projects Progress Reports,

Held at Chicago, November 20, 1975. Report EPA-905/9-75-007, (1975). p 245-252, 1 fig, 1 tab, 5 ref. EPA G005103, G005139, G005140.

Descriptors: *Washington County Project(WI), *Water quality control, *Sediment control, *Demonstration projects, *Erosion control, Wisconsin, Grants, Nonpoint pollution, Model studies, Legislation, Regulation, Sedimentation, Watersheds(Basins), Urbanization, Agriculture, Urban runoff, Dairy industry, Menomonee River watershed(WI), Kewaskum watershed(WI), Germantown watershed(WI).

The Washington County Project, in southeastern Wisconsin, was developed in 1973 for the purposes of demonstrating the effectiveness of land treatment measures for reducing nonpoint pollution and improving water quality and devising institutional arrangements for implementation of a sediment control ordinance. Specific objectives include: (1) use of monitoring to demonstrate sediment and erosion control techniques for improving water quality; (2) developing a sediment control ordinance or other management mechanisms acceptable to landowners and government authorities; (3) developing a model for personnel, technical assistance, and financing for implementing a sediment control program; (4) developing a public program of information dissemination; and (5) evaluating the feasibility of sediment and erosion control management programs in the Great Lakes Basin or other areas. Two watersheds in the county were selected to demonstrate water quality improvements from control techniques, Kewaskum, an agricultural area devoted primarily to dairying, and Germantown, a rapidly urbanizing area. To data, project and support staff have been chosen, and monitoring installations at the sites will be in operation by spring of 1976. (See also W78-04719) (Lynch-Wisconsin)
W78-04736

WATER MANAGEMENT REGIONAL PROGRAMS: MORE POTENTIAL THAN SUCCESS,
Delta Coll, University Center, MI. Dept. of Social Science.
For primary bibliographic entry see Field 6B.
W78-04804

THE POTENTIAL WIND EROSION PROBLEM IN THE UNITED STATES,
Soil Conservation Service, Washington, DC. Ecological Sciences and Technology Div.
L. W. Kimberlin, A. L. Hidlebaugh, and A. R. Grunewald.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 5, p 873-879, September-October 1977. 5 fig, 8 tab, 14 ref.

Descriptors: *Wind erosion, *Soil erosion, *Reviews, *Great plains, *United States, Erosion, Soils, Air pollution, Dusts, Damages, Crops, Ranges, Data collections, Soil damage, Soil loss, Crop damage.

Wind erosion is a chronic problem that poses a continuing threat to erodible soils that are exposed through cultivation, overgrazing, construction, or other practices that remove protective cover. In the Great Plains and in other parts of the country, the potential for wind erosion damage can be expected to increase as new lands are brought into cultivation to meet the growing needs for food and fiber. But, since the days of the Dust Bowl, research and technology have provided many tools for dealing with this important problem. During the drought of the past several months, a major portion of the land in the Plains was protected by conservation practices which helped to hold the soil in place and to diminish the adverse effects of the weather. As new lands are brought into production and those presently cropped are subjected to more intensive use, efforts must be accelerated to insure that conservation technology keeps pace with the needs of American agriculture. (Humphreys-ISWS)
W78-04838

A REVIEW OF MULCHES TO CONTROL WIND EROSION,
Agricultural Research Service, Manhattan, KS. North Central Region.
D. V. Armbrust.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 5, p 904-905, 910, September-October 1977. 3 tab, 17 ref.

Descriptors: *Erosion control, *Wind erosion, *Mulching, *Reviews, Erosion, Soil erosion, Soil management, Soil treatment, Soil stabilization, Bituminous material, Emulsions, Farm wastes, Asphalt, *Mulches, Crop residues, Chemical soil stabilizers.

The need to increase food production and to improve the quality of our environment has prompted a search for materials to control wind and water erosion. This paper reviews research and development associated with application, methods, and amounts of mulch types-crop residues, chemical soil stabilizers, and feedlot wastes (manure) -required to control wind erosion. An effective wind erosion control treatment is one that can resist a 38.0 m/s wind as measured at 15.2 m. Any crop residue, either grown in place or hauled in and spread, can control wind erosion. Hauled-in residues must be spread and anchored to the soil surface by a packer or an anchoring agent, i.e., cutback asphalt or asphalt emulsion. Depending on residue type, minimum amounts needed to control wind erosion are 4.5 to 11 t/ha. Chemical soil stabilizers, i.e., asphalt, polyvinyl alcohol, styrene-butadiene latex emulsions, and resins-in-water emulsions control wind erosion effectively if properly diluted and applied to cover the total soil surface at volumes of at least 3785 L/ha. Wet feedlot manure applied to a highly-erodible sand controlled erosion with 31.8 t/ha surface-applied or 52.3 t/ha tilled-in with a tandem disk. (Humphreys-ISWS)
W78-04839

MINIMUM TILLAGE FALLOW SYSTEMS FOR REDUCING WIND EROSION,
Nebraska Univ. Panhandle Station at Scottsbluff.
C. R. Fenster, and G. A. Wicks.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 5, p 906-910, September-October 1977. 2 tab, 15 ref.

Descriptors: *Wind erosion, *Erosion control, *Dry farming, Soil erosion, Fallowing, Land management, Cultivation, Soil management, Soil conservation, Minimum tillage.

Climate is the greatest single factor that influences wind erosion control. Much of the Great Plains has insufficient precipitation for profitable annual cropping under present dryland cropping practices. Moisture conservation and residue maintenance always should be considered when contemplating a tillage operation. The primary purposes of tillage are to control weeds, to reduce erosion, and to prepare a desirable seedbed. The most common type of minimum tillage system in winter wheat production for reducing wind erosion has been stubble-mulch farming. Vegetative cover is required on the soil surface at all times for erosion control. The amount and kind of residue necessary to protect a particular soil fro wid erosion determines the sequence and type of tillage needed. Seeding equipment must place seed firmly into moist soil while maintaining a protective cover of residue on the soil surface. Wind erosion can be controlled by anchoring residues between the rows and maintaining good soil cloddiness and surface roughtness. Minimum tillage systems will aid in residue maintenance, moisture conservation, erosion control, and reducing energy requirements. (Humphreys-ISWS)
W78-04840

REDUCING WIND EROSION WITH BARRIERS,
Agricultural Research Service, Manhattan, KS. North Central Region.
E. L. Skidmore, and L. J. Hagen.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 5, p 911-915, September-October 1977. 5 fig, 1 tab, 39 ref.

Descriptors: *Wind erosion, *Soil erosion, *Erosion control, *Mathematical models, Model studies, Windbreaks, Barriers, Wind velocity, Tractive forces, Shear stress, Theoretical analysis, Analytical techniques, Erosion forces, Soils.

When wind shear forces on the soil surface exceed the soil's resistance to those forces, soil particles detach and are transported by the wind. Barries obstruct the wind and reduce the wind's speed, thus, reducing wind erosion. Application of a model, developed for evaluating effectiveness of a barrier for reducing the capacity of local wind to cause erosion, illustrated: (a) Wind erosion forces are reduced more than windspeed. (b) Properly oriented barriers give much more protection when preponderance is low. (c) When preponderance of wind erosion forces is low, barrier orientation is almost inconsequential. (d) Because of seasonal variation of wind direction and speed, need for and amount of protection also vary seasonally. Many trees, shrubs, tall growing crops, and grasses, and slat-fences all can be used as barriers to reduce wind erosion. (Humphreys-ISWS)
W78-04841

WIND EROSION RESEARCH ACCOMPLISHMENTS AND NEEDS,
Agricultural Research Service, Big Spring, TX.
For primary bibliographic entry see Field 2J.
W78-04842

ANNUAL GRASSES FOR TEMPORARY PROTECTION OF EARTH SPILLWAYS,
Agricultural Research Service, Stillwater, OK.
W. O. Ree, F. R. Crow, and W. W. Huffine.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 5, p 934-939, September-October 1977. 9 fig, 2 tab, 5 ref.

Descriptors: *Oklahoma, *Spillways, *Erosion, Channels, Grasses, Clay, Soils, Hydraulics, Sudangrass, Wheat, Annual, Protection, *Spillway protection, Earth spillways.

Wheat or sudangrass planted on newly graded spillways can provide early protection against erosion from small but frequent storm flows. Within 10 days after seeding on July 1 in Oklahoma, an irrigated sudangrass cover in an earth spillway increases the permissible discharge rate to five times that for an unprotected spillway. Density of a young plant cover should be at least 750 stems/sq m, uniformly distributed over the spillway surface. Irrigation may be needed to bring early emergence of the cover. Wheat seems to offer slightly better protection than sudangrass. However, the cover choice will depend upon the season. In Oklahoma, wheat would be used for winter and sudangrass for the summer. (Lee-ISWS)
W78-04845

SEDIMENT DEPOSITION PATTERNS IN SIMULATED GRASS FILTERS,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
E. W. Tollner, B. J. Barfield, C. Vachirakornwatana, and C. T. Haan.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 5, p 940-944, September-October 1977. 9 fig, 1 tab, 10 ref.

Descriptors: *Deposition(Sediments), *Grasses, *Grassed waterways, *Model studies, Mathematical models, Hydraulic models, Laboratory tests, Filters, Sediments, Sediment transport, Sediment load, Sedimentation.

The principle of mass continuity was used to develop equations to predict the rate of advance of a sediment deposition front in a grass filter under steady-state flow conditions. Based on the theoretical analysis, it was shown that the rate of advance is proportional to the square root of elapsed time until the depth of deposition reaches the grass height and then linearly proportional to elapsed time. The validity of the equations was evaluated in cylindrical and flat bladed artificial media using homogeneous sediment. The agreement between predicted and observed values was excellent. (Sims-ISWS)
W78-04846

A GEOGRAPHICAL APPRAISAL OF THE EXPANSION AND DETERIORATION OF THE INDIAN DESERT,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 2J.
W78-04932

PROCEEDINGS OF THE 20TH ANNUAL ARIZONA WATERSHED SYMPOSIUM,
Arizona Water Commission, Phoenix.
Report No 8, September 15, 1976, 60 p.

Descriptors: *Arizona, *Water supply, *Water resources, *Water resources development, *Colorado River, *Competing uses, Water demand, Water shortage, Groundwater mining, Groundwater, Fissures(Geologic), Land subsidence, Water levels, Federal project policy, Arid lands, Groundwater availability, Groundwater potential, Federal-State Water Rights Conflicts, *Central Arizona Project, Indian Water Rights, Tucson.

This is a collection of papers and speeches from the Arizona Watershed Symposium held in Phoenix, Arizona. The issues discussed include Arizona's state water plan, groundwater resources, supplies, and problems, groundwater mining and the problem of land subsidence and earth fissures, the role of the forest service in Arizona's water future, the effect of Public Law 92-500 on Arizona's water future, and the Central Arizona Project. The thrust of the conference was that Arizona's future problems revolve around an ever expanding number of water users and water demands and a decreasing water supply. Projections are made about future needs and supplies, and suggestions about water conservation and alternative water sources are discussed. (See W78-04935 thru W78-04941) (Jamail-Arizona)
W78-04934

ARIZONA STATE WATER PLAN--PHASE II,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6E.
W78-04935

ARIZONA'S GROUNDWATER RESOURCES, SUPPLIES AND PROBLEMS,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 4B.
W78-04936

THE SIGNIFICANCE OF GROUNDWATER LEVEL DECLINES IN EASTERN PIMA COUNTY, ARIZONA,
Tucson Water and Sewers Dept., AZ.
For primary bibliographic entry see Field 4B.
W78-04937

FOREST SERVICE'S ROLE IN ARIZONA'S WATER FUTURE,
Forest Service, Albuquerque, NM.
For primary bibliographic entry see Field 6E.
W78-04938

THE EFFECT OF PUBLIC LAW 92-500 ON ARIZONA'S WATER FUTURE,
Southwest Forest Industries, Phoenix, AZ.
For primary bibliographic entry see Field 5G.
W78-04939

CAP UPDATE,
Bureau of Reclamation, Phoenix, AZ. Arizona Projects Office.
For primary bibliographic entry see Field 4A.
W78-04940

THE CAP IN CONTROVERSY,
Central Arizona Project Association, Phoenix.
For primary bibliographic entry see Field 6E.
W78-04941

HYDROLOGY AND SEDIMENTOLOGY OF THE COLORADO RIVER IN GRAND CANYON,
Arizona Univ., Tucson. Dept. of Ecology and Evolutionary Biology.
For primary bibliographic entry see Field 2J.
W78-05002

ALTERATIONS OF TERRACE DEPOSITS AND BEACHES OF THE COLORADO RIVER IN GRAND CANYON,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2J.
W78-05004

ORDER CLASSIFICATION OF URBAN CATCHMENTS,
North Carolina Univ. at Raleigh. Water Resources Research Center.
For primary bibliographic entry see Field 2E.
W78-05022

SEDIMENT FROM DRAINAGE SYSTEMS FOR CLAY SOILS,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
G. O. Schwab, B. H. Nolte, and R. D. Brehm.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 5, p 866-872, September-October 1977. 3 fig, 2 tab, 10 ref.

Descriptors: *Sediment yield, *Drainage systems, *Ohio, *Clays, Tile drainage, Surface drainage, Soils, Measurements, Testing procedures, On-site tests, On-site investigations, Runoff, Agriculture, Irrigation, Rainfall, Crops, Corn(Field), Oats, Alfalfa, Land management, Cultivated lands, Erosion, Soil loss.

Sediment losses from tile and surface drainage systems in a lakebed soil in northern Ohio were measured for 6 yr (1969-74). Average annual losses were 2359 kg/ha from tile only and 3687 kg/ha for surface only. Calculated losses for the combination tile and surface drainage system were 2672 kg/ha. Annual measured losses ranged from about 100 to 9000 kg/ha. Average net losses from sprinkler irrigation were negligible, and usually more sediment was added than removed in the drainage water. Sediment concentration in tile flow from irrigation increased significantly with the antecedent soil moisture content. Concentrations were high at the beginning of flow but decreased to a nearly constant level after 20 hr. A possible explanation for the high concentrations is that the sediment moved in suspension with the water and not necessarily through the soil cracks. Estimates using a rainfall factor in the universal soil loss equation for surface drainage were 89% of the measured losses with an r sq value of 0.25, significant at the 99% level. Estimates using a runoff factor were 74% of the measured losses with an r sq value of 0.35, also significant at the 99% level. (Humphreys-ISWS)
W78-05030

WIND EROSION: PROCESSES AND EFFECT ON SOIL PRODUCTIVITY,
Agricultural Research Service, Manhattan, KS. North Central Region.
For primary bibliographic entry see Field 2J.
W78-05031

LIME TREATMENT OF DAMS CONSTRUCTED WITH DISPERSIVE CLAY SOILS,
Soil Conservation Service, Grenada, MS.
For primary bibliographic entry see Field 8D.
W78-05035

SEDIMENT YIELD PREDICTION BASED ON WATERSHED HYDROLOGY,
Agricultural Research Service, Temple, TX.
J. R. Williams, and H. D. Berndt.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 6, p 1100-1104, November-December 1977. 3 tab, 12 ref.

Descriptors: *Sediment yield, *Forecasting, *Texas, *Watersheds(Basins), *Mathematical models, Model studies, Runoff, Rainfall-runoff relationships, Water yield, Sediment discharge, Hydrography analysis, Unit hydrographs, Peak discharge, Equations, *Hydrologic models, Soil loss, Daily sediment yield.

Daily, monthly, and annual sediment yield can be predicted fairly accurately by attaching a sediment yield model (MUSLE) to hydrologic models. A water yield model based on SCS curve numbers and a soil moisture index was used to predict daily runoff volumes. The runoff-sediment model was tested on 26 watersheds in Texas. A comparison of measured and predicted average annual sediment yields gave an R sq of 0.98. For eight of the watersheds, monthly measured and predicted sediment had an average R sq of 0.66. Prediction accuracy generally increased with decreasing watershed area, mainly because point rainfall better represents actual rainfall as area decreases. The sediment-runoff model should be useful in reservoir design because long-term average annual sediment yield can be predicted accurately. Since the monthly sediment predictions are fairly accurate and the standard deviations compare closely with measured standard deviations, the model should be useful for other applications, like water quality modeling. The model is practical for most applications because inputs are simple and computer costs are low. (Humphreys-ISWS)
W78-05036

ASSESSMENT OF FLOOD AND EROSION ASSISTANCE PROGRAMS, RONDEAU COASTAL ZONE EXPERIENCE, LAKE ERIE,
Waterloo Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 4A.
W78-05037

THE ROLE OF VEGETATION IN STABILIZING THE LOWER GREAT LAKES CANADIAN SHORELINE,
Acres Consulting Services Limited, Niagara Falls (Ontario). Environmental Dept.
T. S. Dai, I. K. Hill, and D. W. Smith.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 46-56, October 1977. 6 fig, 3 tab, 18 ref.

Descriptors: *Shoreline cover, *Vegetation, *Soil stabilization, *Great Lakes, Surveys, Shores, Shore protection, Erosion, Erosion control, Lakes, Waves(Water), Vegetation establishment, Sampling, Data processing, Classification, Shoreline vegetation.

This study examined the natural vegetation of the Canadian shoreline of Lakes Ontario, Erie, and St. Clair. The results suggested that different communities may have different effects on shoreline stability. Classification analyses identified five vegetation communities. The communities were

named for their two leading dominant species. The combined effects of microclimate, soil properties, physiognomic features of the bluffs, and degree of alteration of the shorelines were considered in respect to the vegetation cover, and it was found that no single environmental factor controlled vegetation type. (Sims-ISWS)
W78-05038

PHYSICAL AND CHEMICAL PARAMETERS AFFECTING TRANSPORT OF 137CS IN ARID WATERSHEDS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 5A.
W78-05042

NON-POINT WATER QUALITY MODELING IN WILDLAND MANAGEMENT: A STATE-OF-THE-ART ASSESSMENT VOL. II: APPENDIXES.
Forest Service (USDA), Washington, DC.
For primary bibliographic entry see Field 5B.
W78-05055

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

WATER QUALITY IN NORTH CAROLINA COASTAL PLAIN STREAMS AND EFFECTS OF CHANNELIZATION,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5B.
W78-04707

EFFECTS OF AN URBAN ROAD SYSTEM ON LEAD CONTENT OF AN URBAN WATER SUPPLY SOURCE,
Massachusetts Univ., Amherst. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-04711

THE U.S. GEOLOGICAL SURVEY AND LAND USE MAPPING,
Geological Survey, Reston, VA.
For primary bibliographic entry see Field 7B.
W78-04718

SUMMARY REPORT 1975: FOOD PROTECTION AND TOXICOLOGY CENTER, UNIVERSITY OF CALIFORNIA, DAVIS.
California Univ., Davis. Food protection and Toxicology Center.
For primary bibliographic entry see Field 5C.
W78-04745

WATER POLLUTION INVESTIGATION: CUYAHOGA RIVER AND CLEVELAND AREA,
ECO-LABS, Inc., Cleveland, OH.
For primary bibliographic entry see Field 5B.
W78-04748

FRESHWATER ALGAL VEGETATION IN THE AZORES,
Vaxtbiologiska Institutionen, Uppsala (Sweden).
For primary bibliographic entry see Field 5C.
W78-04752

CLOSTRIDIUM PERFRINGENS AND COLIFORM BACTERIA AS INDICATORS OF FAECAL POLLUTION,
Vattentest A. B., Uppsala (Sweden).
I.. Mellgren.
OIKOS Supplementum, Vol. 15, p 195-201, 1973. 4 fig, 1 tab, 8 ref.

Descriptors: *Clostridium perfringens, *Fecal pollution, *Bioindicators, *Coliforms, *Bacteria, Sweden, Water pollution, Sediments, Stockholm Archipelago(Sweden), Waste water, Path of pollutants, Water pollution sources, Pollutants.

In a study of the distribution of domestic wastewater in the Stockholm, Sweden archipelago, the bacterium Clostridium perfringens proved more reliable and accurate an indicator of fecal water pollution than coliform bacteria. C. perfringens is not affected by environmental factors in the same way as coliforms, and the path of polluted water can be followed much further than with the coliforms. Coliform bacteria have several disadvantages as fecal pollution indicators: (1) they may originate in nonfecal sources, such as paper industry wastewater or soil; (2) survival time in water is short due to zooplankton predation, parisitism from other bacteria, bacteriophages, and adverse effects of the water itself; and (3) rapid changes in coliform numbers in sampling bottles necessitate immediate analysis. In contrast, the natural habitat of C. perfringens is the colon of humans and warm-blooded animals, it survives for decades in nature, and it does not appear to multiply in water or at temperatures below 20C. It is an anaerobic sporeforming rod, nonmotile, Gram-positive, and occurring singly, in pairs, or in short chains. In this study water samples at 1-m depths and sediment samples were taken from the Stockholm Archipelago (Sweden) in 1969-71. Maps of fecal pollution were constructed based on coliforms and on C. perfringens. It was found that the area affected by fecal residues can be much more accurately mapped with C. perfringens. The number of C. perfringes in the sediment is a result of sedimenttion over a long period, and therefore indicative of long-term trends. (Lynch-Wisconsin)
W78-04754

WATER QUALITY DATA DURING SEPTEMBER 16-19, 1974 AT SILVER BAY, SAWMILL COVE, AND EASTERN CHANNEL, SITKA, ALASKA.
Environmental Protection Agency, Seattle, WA. Surveillance and Analysis Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 799, Price codes: A05 in paper copy, A01 in microfiche. Working Paper No. E.P.A.-910-8-76-096, May 1975. 72 p, 10 fig, 5 tab, 9 ref, 6 append.

Descriptors: *Water quality standards, *Water pollution control, *Sitka(AK), *Pulp and paper industry, *Estuaries, Waste water disposal, Effluents, Alaska, Silver Bay(AK), Sawmill Cove(AK), Eastern Channel(AK), Marine fisheries, Regulations, Sludge, Sulfite liquors, Dissolved oxygen, Inlets(Waterways), Estuarine environment, Baseline studies.

A water quality survey conducted near Sitka, Alaska in September 1974 showed that many indicators have not improved since installation of a primary wastewater treatment system at the Alaska Lumber and Pulp Company in September 1972. Twenty-two stations in the marine waters of Eastern Channel and the estuarine waters of Silver Bay and Sawmill Cove were sampled for sulfite waste liquor, dissolved oxygen, temperature, pH, and conductivity at depths of 1, 5, 10, and 12 m. Transparency, and chemical, visual, and qualitative biological examination of bottom deposits were assessed near the mill's main sewer. Alaska Water Quality Standards specify that sulfite waste liquor concentrations above 10 mg/l are damaging to some immature shellfish, and above 50 mg/l are toxic to phytoplankton and fish-food organisms. Concentrations of >50 mg/l occurred in 14% of 232 samples taken, and >10 mg/l concentrations occurred in 51% of the samples. At 1 and 5 m depths, 42% of the samples had >50 mg/l concentrations, and 98% >10 mg/l. Of near-surface stations 83% had concentrations >50 mg/l. No major improvement in sulfite waste liquor have occurred since 1968-69. Although improvements in dissolved oxygen have been made since 1972, concentrations continue to fall below the 6.0 mg/l standard during periods of low stream discharge in midsummer and early fall at the 1 m depth. Little improvement was noted in chemical characteristics of sludge deposits in Sawmill Cove and adjacent Silver Bay. (Lynch-Wisconsin)
W78-04756

A MALLOMONAS POPULATION,
Vaxtbiologiska Institutionen, Uppsala (Sweden).
For primary bibliographic entry see Field 5C.
W78-04776

ACTINOTAENIUM COSMARIUM AND STAURODESMUS IN THE PLANKTON OF ROTORUA LAKES,
Vaxbiologiska Institutionen, Uppsala (Sweden).
For primary bibliographic entry see Field 5C.
W78-04777

BIOLOGICAL SURVEY OF PINKHAM CREEK AND THE NORTH PLATTE RIVER IN THE VICINITY OF COWDREY, COLORADO, AUGUST 24, 1972,
Environmental Protection Agency, Denver, CO. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5C.
W78-04781

BACTERIOLOGICAL INVESTIGATIONS OF THE UPPER SOUTH PLATTE RIVER BASIN. MAY 1972, JULY 1972, SEPTEMBER 1972,
Environmental Protection Agency, Denver, CO. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5C.
W78-04782

EFFECTS OF ENVIRONMENTAL CHANGES ON MARSH VEGETATION WITH SPECIAL REFERENCE TO SALINITY,
Tulane Univ., New Orleans, LA.
For primary bibliographic entry see Field 5C.
W78-04785

THE CONTRIBUTION OF AGRICULTURE TO THE EUTROPHICATION OF SWISS WATERS, I. RESULTS OF DIRECT MEASUREMENTS IN THE DRAINAGE AREA OF VARIOUS CHANNELS,
For primary bibliographic entry see Field 5C.
W78-04786

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 3, DETERMINATION OF TOTAL PHOSPHORUS IN NATURAL WATERS,
Uppsala Univ. (Sweden). Dept. of Analytical Chemistry.
For primary bibliographic entry see Field 5B.
W78-04790

SYSTEMS FOR RAPID RANKING OF ENVIRONMENTAL POLLUTANTS,
Stanford Research Inst., Menlo Park, CA.
S. Brown, B. R. Holt, and K. E. McCaleb.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 168, Price codes: A12 in paper copy, A01 in microfiche. Final Report CRESS-2, to EPA, August 1975. 294 p, 2 fig, 18 tab, 84 ref, 9 append. 68-01-2940.

Descriptors: *Pollutants, *Ranking, *Priorities, *Systems analysis, *Environmental Protection Agency, EPA, Hazards, Toxins, Scientific and Technical Assessment Reports, STARs, Mathematical models, Pollution abatement, Problem identification and ranking, Planning.

A system for priority ranking of hazardous agents which adversely affect the environment was developed for use by the Office of Research and Development (ORD) of the Environmental Protection Agency (EPA) in preparing a series of Scientific and Technical Assessment Reports (STARs). The STARs summarize the state of knowledge regarding specific hazardous agents, a term interpreted as broader than 'pollutant' and including such entities as chemical pollutants, thermal waste, radiation, and noise. An optimal hybrid ranking system was developed from three possible systems identified by an interdisciplinary team of scientists and analysts. These systems were: (1) expert judgment, (2) an information screening system using indexes, and (3) a mathematical model. A combination of the expert system and a more objective screening/model subsystem was selected. The objective subsystem is designed to support and calibrate the expert system, and consists of an explicit procedure that tests the state of information about an agent, processes available information on the basis of the test results. The expert system would cost about $3,500 per agent, or $120-130,000 annually for 36 agents. The subsystem would cost $50-60,000 per year. The system was tested on ten agents, resulting in the following ranking: cyanides, carbon disulfide, beryllium, lithium, plutonium, antimony, heat from man-made sources, carbonyl sulfide, cobalt, and molybdenum. (Lynch-Wisconsin)
W78-04806

SUBSTANTIVE CORRECTIONS TO SIL COMMUNICATIONS (IVL MITTEILUNGEN) NUMBERS 6 AND 20,
Wisconsin Univ.-Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 2H.
W78-04810

LONG TERM PEACE RIVER CHARACTERISTICS AS A MEASURE OF A PHOSPHATE SLIME SPILL IMPACT,
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-04850

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. GREAT LAKES, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04855

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. ATLANTIC COAST, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04856

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. GULF COAST, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04857

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. PACIFIC COAST, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04858

SURFACE-WATER AND GROUND-WATER FEATURES, CLAY COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-04870

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 3. SOUTHWEST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04871

ANALYSIS OF BOTTOM MATERIAL FROM THE WILLAMETTE RIVER, PORTLAND HARBOR, OREGON,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 2K.
W78-04874

WATER RESOURCES OF THE BARONA, CAPITAN GRANDE, AND SYCUAN INDIAN RESERVATIONS, SAN DIEGO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04876

A NEW METHOD OF MONITORING WATER QUALITY IN A STREAM RECEIVING SEWAGE EFFLUENT, USING CHIRONOMID PUPAL EXUVIAE,
Bristol Univ. (England). Dept. of Zoology.
R. S. Wilson, and J. D. McGill.
Water Research, Vol. 11, p 959-962, 1977. 3 fig, 21 ref.

Descriptors: *Methodology, *Sampling, *Diptera, *Aquatic insects, *Bioindicators, Water quality, Midges, Streams, Systematics, Data collections, Effluents, Sewage effluents, Pollutant identification, *Chironomid pupal exuviae, Species composition, Diversity indices.

It was proposed that the chironomid fauna of a river may be adequately sampled by collecting the floating pupal exuviae which accumulate along the banks and against obstructions. This technique was found to be simple, quick, and applicable to large, deep rivers as well as to small, shallow streams. Such samples provided enough material for examining the percentage composition of species, and for calculating diversity indices. The pupal exuviae were much easier to identify to species or species group than are the larvae. An examination of the effect of a sewage discharge into a small stream in South West England was given as a practical example of the method. (Klein)
W78-04880

WATER POLLUTION STUDIES ON LAKE ILLAWARRA, I. SALINITY VARIATIONS AND ESTIMATION OF RESIDENCE TIME,
Wollongong Univ. (Australia). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-04882

WATER POLLUTION STUDIES ON LAKE ILLAWARRA, II. THERMAL BEHAVIOUR,
Wollongon Univ. (Australia). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-04883

WATER POLLUTION STUDIES ON LAKE ILLAWARRA, III. DISTRIBUTION OF HEAVY METALS IN SEDIMENTS,
Wollongong Univ. (Australia). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-04884

THE COMMON MUSSEL MYTILUS EDULIS AS AN INDICATOR OF TRACE METALS IN SCANDINAVIAN WATERS. I. ZINC AND CADMIUM,
Uppsala Univ. (Sweden). Inst. of Zoology.
D. J. H. Phillips.
Marine Biology, Vol 43, p 283-291, 1977. 3 fig, 3 tab, 38 ref.

Descriptors: *Bioindicators, *Sampling, *Mussels, *Salinity, Metals, *Zinc, *Cadmium, Shellfish, Invertebrates, Water pollution sources, Water quality, Path of pollutants, *Mollusks, *Scandinavia, *Baltic Sea, Skagerrak, Kattegat.

Concentrations of zinc and cadmium in whole soft parts of mussels, Mytilus edulis (L.), collected from 54 locations in Scandinavian waters were dtermined. Local variations in concentrations of the two metals found in samples taken close to industrial sources of zinc and cadimum confirmed the mussel to act as an accurate indicator of pollution by these metals over the entire range of salinities in which this species can exist. Offshore samples remote from industrial discharges revealed higher concentrations of zinc and cadmium in mussels from low-salinity areas. Major decreases in metal concentrations present in the mussel were apparent in areas of rapid salinity change. Results suggested the existence of a higher biological availability of these metals in regions of low salinity; possible reasons for this were discussed. Data from the present survey were also compared to those reported for mussels taken elsewere. Results revealed the Baltic area to be considerably polluted by trace metals; the waters of Kattegat and Skagerrak were considered to be relatively unpolluted. (Klein)
W78-04890

THE EFFECTS OF FREE CHLORINE AND CHLORAMINE ON GROWTH AND RESPIRATION RATES OF LARVAL LOBSTERS (HOMARUS AMERICANUS),
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 5C.
W78-04892

TOXICITY OF CHLORINE TO JUVENILE SPOT, LEIOSTOMUS XANTHURUS,
Environmental Research Lab., Gulf Breeze, FL.; and Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5C.
W78-04895

THE ACUTE TOXICITY OF SIX MONOCYCLIC AROMATIC CRUDE OIL COMPONENTS TO STRIPED BASS (MORONE SAXATILIS) AND BAY SHRIMP (CRAGO FRANCISCORUM),
National Marine Fisheries Service, Tiburon, CA. Tiburon Lab.
For primary bibliographic entry see Field 5C.
W78-04896

GAS-LIQUID CHROMATOGRAPHY DETERMINATION OF RESIDUES OF METHANESULFONATE OF META-AMINOBENZOIC ACID ETHYL ESTER IN FISH,
Fish and Wildlife Service, Warm Springs, GA. Southeastern Fish Control Lab.

J. B. Sills, and G. W. Luhning.
Journal of the Association of Official Analytical Chemists, Vol 60, p 961-962, July 1977. 1 tab, 7 ref.

Descriptors: *Pollutant identification, *Analytical techniques, *Chromatography, *Methodology, *Organic compounds, *Fish, Gas chromatogrphy, Biochemistry, Laboratory tests, Biological properties, Fish physiology, Sulfonates, Tissue analysis, MS-222, *Gas-liquid chromatography, Muscle tissue, Esters.

In this gas-liquid chromatographic procedure for determining residues of methanesulfonate of m-aminobenzoic acid ethyl ester (MS-222) in fish muscle, homogenized tissue was extracted with distilled water, and proteins were removed by coagulation with trichloroacetic acid, centrifugation, and filtration. After careful pH adjustment of the filtrate, MS-222 was partitioned into benzene-ethyl ether and measured by alkali flame ionization gas chromatography. Tissues with known additions of 1-19 microg MS-222/g were analyzed, with recoveries of 84-95%. (Klein)
W78-04899

A COMPARISON BETWEEN VARIOUS CRITERIA FOR THE INTERPRETATION OF BIOLOGICAL DATA IN THE ANALYSIS OF THE QUALITY OF RUNNING WATERS,
Parma Univ. (Italy). Lab. di Ecologia.
P. F. Ghetti, and G. Bonazzi.
Water Research, Vol. 11, p 819-831, 1977. 5 fig, 4 tab, 29 ref.

Descriptors: *Biological communities, Water quality, *Speciation, Indexing, Correlation analysis, Environmental effects, Statistical methods, Ecosystems, Aquatic life, Systematics, Mathematical studies, Model studies, Methodology, Benthos, Invertebrates, *Pollutant identification, Data assessment, Macroinvertebrate communities, Biotic index, Diversity index, Saprobic index, *Torrente Parma(Italy).

Common biological criteria was used for the assessment of water quality to the macroinvertebrate populations in the Torrente Parma (Italy). Data concerning the structure and dynamics of the macroinvertebrate community over one year were analysed through species diversity indices, the saprobic index, and the biotic indices of Woodiviss and Vernesux-Tuffery. The values obtained by applying the various indices were compared. A tentative conversion scale was developed between indices which gave a high degree of correlation. A model representation of the annual species distribution was made using cluster analysis and Fager's affinity index. (Klein)
W78-04901

55FE IN PACIFIC OCEAN PLANKTON,
Oregon Coll. of Education, Monmouth.
For primary bibliographic entry see Field 5B.
W78-04903

VIABILITY OF EMBRYOS OF THE WIN.ER FLOUNDER PSEUDO-PLEURONECTES AMERICANUS EXPOSED TO COMBINATIONS OF CADMIUM AND SALINITY AT SELECTED TEMPERATURES,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5C.
W78-04908

APPRAISAL OF A REFERENCE TOXICANT FOR ESTIMATING THE QUALITY OF OYSTER LARVAE,
Washington State Dept. of Fisheries, Brinnon. Shellfish Lab.-Point Whitney.
R. D. Cardwell, C. E. Woelke, M. I. Carr, and E. Sanborn.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 6, p. 719-725, 1977. 1 tab, 18 ref.

Descriptors: *Toxicity, *Surfactants, *Larval growth stage, *Growth stages, *Mortality, *Spawning, *Oysters, *Animal metabolism, Animal physiology, Chemical analysis, Bioassay, Detergents, Water pollution effects, Commercial shellfish, *Reference toxicants, DSS, *Dodecy sodium sulfate.

The surfactant dodecyl sodium sulfate (DSS) was evaluated as a reference toxicant. There was a weak relationship between the degree of abnormal development and mortality of a given lot of oyster larvae and its sensitivity to DSS. A significant relationship (P 0. 05) was observed between the time required to induce a given female to spawn and the sensitivity of its progeny to DSS. It was inferred that DSS was not suitable as a reference toxicant. (Katz)
W78-04912

A SURVEY ON THE MERCURY CONTENT OF THE PERSIAN GULF SHRIMP,
Tehran Univ. (Iran). Dept. of Food Hygiene.
V. Parveneh.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 6, p. 778-782, 1977. 9 ref.

Descriptors: *Mercury, Commercial shellfish, *Shrimp, *Toxicity, *Public health, *Heavy metals, Spectrometry, Water pollution effects, Crustacean, Chemical analysis, Bioaccumulation, Tissue analysis, *Methylmercury, *Persian Gulf.

The mercury content of the edible part of the commercially important Persian Gulf Shrimp was analyzed. The level of mercury in the 100 samples examined ranged from 0.08 to 0.88 mg/kg with a mean value of 0.24 mg/kg and a standard deviation of 0.18. These values did not exceed proposed mercury content limit for human consumption. (Katz)
W78-04914

ACCUMULATION OF AROMATIC HYDROCARBONS IN TISSUES OF PETROLEUM-EXPOSED MALLARD DUCKS (ANAS PLATVRHVNCHOS),
New Orleans Univ., LA. Center for Bio-Organic Studies.
For primary bibliographic entry see Field 5C.
W78-04919

ACCUMULATION OF SATURATED HYDROCARBONS IN TISSUES OF PETROLEUM-EXPOSED MALLARD DUCKS (ANAS PLATVRHVNCHOS),
New Orleans Univ., LA. Center for Bio-Organic Studies.
G. C. Lawler, W. Loong, and J. L. Laseter.
Environmental Science and Technology, Vol. 12, No. 1, p 47-51, 1978. 3 fig, 3 tab, 22 ref.

Descriptors: *Oil spills, *Oil pollution, *Animal metabolism, *Mallard duck, *Absorption, *Organic compounds, *Water birds, Gas chromatography, Mass spectrometry, Tissue analysis, *Bioaccumulation, Crude oil, South Louisiana crude.

Mallard drakes were dosed with 5 ml a day of crude oil for 14 days. Tissues from control and experimental ducks were then examined for petroleum hydrocarbons by combined high-resolution gas chromatography and mass spectrometry. Oil was found in every experimental tissue examined but the brain. The skin (an underlying adipose tissue) contained the highest level of saturated petroleum hydrocarbons. The other tissues were ranked relative to the skin as follows: skin > uropygial gland > breast muscle, heart muscle > liver > brain. That saturated petroleum hydrocarbons did not accumulate in duck tissues in the same relative amounts observed in crude oil suggested selective uptake and/or metabolism. (Katz)
W78-04920

EFFECTS OF DDT AND POLYCHLORINATED BIPHENYLS ON CELLULAR METABOLISM AND ULTRASTRUCTURE OF CRITHIDIA FASCICULATA, A FLAGELLATED PROTOZOAN,
Armed Forces Radiobiology Research Inst., Bethesda, MD.
For primary bibliographic entry see Field 5C.
W78-04922

WATER QUALITY AND SOIL PROPERTIES: WATER QUALITY AND ITS EFFECT ON THE PROPERTIES OF LIGHT TEXTURED SOILS,
Rajasthan Coll. of Agriculture, Jaipur (India). Dept. of Soil Science and Agricultural Chemistry.
For primary bibliographic entry see Field 2G.
W78-04930

URBAN RUNOFF QUALITY IN NORTHERN GUAM,
Guam Univ., Agana. Water Resources Research Center.
W. J. Zolan, R. N. Clayshulte, S. J. Winter, J. A. Marsh, and R. H. F. Young.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 564, Price codes: A09 in paper copy, A01 in microfiche. Technical Report No 5, January 1978. 168 p, 101 fig, 32 tab, 14 ref, 2 append. OWRT A-005-GUAM(1). 14-34-0001-6054,7023,7024.

Descriptors: *Storm runoff, *Surface runoff, Water quality, *Storm drains, Cities, Water spreading, Urban runoff, *Water quality standards, *Pollutant identification, Measurement, *Coliform bacteria, *Nitrate-nitrogen, Water pollution sources, *Guam, *Ponding basins, Municipal wastes.

The purpose was to obtain qualitative information on urban runoff in northern Guam. Runoff was collected over an 18 month period from ponding basins and storm drains and analyzed for common water quality parameters. Results indicate that pollutant concentrations in ponding basins are relatively low in comparison to levels measured in other communities in the United States. Moderate to high concentrations of oil and grease and soaps are occasionally measured at storm drain outlets emptying into ponding basins. Coliform bacteria levels are generaly low with geometric means of 900 total coliform per 100 ml and 215 fecal coliform per 100 ml. However, counts range from near zero to several hundred thousand (total coliform) per 100 ml depending on rainfall occurrence and basin sampled. Urban runoff being discharged into coastal waters is generally low in pollutants with the exception of nitrate-nitrogen and coliform bacteria. Counts of bacteria in excess of the Guam Water Quality Standards established for Agana Bay shore waters were observed on most samplings. Groundwater seepage and tap water sources are the suspected source of the high nitrate-nitrogen concentrations (ranging up to 3.4 mg/l) which also exceed Guam Water Quality Standards.
W78-04944

PROCEEDINGS OF CONFERENCE ON ENVIRONMENTAL QUALITY SENSORS (SECOND) HELD AT NATIONAL ENVIRONMENTAL RESEARCH CENTER, LAS VEGAS, NEVADA ON OCTOBER 10-11, 1973.
National Environmental Research Center, Las Vegas, NV.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 570, Price codes: A99 in paper copy, A01 in microfiche. December 1973, 762 p. 253 fig, 26 tab, 211 ref, 6 append.

Descriptors: *Monitoring, *Pollution identification, *Water pollution control, *Remote sensing, *Instrumentation, Data collections, Aerial photography, Satellites, Water pollution, Mapping, Oil

spills, Turbidity, Automatic control, Air pollution, Methodology, Pollutants, Fluorescence, Thermal pollution, *Earth Resources Technology Satellite(ERTS), *Skylab, *Sensors, Multispectral scanners, Lasers.

The Second Conference on Environmental Quality Sensors was held October 10-11, 1973 in Las Vegas, NV, at the National Environmental Research Center (NERC). Attendance was limited to EPA research scientists and Regional Office staff working on research or application aspects of remote sensing. Some 48 papers covered the following broad areas: (1) aerial sensing techniques for water pollution (oil spills, water surface temperature, dissolved oxygen, turbidity, current circulation patterns, acid mine drainage sources, outfalls, thermal pollution, algae, sediment, wastes, and plumes); (2) air pollution monitoring; (3) aerial mapping (thermal, land use, water circulation patterns, pollution effects); (4) regional monitoring systems (St. Louis, Minneapolis-St. Paul, Eastern Europe); (5) automatic on-site monitoring, including Data Collection Platforms (DCPs); (6) remote sensing and data relay using satellites (ERTS, Skylab, GOES, and the National Environmental Monitoring System); (7) remote sensing instrumentation and techniques using aircraft or satellites (multispectral scanners, fluorescence excitation, LIDAR fluorosensors and other laser applications, Zeeman Atomic Absorption Spectrometer, electrochemical sensors/thermal scanners, long path optical measurement, microwave, infrared, ultraviolet, visible spectrum aerial photography, television, false-color imagery); (8) imagery interpretation techniques and keys; and (9) projections of future environmental problems and needs. (See W78-04680 thru W78-04699 and W78-04948 thru W78-04961) (Lynch-Wisconsin)
W78-04947

INTEGRATED REMOTE SENSING SYSTEM,
Environmental Protection Agency, Las Vegas, NV. Monitoring Operations Lab.
L. M. Dunn, and A. E. Pressman.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, published December 1973, Sect. I, p 1-31. 8 fig, 4 append.

Descriptors: *Remote sensing, *Aerial photography, *Monitoring, *Pollution identification, Photography, Mapping, Runoff, Oil spills, Infrared radiation, Thermal radiation, Nevada, Data collections, Nonpoint pollution, Multispectral scanners, Thermal mapping.

The National Environmental Research Center in Las Vegas (NERC-Las Vegas) is responsible for developing environmental monitoring techniques and programs for the U.S. Environmental Protection Agency. To carry this out the Monitoring Operations Laboratory, Imagery Acquisition and Interpretation Branch, is developing an integrated system for the collection, processing, interpretation, and reporting of remote sensing data. Five major areas are being addressed: (1) outfall detection, location, and analysis; (2) oil spill damage assessment and documentation; (3) an agricultural chemical runoff model; (4) nonpoint source water pollution monitoring approaches and techniques; and (5) a technical assistance program. Under the latter, the goal of NERC-Las Vegas is to provide annotated data displays, raw data with location indexes, isothermal contour maps, and final interpretation reports for immediate regional needs within 45 days of notification. The data acquisition system is oriented toward remote sensing, especially aerial thermal mapping and multispectral measurements. Using a Monarch B-26 aircraft, IR scanner output is recorded on a 14-tract tape. When high spatial resolution is required, thermal infrared images are recorded on 5-in black and white film from the original 14-track tape. The ground data interception station consists of a 14-tract tape playback recorder, high-speed analog-to-digital converter, computer, 5-inch film recorder, image-enhancement system, scan converter, and 9-track computer-compatible tape recorder. (See also W78-04947) (Lynch-Wisconsin)
W78-04948

EVALUATION OF THE ZEEMAN ATOMIC SPECTROMETER,
National Environmental Research Center, Las Vegas, NV. Monitoring Systems Research and Development Lab.
For primary bibliographic entry see Field 7B.
W78-04949

MULTIWAVELENGTH LIDAR FOR REMOTE SENSING OF CHLOROPHYLL-A IN PHYTOPLANKTON,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
P. B. Mumola, O. Jarrett, Jr., and C. A. Brown, Jr.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, published December 1973, Section II, p 1-16. 8 fig.

Descriptors: *Chlorophyll, *Remote sensing, *Fluorescence, *Algae, Phytoplankton, Instrumentation, Virginia, Monitoring, *Pollutant identification, *LIDAR, *Chlorophyll-a, Lasers, James River(VA), York River(VA), Airborne fluorosensing.

NASA Langley Research Center is developing an airborne fluorosensor using multiwavelength laser radar (LIDAR) for detection of chlorophyll-a in living algae where more than one color group may be present. Optical properties of algae and phytoplankton alter the fluorescence excitation and emission spectra of the chlorophyll-a molecule. Over 45 algal species of the four major color groups (blue-green, green, golden-brown, and red) have been analyzed for fluorescence excitation and emission spectra, with Rhodamine B as the fluorescence standard. Excitation spectra differ from one color group to another, each having a unique region for optimum excitation. Spectra within a color group are, however, remarkably similar, and one can therefore characterize fluorescent excitation properties of any algae by its color group. No single excitation wavelength can be chosen to uniformly stimulate chlorophyll-a fluorescence in all algae. The laser used in the system is a four-color dye laser pumped by a single linear xenon flashlamp. Fluorescence is collected by a 25.4-cm-diameter Dall-Kirkham-type telescope, and then passed through a narrow bandpass filter centered at 685 nm (the chlorophyll-a fluorescence peak) and on to the photomultiplier (PMT) tube. The PMT signal is digitized by a waveform digitizer and stored on magnetic tape. Field tests over the York and James rivers (VA) verified this technique. Maximum operational altitude of the present system is about 300 m. (See also W78-04947) (Lynch-Wisconsin)
W78-04950

SUMMARY OF NASA LANGLEY RESEARCH CENTER REMOTE SENSING ACTIVITIES UNDER THE ENVIRONMENTAL PROTECTION AGENCY INTERAGENCY AGREEMENTS: POTENTIAL FOR REGIONAL APPLICATIONS,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
J. L. Raper.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, published December 1973, Section II, p 40-68. 20 fig.

Descriptors: *Remote sensing, *Water pollution, Eutrophication, Infrared radiation, Spectrometers, Photography, Aerial photography, *Pollutant identification, Monitoring, Multispectral scanners, Lasers, Radiometers, Earth Resources Technology Satellite(ERTS).

The NASA/EPA Interagency Agreement for Water Pollution Sensor Evaluation (June 1972) specifically mandated investigations of pulsed laser systems, multichannel scanning radiometers, multiband cameras, infrared scanners, and second derivative infrared spectrometers. The NASA Langley Research Center is undertaking investigations in 12 areas to carry out these goals. A 2.65-GHz S-band microwave radiometer which was developed for remote sensing at sea condition, produced as a byproduct data on surface salinity. If the 0.1 K accuracy in brightness temperature is maintained in the L-band system, a variation of 0.2-0.3 ppt of salinity change can be detected over the 3-35 ppt salinity range. A major EPA goal was to develop methods of detecting and monitoring water algae content. A multispectral scanner was used to identify algae and to provide data for a quantitative map of algae content. A C-130 aircraft and 24-channel multispectral scanner were used to gather data in October 1972 over the Patuxent River (MD). The data have not yet been completely analyzed. Earth Resources Technology Satellite (ERTS) imagery data is currently being used in five projects: lake eutrophication, upper bay pollution, land fill classifications, acid mine drainage, and data automation and transmission. Techniques are also being devised for remote sensing of septic tank violation on the South River (MD). (See also W78-04947) (Lynch-Wisconsin)
W78-04951

THE REMOTE DETECTION AND IDENTIFICATION OF SURFACE OIL SPILLS,
Spectrogram Corp., North Haven, CT.
H. R. Gram.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, published December 1973, Section VI, p 21-33. 2 fig.

Descriptors: *Oil spills, *Remote sensing, *Fluorescence, Monitoring, Powerplants, Electric powerplants, Instrumentation, Buoys, Water pollution, *Pollutant identification, Barges, Transportation, Fuel oils, Fuel oil No. 6.

Alternative designs considered by an instrument manufacturer commissioned to develop a dockside early warning oil spill detector for an electric power company are described. After evaluating existing analytical methods, the manufacturer developed a device based on fluorescence. The power company desired a buoy-type detector which could be deployed both fore and aft of the large barges in which its oil is delivered. It needed to operate year round day and night, with minimum maintenance under severe weather conditions. Moving parts and contact with the water surface were excluded from consideration. Infrared absorption and reflectance, visible and ultraviolet absorption, chromatography, surface conductivity, and vapor detection were all discarded for various reasons, including interference from surface debris and maintenance problems. Fluorescence or phosphorescence seemed most promising, and laboratory tests for spectral data on undiluted samples were conducted. All oils exhibited overlapping fluorescent signals in the blue region of the visible spectrum when excited by shortwave length ultraviolet radiation. A compromise wavelength was selected for oil was found in the red region, it was decided to include two optical detection channels in the prototype, which was successfully field tested. A land-based console provided through a cable. (See also W78-04947) (Lynch-Wisconsin)
W78-04952

VIDEO DETECTION OF OIL SPILLS,
National Aeronautics and Space Administration, Moffett Field, CA. Ames Research Center.
J. P. Millard, and G. F. Woolever.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, published December 1973, Section VI, p 47-64. 9 fig, 1 tab, 14 ref. Coast Guard MIPR Z-70099-2-23146.

Descriptors: *Oil spills, *Remote sensing, Water pollution, *Pollutant identification, California, Aircraft, Oil pollution, Filters, *Television cameras, Santa Barbara Channel(CA).

Three airborne remote sensing systems employing television cameras to detect oil spills being developed by NASA's Ames Research Center, CA, include a conventional TV camera, two cameras operating in a subtractive mode, and a field-sequential camera. The first in a series of test flights conducted over oil platforms in the Santa Barbara Channel (CA) indicates that an appropriately filtered conventional TV camera successfully improves the contrast between oil and water. The camera was mounted in the nose of a Cessna 402 and contained a silicon-dioxide-array image tube and standard glass optics. It was filtered with a polarizer with its principal axis oriented horizontally, and incorporated a Corning 7-54 filter which blocked out visible portions of the spectrum and transmitted the near-UV and optical infrared portions. On the black-and-white monitor image the oil appears bright white against a dark water background. Types of oil and thicknesses to which the system will respond are not presently known. False color enhancement improved the contrast, but problems of sun glint restricted this technique to overcast days. The second system tested, involving two cameras with polarizers rotated at 90 degrees to one another in a subtractive mode, worked well, but the simpler one-camera system was considered preferable. The field sequential system has not yet been tested. (See also W78-04947) (Lynch-Wisconsin)
W78-04953

MEASUREMENTS OF THE DISTRIBUTION AND VOLUME OF SEA-SURFACE OIL SPILLS USING MULTIFREQUENCY MICROWAVE RADIOMETRY,
Hulburt (E.O.) Center for Space Research, Washington, DC. Space Science Div.
J. P. Hollinger, and R. A. Mennella.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, published December 1973, Section VI, p 65-74. 5 fig, 1 tab, 8 ref. DOT/USCG 2-21881, Coast Guard Z-70099-2-21881.

Descriptors: *Remote sensing, *Oil spills, *Microwaves, Water pollution, Pollutant identification, Instrumentation, Virginia, Multifrequency passive microwave radiometry.

An Atlantic Ocean test of multifrequency passive microwave radiometry shows that this method offers the potential to measure distribution of marine oil slicks, and to locate thicker regions and measure their thickness and volume. Eight controlled oil spills off the coast of Virginia were measured between August 1971 and August 1972, and were keyed and verified by ground truth data. Oil in two of the spills was dyed with an oil soluble red dye to help establish distribution of the spill. Microwave measurements were taken from a DC-4 aircraft at 19.4 and 69.8 GHz for the first five spills, and at 19.4 and 31.0 GHz for the rest. The latter combination proved more effective for thicker oil concenrtrations. The half-power antenna beam width at all frequencies was 7.2 degrees, yielding a beam spot on the surface of 15 m at the aircraft's operating altitude of 122 m. Slicks always formed an identifiable region containing 90% of the oil, with film thicknesses of 1 mm or more. This region, which occupied less than 10% of the total spill area, was surrounded by a much wider and thinner slick. The thick region could be located and delineated solely by microwave observations. The volume of oil measured by microwave was within 25% of the volume of oil spilled. This detection method works day or night in all weather conditions. (See also W78-04947) (Lynch-Wisconsin)
W78-04954

THE NATIONAL ENVIRONMENTAL MONITORING SYSTEM,
Magnavox Co., Fort Wayne, IN.
T. Major.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, published December 1973, Section VI, p 75-109. 26 fig, 3 ref.

Descriptors: *Monitoring, *Satellites, *Automatic control, Environmental effects, Water pollution, United States, Europe, Instrumentation, Pollution abatement, Data collections, Water quality, Meteorological data, Pollutant identification, *Geostationary Operational Environmental Satellite(GOES), *Data Collection Platform(DCP), Japan, Soviet Union, Earth Resources Technology Satellite(ERTS).

Under the National Environmental Monitoring System, the United States will deploy two geostationary operational environmental satellites (GOES) over the western hemishere. Three more of the NASA-developed satellites will be launched by the European Space Research Organization, the Soviet Union, and Japan. The five communications-compatible satellites will form a worldwide monitoring system, relaying data from 40,000 land- and water-based automatic data collection platforms (DCPs) equipped with environmental sensors and radio sets. Digital sensor signals will be transmitted at 100 bits/sec over 150 UHF channels. The first U.S. satellite is set for launch early in 1974. Freshwater hydrological monitoring stations installed in grids across major watersheds will be a principal DCP application. They will measure precipitation, water level, water flow, and water quality. Automatic water quality monitoring stations able to transmit data by way of Earth Resources Technology Satellite (ERTS) are being developed by the National Environmental Research Center in Cincinnati (OH). Water quality monitoing buoys become economically mandatory when synoptic monitoring is required, as manual shipboard monitoring is too costly. Manned and unmanned weather stations are also part of the program design. Extensive diagrams of the program components are also given. (See also W78-04947) (Lynch-Wisconsin)
W78-04955

SKYLAB APPLICATION TO ENVIRONMENTAL MONITORING,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
V. S. Whitehead.
In: Proceedings of Conference of Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, published December 1973, Section VII, p 1-10. 1 fig.

Descriptors: *Remote sensing, *Satellites, *Monitoring, Aerial photography, Spectrometers, Infrared radiation, Geologic investigations, Meteorological data, Mapping, Water pollution, Agriculture, Oceans, Coasts, Pollutant identification, *Skylab, *Earth Resources Experiment Package(EREP), Multispectral scanners.

Skylab, launched May 14, 1973, had on board a cluster of five instruments systems, Earth Resources Experiment Package (EREP), three of which produce data directly applicable to environmental monitoring: (1) a multispectral photographic facility (S190A) with earth terrain camera (S190B), (2) an infrared spectrometer system (S191); and (3) a multispectral scanner (S192). The S190A, which consists of a band of six calibrated bore-slighted 6-in focal length cameras, provides radiometrically and metrically accurate images of ground radiance. The S190B provides high-resolution photography, with ground coverage of 59 n mi square. The infrared spectrometer system quantifies effects of atmospheric attenuation on radiation from surface features over a broad spectral range; the filter wheel spectrometer spectrally scans radiation from 0.4-2.5 micrometers and 6.6-16.0 micrometers. The multispectral scanner records radiance values simulataneously in 13 bands in the visible, near-IR, and thermal IR portions of the spectrum. Limitations of EREP include nadir viewing capability restricted to + or - 50 degrees latitude, gaps between track, only one or two earth-viewing passes per day, and the fact that data is stored with the crew, not telemetered back to earth. The most promisint use of EREP is not detection or tracking of specific contaminants, but rather providing a synoptic perspective on environmental problems. (See also W78-04947) (Lynch-Wisconsin)
W78-04956

ERTS-1 DETECTION OF ACID MINE DRAINAGE SOURCES,
Ambionics Inc., Washington, DC.
E. D. DeGraff, and E. Berard.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, published December 1973, Section VII, p 27-36.

Descriptors: *Acid mine water, *Coal mine wastes, *Potomac River, *Remote sensing, Satellites, Aerial photography, Water pollution sources, Water pollution, Pollutants, Maryland, Land use, *Pollutant identification, *Earth Resources Technology Satellite(ERTS), *Upper Potomac River Basin, Multispectral scanners.

Remote sensing imagery by Earth Resources Technology Satellite-1 (ERTS-1) is to be used to locate and monitor sources of acid drainage pollution from the coal fields in the Upper Potomac River Basin. Each image from the ERTS multispectral scanner covers 34,000 sq km; images from four spectral bandwidths ranging from green to near infrared are produced simultaneously. Ground resolution is about 150 ft. In this investigation ERTS images, which have not been received as yet, will be supplemented by data from aircraft and traditional methods, including field-smple data collected gy the Maryland Water Resources Administration Laboratory on pH, total solids, CaCO3, ferrous iron, ferric iron, aluminum, sulfates, and turbidity. Analysis procedure: (1) locate and classify pollution sources on the ERTS imagery using supplementary data; (2) mark topographic changes resulting from surfaces mining on ERTS frames; (3) analyze images over time for texture (degree of coarseness), shapes, and response to varied color bandwidths; (4) relate vegetative cover to topography and drainage basins; (5) analyze ERTS transparencies using I 2S Additive Color Equipment for enhancement of image features; (6) prepare a land-use map, and examine polluted areas for similarities; and (7) use such similarities to identify and investigate new areas which may be polluted. (See also W78-04947) (Lynch-Wisconsin)
W78-04957

WATER QUALITY ANALYSIS USING ERTS-A DATA,
Moore School of Electrical Engineering, Pennsylvania, PA.
H. Kritikos, L. Yorinks, and H. Smith.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada

on October 10-11, 1973, published December 1973, Section VII, p 37-56. 6 fig, 2 tab, 19 ref.

Descriptors: *Potomac River, *Water quality, *Remote sensing, Satellites, Aerial photography, Earth-water interfaces, Sedimentation, Algae, Chesapeake Bay, Mapping, Tidal effects, Pollutant identification, *ERTS data, Multispectral scanners.

Remote sensing imagery by Earth Resources Technology Satellite-A (ERTS-A) of the Upper Potomac River tidal system, including parts of Chesapeake Bay, was analyzed to determine land-water interfaces and to identify and locate water types according to reflectivity. The images, correlated with ground truth datas, were produced by the ERTS multispectral scanner, which has four spectral bands; transmitted digital data was converted to photographic images before analysis. Of 127 gray levels of the magnetic tapes, only 16 were retained at the photographic level, a serious degradation of the data. Band III (0.7-0.8 micrometers) was useful for determining land-water interfaces, as it gave the greatest contrast between water and its environment. A mask was generated to determine areas covered by water. Band II (0.6-0.7 micrometers) showed maximum brightness spread, with three distinct brightness clusters. These clusters were the basis for identifying three classes of water according to low, medium, and high reflectivity. On computer-generated thematic maps, areas of high sedimentation or algae content were easily determined because of their high reflectivity and consequent brightness. These areas were the Anacostia River and most of the west bank of the Potomac. The most significant observation was that after high tide polutants seemed to accumulate at the west bank of the river. (See also W78-04947) (Lynch-Wisconsin)
W78-04958

SATELLITE STUDIES OF TURBIDITY, WASTE DISPOSAL PLUMES AND POLLUTION-CONCENTRATING WATER BOUNDARIES,
Delaware Univ., Newark. Coll. of Marine Studies.
V. Klemas.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, published December 1973, Section VII, p 57-87. 13 fig, 15 ref.

Descriptors: *Remote sensing, *Aerial photography, *Satellites, Turbidity, Waste disposal, Acidic water, Suspended solids, Sediments, Circulation, Tidal effects, Pollutant identification, *Delaware Bay, *ERTS data, Multispectral scanners.

Remote sensing imagery from five orbits of Earth Resources Technology Satellite-1 (ERTS-1) over Delaware Bay in 1972-1973 were interpreted with emphasis on turbidity, off-shore acid disposal plumes, and boundaries between water masses having distinct physical and chemical properties. The four-band multispectral scanner images were produced during different parts of the tidal cycle. The red band (band 5, 0.6-0.7 microns) gave the best contrast for detecting suspended sediment, which acts as a natural tracer for gross current circulation patterns. However, these patterns were delineated by only 3-4 neighboring shades of grey. Color density slicing helped delineate the patterns and differentiate turbidity levels, and negative transparencies gave better contrast when tones fell to within the first few steps of the grey scale. Additive color viewing of the bands did not noticeably improve contrast above that of the best band (band 5). Several distinct water boundaries were noted on band 5 on August 16, 1972. The image of January 25, 1973 disclosed an acid waste plume dumped from a barge 36 mi east of Cape Henlopen; it showed up more strongly in the green band (band 4, 0.5-0.6 microns) than the red band (band 5). Since some acids turn gradually from green to brownish-red after dumping into seawater, the ratio between the two bands may indicate the time elapsed since dumping. (See also W78-04947) (Lynch-Wisconsin)
W78-04959

DATA COLLECTION PLATFORMS FOR ENVIRONMENTAL MONITORING,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
J. E. Painter.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, Published December 1973, Section VII, p. 88-110. 5 fig, 6 tab.

Descriptors: *Monitoring, *Remote sensing, *Satellites, On-site data collections, Automatic control, Delaware River, Massachusetts, Chesapeake Bay, *Data collections, Hydrology, Volcanoes, Pollutant identification, *ERTS data collection platform, *DCP's, Sensors.

The data collection system of the Earth Resources Technology Satellite (ERTS) is the first attempt to establish a large-scale telemetry network using a satellite to relay data from on-site environmental sensors (Data Collection Platforms, or DCP's) to a central collection point. There are currently 125 DCP's in operation in 22 states and 5 foreign countries. Receiving, demodulating, and decoding equipment are located at the Goldstone, (CA) and Goddard data acquisition stations. The automatically controlled DCP's, which have as many as eight sensors, convert analog data to digital form, add a DCP identification number, encode the data, and transmit it to the ERTS. At the ERTS Operations Control Center at Goddard, data is screened for quality and transmitted to users by teletype. One-third of both users and DCP's are accounted for by the U.S. Geological Survey. Hydrology is at present the primary application of data, with volcanology second and water quality third. Each DCP is contacted during 2-7 orbits per day, and 1-4 messages are received by the satellite during each contact period, with an average of 17 good messages per day. Pollution sensors have proven the weakest element in the network, with a high failure rate in experiments to date. Several of these experiments are described in this paper, including projects in the Delaware River Basin, in Massachusetts, and on Chesapeake Bay. (See also W78-04947) (Lynch-Wisconsin)
W78-04960

LIDAR POLARIMETER MEASUREMENTS OF WATER POLLUTION,
Texas A and M Univ., College Station. Remote Sensing Center.
J. W. Rouse, Jr.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, Published December 1973, Section VIII, p. 28-47. 6 fig, 7 ref. DOT-CG-34017-A.

Descriptors: *Remote sensing, *Turbidity, *Oil spills, Instrumentation, Water quality, Water pollution, Pollutant identification, *LIDAR, *Lasers, Backscatter, Polarimeters, Depolarization.

The Lidar Polarimeter, a dual-polarization laser instrument being developed at Texas A and M University, is potentially useful for remote measurements of turbidity and oil on water. The system employs a low-power CW helium-neon 633 nm laser which transmits a narrow beam of polarized, chopped, monochromatic light. A narrow-beam, dual-polarization receiver detects both vertically and horizontally polarized light backscattered from the illuminated target. Measurements of laser light backscattered from non-uniform media confirm the theoretical prediction that depolarization is a subsurface volume-scatter process dependent on the density of suspended particles in the volume. Laboratory and field experiments demonstrated the instruments's capability for measuring turbidity. Tests for detecting oil on water showed that the presence of oil alters the like- and cross-polarized backscatter return, but that oil cannot be uniquely differentiated from characteristics created by certain turbidity conditions. To improve detection reliability, a record-generation Lidar Polarimeter is being constructed for the Coast Guard which employs two lasers, 633 nm and 441.6 nm. The shorter-wavelength source utilizes the increase in refraction index of many types of oil in the blue region. This system has the added advantage of real-time classification of the Lidar Polarimeter signals. (See also W78-04947) (Lynch-Wisconsin)
W78-04961

ANALYSIS OF SOME AQUATIC ENVIRONMENTS OF THE VALLEY OF KATHMANDU DURING THE MONSOON PERIOD: AUGUST-SEPTEMBER, 1971, (IN FRENCH),
Centre Univ. de Savoie, Chambery (France). Lab. de Biologie Vegetale.
For primary bibliographic entry see Field 5G.
W78-04962

SURVEY OF BACTERIA, PHYTOPLANKTON, AND TRACE CHEMISTRY OF THE LOWER COLORADO RIVER AND TRIBUTARIES IN THE GRAND CANYON NATIONAL PARK,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
M. R. Sommerfeld, W. M. Crayton, and N. L. Crane.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 731, Price codes: A07 in paper copy, A01 in microfiche. National Park Service, Grand Canyon National Park Report Series, Colorado River Research Program, Technical Report No. 12, July 15, 1976. 136 p, 35 fig, 22 tab, 75 ref.

Descriptors: *Monitoring, *Aquatic microorganisms, *Coliforms, Pathogenic bacteria, Salmonella, Shiggella, Sampling, Chemical analysis, Diatoms, *Phytoplankton, Chlorophyta, Cyanophyta, Pyrrophyta euglenophyta, Boron, Salts, Water quality, Copper, Iron, Calcium, Sodium, ZinC, Trace elements, Manganese, *Colorado River, National Parks, *Arizona, *Grand Canyon National Park, *Pollutant identification.

This baseline research program established aquatic monitoring sites on the Colorado River and its major tributaries in the Grand Canyon National Park and vicinity that could be used for future reference. The investigation revealed total viable bacterial members of 10 to the 2nd power through 10 to the 5th power/ml in the Colorado River and 10 to the 1st power through 10 to the 6th power/ml in the tributaries. The variability in these counts was attributable to sediment load and watershed characteristics. Total coliform bacterial counts exceeded the desirable water quality level at numerous sites. This count raises the possibility of fecal contamination by warm blooded animals and of a potential health hazard. The phytoplankton population was diverse but sparse, particularly downstream from Lee's Ferry. Numbers never exceeded 3000/liter. A total of 122 species were identified in the Colorado River, 137 in the tributaries with 71 being tributary specific. On the basis of numbers, phytoplankton must be considered relatively unproductive in this region. The concentration of 15 chemical elements was monitored, with boron, iron and zinc showing large temporal and spatial variation, and sodium levels increasing from 7-13% downstream. The tributaries differed chemically and showed large variations in boron, calcium, iron, magnesium and manganese relative to flow. Overall, the dissolved chemical quality of the river and tributaries was generally acceptable. (Payton-Arizona)
W78-04999

AQUATIC INVESTIGATION ON THE COLORADO RIVER FROM SEPARATION CANYON TO THE GRAND CLIFFS, GRAND CANYON NATIONAL PARK,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
J. E. Deacon, and J. R. Baker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 734, Price codes: A03 in paper copy, A01 in microfiche. National Park Service, Grand Canyon National Park Report Series, Colorado River Research Program Technical Report No. 15, June 1976. 26 p, 10 tab, 14 ref.

Descriptors: Chemical properties, Biological properties, Physical properties, *Water temperature, Water chemistry, Sewage effluents, Density, Euphotic zone, Impaired water quality, Suspension, Water quality, Turbidity, Phytoplankton, *Bacteria, Coliforms, *Colorado River, Productivity, National Park, *Arizona, *Grand Canyon National Park, Lake Mead, *Dissolved oxygen, *Nutrients, Phosphorus.

Physical, chemical, and biological data were collected from two sites between separation rapids and Pierce Ferry in order to examine limnological effects of the Colorado River in relation to Lake Mead. Water temperatures were 2 degrees to 10 degrees cooler than those reported before the closure of Glen Canyon Dam, which may have changed the previous density relationship between Lake Mead and the Colorado River as well as affecting current patterns and limnological conditions in Lake Mead. Dissolved oxygen levels, nutrient concentrations, and bacteria numbers indicate a natural unpolluted state. High phosphorus (greater than 300 ug/l) and coliform concentrations (1160/100 ml) found on January 4, 1976, were an exception, probably due to a large organic discharge into the river. It was suggested that sewage effluent from visitor use has a minimal effect but potential health hazards may exist at some campsites. Primary productivity was found to be variable but generally limited due to concentrations of suspended material. Higher productivity would be undesirable due to the possibility of phytoplankton blooms and increased periphyton growth. (Payton-Arizona)
W78-05000

LIMNOLOGIC STUDIES ON THE COLORADO RIVER FROM LEE'S FERRY TO DIAMOND CREEK,
Arizona State Univ., Tempe. Dept. of Zoology.
G. Cole, and D. Kubly.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 736, Price codes: A05 in paper copy, A01 in microfiche. National Park Service, Grand Canyon National Park Report Series, Colorado River Research Program, Final Report, Technical Report No. 8, June 1976. 88 p, 27 tab, 10 fig, 35 ref.

Descriptors: Running waters, Streams, River systems, *Salinity, Irrigation water, *Suspended solids, Flow control, Alteration of flow, *Colorado River, River regulation, Chemical analysis, *Pollutant identification, Limnology, Hardness(Water), Ionization, Light penetration, Light intensity, Nutrients, Water resources, Planning, Arizona, National Parks, *Grand Canyon National Park, Lee's Ferry, Diamond Creek, Little Colorado River.

The stretch of the Colorado River from Lee's Ferry to mile 225 was found to contain non-potable water due to a high ratio of suspended solids (average 643 ppm) resulting in water too saline to meet present health standards. It is, however, suitable for livestock and industrial usage. A key factor in maintaining this utility is keeping present flow rates or increasing them if possible. Discharge of the Colorado River dilutes the more concentrated streams (such as Kanab Creek and the Little Colorado River), while the flow rate of other tributaries helps dilute the main stream and ameliorate the salt concentration contributed by the more saline tributaries. It is pointed out that gross manipulations of tributary environments should be avoided as they would lead to erosion and a weakening of desired dilution effects by increasing mineral content and aggravating existent salinity problems. (Payton-Arizona)
W78-05003

WATER-QUALITY AND RAINFALL DATA COLLECTED WITH AUTOMATED FIELD STATION, FORT MCCLELLAN, ALABAMA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
M. H. Smith, H. M. Floyd, and H. W. West.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A035 825, Price codes: A03 in paper copy, A01 in microfiche. Report No. Miscellaneous Paper M-76-22, December, 1976. 28 p, 9 fig, 1 tab.

Descriptors: *Pollutant identification, *Water analysis, *Rain gage, Data collections, Water quality, Precipitation, Rain, Rainfall, Analytical techniques, *Water quality sensor, *Rain water analysis.

The system of instruments used to collect water-quality and rainfall data at one site at Fort McClellan, Alabama is briefly described. This work constituted an initial phase in upgrading data acquisition procedures for the long-range environmental program designed to improve management of the installation's natural resources and maintenance of environmental quality. Water quality data include concentration of hydrogen ions (pH), dissolved oxygen, conductivity, water temperature, and transmissivity. Data are presented in tabular form and sample calculations and formulae are given. Pictorial illustrations of the instruments and examples of the data collected from November 12, 1975 through May 27, 1976 are presented. (Seip-IPA)
W78-05010

DETERMINATION OF NITRATE BY ANION EXCHANGE WITH ULTRAVIOLET DETECTION,
Iowa State Univ., Ames. Dept. of Chemistry.
J. G. McComas.
Available from the National Technical Information Service, Springfield, VA 22161 as IS-T-713, Price codes: A03 in paper copy, A01 in microfiche. USERDA Report No. IS-T-713, 1976. 29 p, 7 fig, 2 tab, 21 ref. ERDA W-7405-eng-82.

Descriptors: *Pollutant identification, *Nitrate, *Spectrophotometry, *Anion exchange, *Chromatography, Analytical technique, Water analysis, Water chemistry, Water quality, Water pollution sources, Hydrogen ion concentration, Nitrites, Anion exchange resin, *Silica gel matrix, Anion exchange column, *Ultraviolet absorbance, Silyated silica gel, Spectrophotometric cell, Anion interference, Methemoglobinemia.

An accurate, rapid means of determining nitrate concentration without interruption is essential since nitrate is an indicator of pollution, e.g., from fertilizers, animal wastes or effluents, and is a primary cause of methemoglobinemia as well. A chromatographic method in which a weak base anion exchange resin, synthesized by surface bonding 3-aminopropyltriethoxysilane to silica gel, is used to separate nitrate from interferences has been developed. The nitrate is determined by measuring its absorbance at 220 nm. The detection limit is 0.1 ppm nitrate with a range of 0.1 to 100 ppm nitrate. The relative error and the relative standard deviation is typically less than 2% and 1% respectively. This is due to the high sensitivity of the ultraviolet measurement of 0.061 absorbance unit per part-per-million nitrate. An interference study was performed and no anions commonly found in potable water interfered. A comparison of this method was made with the conventional brucine method on real samples and satisfactory agreement was obtained between the two methods. (Seip-IPA)
W78-05011

MANUAL: RESEARCH AND DEMONSTRATION OF IMPROVED SURFACE MINING TECHNIQUES FOR THE EASTERN KENTUCKY COAL FIELDS.
Kimball (L. Robert) Consulting Engineer, Lexington, KY.
For primary bibliographic entry see Field 5G.
W78-05013

COMPUTER-ASSISTED FURNACE ATOMIC ABSORPTION SPECTROMETRIC ANALYSIS,
Environmental Research Lab.-Duluth, MN.
J. E. Poldoski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 133, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-600/J-77-010, In: Analytical Chemistry, Vol 49, p 891-893, 1977. 3 fig, 1 tab, 7 ref.

Descriptors: *Pollutant identification, *Computer, Gas, Chromatography, Analytic techniques, *Spectrophotometry, Data processing, Water analysis, Water chemistry, *Trace analysis, Atomic absorption analysis, *Atomic absorption spectrophotometers, Atomization signal, A/D conversion.

The use of furnace atomic absorption instrumentation with a turnkey chromatography data system in water analysis is described. A simple addition of relays to the furnace power supply allows for automatic start-up of A/D conversion and spectrophotometer zeroing at the proper time. Manipulations involving editing, sorting and averaging of up to 250 atomization signals in an analysis run were accomplished by developing a procedure employing BASIC language programming techniques. The same dedicated data system was employed for all steps and post-run data processing, conveniently accomplished in 5-15 minutes, gave a tabulation of sample name, mean concentration, standard deviation, number of analyses, and percent recovery. (Seip-IPA)
W78-05014

LABORATORY MEASUREMENTS OF RADIANCE AND REFLECTANCE SPECTRA OF DILUTE SECONDARY-TREATED SEWAGE SLUDGE,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
W. G. Witte, J. W. Usry, C. H. Whitlock, and E. A. Gurganus.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA TP-1089, Price codes: A02 in paper copy, A01 in microfiche. Report No. NASA TP-1089, December, 1977. 20 p, 6 fig, 3 tab, 10 ref.

Descriptors: *Pollutant identification, *Remote sensing, *Sewage effluents, *Sludge, Waste dumps, Water pollution sources, Water analysis, Waste acid, Analytical techniques, *Ocean waste dumping, *Waste detection, Spectral signature.

A research program was conducted by NASA, in cooperation with EPA and the National Oceanic and Atmospheric Administration (NOAA), to evaluate the feasibility of remotely monitoring ocean dumping of waste products such as acid and sewage sludge. One aspect of the program involves the measurements of upwelled spectral signatures for sewage-sludge mixtures of different concentrations in an 11,600-liter tank; radiance and reflectance spectra in the visible near-infrared ranges for concentrations ranging from 9.7 to 180 ppm of secondary-treated sewage sludge mixed

with two types of base water are given. Results indicate that upwelled radiance varies in a near-linear manner with concentration and that the sludge has a practically flat signal response between 420 and 970 nm. Reflectance spectra were obtained for the sewage-sludge mixtures at all wavelengths and concentrations. (Seip-IPA)
W78-05016

LAND USE CHANGE DETECTION WITH LANDSAT-2 DATA FOR MONITORING AND PREDICTING REGIONAL WATER QUALITY DEGRADATION,
Arkansas Univ., Fayetteville. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-05018

THE USE OF MAGNESIUM CARBONATE IN CHLOROPHYLL DETERMINATIONS,
Geological Survey, Atlanta, GA. National Water Quality Lab.
B. W. Lium, and W. T. Shoaf.
Water Resources Bulletin, Vol. 14, No. 1, p 190-194, February 1978. 2 fig, 1 tab, 5 ref.

Descriptors: *Magnesium carbonate, *Chlorophyll, *Water sampling, *Magnesium, Photosynthesis, Analytical techniques, Plant pigments, Algae, Aquatic plants, Phytoplankton, Diatoms, Water analysis, Sampling, Chlorophyta, Plankton, *Sample preservation.

Chlorophyll analyses of both laboratory cultures and natural aquatic samples were unaffeced by the use of magnesium carbonate. Equal volumes of the samples (at various pH values) were pipetted onto 0.45 micrometer filters with and without magnesium carbonate. Chlorophyll concentrations were determined for each filtered sample and for those frozen for specified times. In all samples tested, there was no difference either in the retention of algae or in the stability of chlorophyll over the time period and pH range tested. (Henley-ISWS)
W78-05029

FINE PARTICULATE EMISSIONS DUE TO WIND EROSION,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 2J.
W78-05032

PHYSICAL AND CHEMICAL PARAMETERS AFFECTING TRANSPORT OF 137CS IN ARID WATERSHEDS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
J. R. McHenry, and J. C. Ritchie.
Water Resources Research, Vol. 13, No. 6, p 923-927, December 1977. 6 tab, 8 ref, 1 append. ERDA AT-(49-7)-3029.

Descriptors: *Radioisotopes, *Cesium, *Soils, *Sediments, Isotope studies, Watersheds(Basins), Erosion, Arid lands, Sediment transport, Reservoirs, Sampling, Data processing, Soil properties, Chemical properties, Physical properties, Sedimentation.

The occurrence and amount of fallout 137Cs were determined in 12 watersheds in the arid southwestern U.S. The factors believed to influence the distribution of 137Cs in the watershed soils and in the reservoir sediments were investigated by using stepwise regression techniques. Seventeen parameters, in the case of soils, and 21 parameters, in the case of sediment, were used in the study. Of the variation in the 137Cs content of soils, 90% per unit weight, could be predicted in terms of the percentage of soil nitrogen, the R factor (rainfall intensity) of the universal soil loss equation, the percentage of sand in the soils, and the soil cation exchange capacity. Also, 90% of the variation in the content of 137Cs in the watershed soils, per unit area, could be predicted in terms of the fallout intensity, the percentages of silt and clay, and the cation exchange capacity. For reservoir sediments, the equivalent predictors of 137Cs accumulation in the sediment profile, per unit weight, were the soil cation exchange capacity, the January-March average precipitation, and the soil contents of total P and N. The distribution of 137Cs in sediments per unit area was predicted similarly by watershed area, percentage of total soil C, reservoir surface area, area concentration of 137Cs in the watershed soils, and soil organic matter. (Sims-ISWS)
W78-05042

BENTHIC INVERTEBRATES AS WATER QUALITY INDICATORS IN THE PENOBSCOT RIVER, MAINE,
Maine Univ. at Orono. Dept. of Entomology.
C. F. Rabeni, and K. E. Gibbs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 674, Price codes: A05 in paper copy, A01 in microfiche. University of Maine Land and Water Resources Institute, Orono, Completion Report, December 1977. 75 p, 15 fig, 7 tab, 55 ref. OWRT A-028-ME(3), 14-31-0001-5019.

Descriptors: Analysis, Classification, Current velocity, Detritus, Dissolved oxygen, *Invertebrates, Effluents, Rivers, *Sampling, Standing crops, Turbidity, Water chemistry, Water quality, Water temperature, *Maine, *Penobscot River(Maine), *Bioindicators, Pulp wastes, *Pollutant identification, Water pollution sources, *Benthic macroinvertebrate, Bray-Curtis ordination, *Hess sampler, Pollution-stressed/clean water communities, Siltation, Water depth.

This study was designed to develop a system for using benthic macroinvertebrates as water quality indicators in a large deep river. Objectives were: (1) to develop reliable sampling techniques; (2) to determine whether pollution-stressed communities were predictively different from clean water communities; and (3) to determine the range of, and environmental factors responsible for, variations in the structures of clean water communities. Two sampling methods were of value-- (1) a modified Hess sampler which obtained a more representative sample of actual standing crop, and (2) rock-filled baskets secured to the river bottom, which collected a greater number of individuals and taxa. Indicator organisms were not particularly sensitive, and species diversity was often misleading. An efficient water quality classification system was developed using the Bray-Curtis ordination, which was sensitive to changes in the faunal community structure caused by pulp and paper mill effluents. Invertebrates were better indicators of certain types of pollution than were standard physical and chemical methods. Analysis also indicated that the composition of clean water invertebrate communities were partially determined by current velocity, siltation, and organic detritus, and was not affected by water temperature, turbidity, dissolved oxygen, water depth, and water chemistry. Even though there were wide variations in community composition, clean water communities could be distinguished from communities affected by pollution.
W78-05053

RESUSPENSION OF PLUTONIUM FROM CONTAMINATED LAND SURFACES: METEOROLOGICAL FACTORS,
Environmental Monitoring and Support Lab., Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5B.
W78-05056

TRACE METALS IN ORGANISMS FROM OCEAN DISPOSAL SITES OF THE MIDDLE EASTERN UNITED STATES,
National Marine Fisheries Service, Milford, CT. Milford Lab.
R. A. Greig, D. R. Wenzloff, A. Adams, B. Nelson, and C. Shelpuk.
Archives of Environmental Contamination and Toxicology, Vol 6, No 4, 1977, p 395-409, 7 tab, 28 ref.

Descriptors: *Environmental effects, *Water pollution, *Disposal, Waste disposal, Sewage disposal, Oceans, Trace elements, Metals, Silver, Cadmium, Manganese, Zinc, Arsenic, Chromium, Mercury, Lead, Fish, Marine fish, Bioaccumulation.

Windowpane flounder and rock crab were collected from disposal sites off New Haven, CN., New York City, and Delaware Bay, and from a control site at Chincoteague Inlet as well as in Long island Sound, Barnegat Bay, and a second area off New York City. No substantial variation in concentration of trace metals was found except that silver was higher in rock crab collected near the New York Bight disposal site; Cd, Mn, and Zn concentrations were greatest in rock crab collected from Long Island Sound. The digestive glands of Long Island Sound. The digestive glands of Long island Sound channeled whelk contained about three times as much Cd and Ag as those from the control site. Channeled whelk were not obtained from the other sites. The data suggests that windowpane flounder and rock crab do not significantly accumulate trace metals to a greater degree than animals obtained from a control site. (Chilton-ORNL)
W78-05059

MERCURY DISPERSAL FROM LODE SOURCES IN THE KUSKOKWIM RIVER DRAINAGE, ALASKA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 5B.
W78-05060

INTERACTIONS BETWEEN ZINC AND SUSPENDED SEDIMENTS IN THE FRASER RIVER ESTUARY, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Dept. of Geological Sciences.
D. Grieve, and K. Fletcher.
Estuarine and Coastal Marine Science, Vol. 5, No. 3, May 1977, p 415-419, 2 fig, 1 tab, 16 ref.

Descriptors: Geochemistry, *Estuaries, *Sediments, Rivers, Canada, *Zinc, Suspended load, Suspension, Adsorption, Sorption, *Pollutant identification, Desorption, Fraser River estuary(Canada).

Zinc, iron, and manganese concentrations were determined in suspended sediments in water samples collected from a depth of 1 m at eight stations. Range of suspended sediments was from 25 mg/l to 4 mg/l. Changes in concentration of suspended Fe and Mn closely followed variations in suspended sediment load. Increase in dissolved and suspended Zn was found in the mixing zone between fresh and brackish waters. Adsorption and desorption of Zn, together with movement of suspended sediments in the estuary, provided a mechanism for increasing concentration of Zn in estuarine waters compared to those in inflowing water. It was concluded that, depending on the extent of desorption, eventual deposition of suspended sediments will result in the coastal zone acting as a sink for zinc. (Chilton-ORNL)
W78-05061

A 96-HOUR SEDIMENT BIOASSAY OF DULUTH AND SUPERIOR HARBOR BASINS (MINNESOTA) USING HEXAGENIA LIMBATA, ASELLUS COMMUNIS, DAPHNIA MAGNA,

AND PIMEPHALES PROMELAS AS TEST ORGANISMS,
Heidelberg Coll., Tiffin, OH. River Studies Lab.
B. L. Prater, and M. A. Anderson.
Bulletin of Environmental Contamination and Toxicology, Vol. 18, No. 2, August 1977, p 159-169, 2 fig, 6 tab, 5 ref.

Descriptors: Environmental effects, *Water pollution sources, *Bioassay, Chemistry, Minnesota, Toxicology, Mortality, Organic compounds, Pollutant identification, *Sediment bioassay, Synergistic effects, Antagonistic effects.

The stations from which samples were collected were chosen to reflect areas that were suspected to be heavily polluted, moderately polluted, and nonpolluted. A correlation was drawn between the percent mortality of biological test organisms and the bulk sediment chemistry data collected for each station. Biological data and chemical data for each of the eight stations is presented in tabular form. It did not appear that any one parameter was responsible for the mortality of the test organisms. Concentrations varied from one station to another and did not always appear highest at those stations where mortality was greatest. An assumption was made that either a synergistic or antagonistic effect was occurring or that chemical parameters that were not measured (such as organics) were present in high enough concentrations to cause mortality. (Chilton-ORNL)
W78-05066

RELATIVE SENSITIVITY TO LEAD OF A NAKED GREEN FLAGELLATE DUNALIELLA TERTIOLECTA,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5C.
W78-05072

AN ECOLOGICAL SURVEY OF THE HEAVY METAL CONTAMINATION OF THE EDIBLE CLAM PAPHIA SP. ON THE IRON-ORE TAILINGS OF TOLO HARBOUR, HONG KONG,
Chinese Univ. of Hong Kong. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-05078

LEAD UPTAKE FROM SEA WATER AND FOOD, AND LEAD LOSS IN THE COMMON MUSSEL MYTILUS EDULIS,
Institut fuer Meeresforschung, Bremerhaven (West Germany).
For primary bibliographic entry see Field 5C.
W78-05083

POLYCHLORINATED BIPHENYLS IN COTTIDS, MUSSELS, AND SEDIMENT IN SOUTHERN PUGET SOUND, WASHINGTON,
Evergreen State Coll., Olympia, WA.
For primary bibliographic entry see Field 5C.
W78-05084

AQUATIC FIELD SURVEYS AT IOWA, RADFORD AND JOLIET ARMY AMMUNITION PLANTS, VOLUME I - IOWA ARMY AMMUNITION PLANT,
Environmental Control Technology Corp., Ann Arbor, MI.
S. L. Sanocki, P. B. Simon, R. L. Weitzel, D. E. Jerger, and J. E. Schenk.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 776, Price codes: A18 in paper copy, A01 in microfiche. Final Report to Army Research and Development Command, Washington, D.C. November 1976. 391 p, 107 fig, 115 tab, 45 ref, 20 append. DAMD 17-75-C-5046.

Descriptors: *Iowa Army Ammunition Plant, *Ammunition plants, *Environmental effects, *Industrial wastes, *TNT, *Water pollution sources, *Water pollution effects, Iowa, Effluents, Streams, Brush Creek(IA), Sediments, Sewage disposal, Data collections, Species diversity, Pollutants, Nutrients, Boilers, Aquatic life.

Two field surveys of streams on the grounds of the Iowa Army Ammunition Plant (IAAP) were conducted in June and October 1975 to determine biological and chemical effects to the environment of munitions wastes discharged by the facility. Sampling stations located on Brush Creek and Spring Creek indicated the major pollution sources were boiler blowdown water at 30-70C, discharged into Brush Creek from the power-generating plant, and phosphoric wastes from the sewage treatment plant and several industrial outfalls. Low levels of 2,4,6-trinitrotoluene (TNT), the most important component at the plant, and its transformation products were observed in the water and sediment of Brush Creek at all stations except control station B1. Concentrations were generally highest near the industrial sources, decreasing near the southern IAAP boundary. High concentrations of TNT were found in Brush Creek sediments near the site of an old treatment lagoon, and occurrence of high concentrations in nonflooded soils in the same area suggests that the half-life of polynitro aromatics is much longer under such conditions than in sediments. Dissolved solids were 30% higher in Brush Creek on IAAP grounds than upstream, and phosphorus and nitrate-nigrogen levels were also higher. Minor variations in biological species diversity were noted, corresponding to nutrient and alpha-TNT level fluctuations. (See also W78-05112 and W78-05114) (Lynch-Wisconsin)
W78-05111

AQUATIC FIELD SURVEYS AT IOWA, RADFORD AND JOLIET ARMY AMMUNITION PLANTS, VOLUME II - RADFORD ARMY AMMUNITION PLANT,
Environmental Control Technology Corp., Ann Arbor, MI.
R. L. Weitzel, R. C. Eisenman, and J. E. Schenk.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 777, Price codes: A20 in paper copy, A01 in microfiche. Final Report to Army Research and Development Command, Washington, D.C. November 1976. 448 p, 63 fig, 69 tab, 42 ref, 16 append. DAMD 17-75-C-5046.

Descriptors: *Radford Army Ammunition Plant(VA), *Ammunition plants, *Nitroglycerin, *Industrial wastes, *Environmental effects, *Water pollution sources, *Water pollution effects, Aquatic life, Virginia, New River(VA), Effluents, Data collections, Pollutants, Nutrients, Carbon, Species diversity, Rivers.

Sampling of New River, which flows through the Radford Army Ammunition Plant (RAAP) near Radford, Virginia was conducted in May-June and October-November 1975 to measure the biological and chemical impact to the environment of nitroglycerin-production waste discharges. In general, little definitive information was obtained with respect to environmental impact of nitroglycerin production, due to low discharge volume from the facility relative to flow in receiving waters. Insignificant variations in biological community structure were observed; species diversity variations could not be correlated with nitroglycerin effluents. Periphyton production was inhibited near certain outfalls, but a cause-effect relationship was not established. Although water quality of the New River is generally quite good on RAAP grounds, some chemical effects were noted. Concentrations of total organic carbon during the May-June survey were appreciably higher at the sampling station furthest downstream (22 mg/l) than at the upstream control station (4 mg/l). Chromium levels were also higher downstream (0.048 mg/l maximum) than upstream. Nitrogen levels were somewhat higher downstream, but differences were not great (a maximum of 0.34 mg/l) Nitroglycerin was found intermittently in the water column at all stations at concentrations of 0.01-0.02 mg/l, but in few sediment cores. (See also W78-05111 and W78-05114) (Lynch-Wisconsin)
W78-05112

AN INVESTIGATION OF THE NEARSHORE REGION OF LAKE ONTARIO IFYGL.
State Univ. of New York Coll. at Buffalo.
For primary bibliographic entry see Field 5C.
W78-05113

AQUATIC FIELD SURVEYS AT IOWA, RADFORD, AND JOLIET ARMY AMMUNITION PLANTS, VOLUME III - MICROBIOLOGICAL INVESTIGATIONS, IOWA AND JOLIET ARMY AMMUNITIONS PLANTS,
Environmental Control Technology Corp., Ann Arbor, MI.
D. E. Jerger, P. B. Simon, R. L. Weitzel, and J. E. Schenk.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 778, Price codes: A08 in paper copy, A01 in microfiche. Technical Publication of Environmental Control Technology Corporation, November 1976. 141 p, 14 fig, 45 tab, 41 ref, 10 append. DAMD 17-75-C-5046.

Descriptors: *Ammunition Plants, *Iowa Army Ammunition Plant, *Joliet Army Ammunition Plant(IL), *Microorganisms, *TNT, *Degradation(Decomposition), Iowa, Illinois, Brush Creek(IA), Grant Creek(IL), Industrial wastes, Effluents, Toxicity, Water pollution sources, Pseudomonas, Benthos, Sediments, Water pollution effects, Path of pollutants.

Aqueous and sediment samples were collected in June and October 1975 from streams at the Iowa Army Ammunition Plant (IAAP) near Burlington, Iowa and at the Joliet Army Ammunition Plant (JAAP), Illinois to investigate effects of microorganisms in determining the fate of TNT in wastewater. Degradation studies with indigenous sediment microbiological populations indicated that the transformation/ degradation of TNT is a cometabolic process requiring an added carbon source. Total mineralization of TNT did not occur, and persistent end-products were found. TNT transformation by microorganisms was fairly rapid and appeared to be concentration-dependent. Acclimated and unacclimated populations from both plants transformed 70-90% of the TNT at concentrations of 10 ppm and 100 ppm in 3-5 days. At 100 ppm an increase in cell density was noted. Anaerobic degradation studies showed that 100 ppm concentrations initially inhibited methane production, but as acclimation progressed, TNT concentrations of >200 ppm were necessary to elicit a toxic respone. It appears that aqueous and sediment microbial communities inherently contain organisms capable of transforming TNT, as extensive acclimation periods were not required. Major transformation products identified differed from those identified by other researchers studying TNT photolysis. (See also W78-05111 and W78-05112) (Lynch-Wisconsin)
W78-05114

REMOTE SENSING ANALYSIS OF LAKE LIVINGSTON AQUATIC PLANTS, 1975 FINAL REPORT,
Texas A and M Univ., College Station. Remote Sensing Center.
A. R. Benton, Jr., and R. M. Newnam.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-31644, Price codes: A03 in paper copy, A01 in microfiche. Report NASA-CR-147975, March 1976. 40 p, 3 fig. NASA NGL 44-001-001.

Descriptors: *Remote sensing, *Lake Livingston(TX), Aquatic weed control, *Water hyacinth, *Eutrophication, *Aerial photography, Trinity River(TX), Brushy Creek(TX), Eichhornia crassipes, Potamogeton, Hydrilla, Coontail, Duckweed, Chemcontrol, Herbicides, 2 4-D, Lakes, Boating, Nutrients.

Aerial infrared color photography monitored the spread of water hyacinth, hydrilla, coontail, duckweed, and potamogeton in Lake Livingston, Texas during 1974-75, and showed results of attempts to control the plants with the herbicide 2,4-D. The newly-formed lake is fed by the nutrient-rich Trinity River. The spread of the plants among lakes has been linked to trailered boats. Winter severity strongly influenced subsequent spring infestations; the mild winter of 1973-74 permitted much of the 1973 water hyacinth crop to winter over, and explosive growth occurred by April 1974. Two hard freezes during the winter of 1974-75 seriously damaged the hyacinth mat, delaying growth until June 1975. Chemical control efforts during 1974 proved inadequate. Localized control in 1975 on White Rock Creek was 100% effective, but in the Jungle and elsewhere on the lake, growth was uninterrupted. The freezes prevented the hyacinth from getting a good start, and domination shifted to submersed plants. A heavy hydrilla infestation occurred in Beacon Bay in 1974, and a lesser infestation was noted in 1975, partially controlled by herbicide treatments. Chemical control experiments conducted on Brushy Creek were also photographed, and a report on those efforts is included. Aerial monitoring of the entire lake shoreline is recommended for 1976. (Lynch-Wisconsin)
W78-05134

THE USE OF MACROINVERTEBRATE BENTHOS IN EVALUATING ENVIRONMENTAL DAMAGE
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
K. W. Cummins.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-750646-2, Price codes: A02 in paper copy, A01 in microfiche. In: Proceedings of the Workshop on Biological Significance of Environmental Impacts. University of Michigan. 11 p, 2 fig, 1 tab, 23 ref. NSF BMS-74-20746, AT(11-1)-2002.

Descriptors: *Macroinvertebrates, *Benthic fauna, *Bioindicators, *Water quality indicators, *Food habits, *Water pollution effects, Environmental effects, Lotic environment, Ecosystems, Ecology, Watersheds(Basins), Streams, Rivers, Particle size, Organic matter, Insects.

Freshwater benthic macroinvertebrates, especially in running waters, can be divided into four functional groups reflecting their food-gathering habits; changes in the relative dominance of these groups can help indicate environmental damage to the ecosystem. The functional groups, associated with basic organic food sources, are: (1) shredders, which feed on coarse particulate organic matter (CPOM), generally 1-4 mm; (2) collectors, which depend on fine particulate organic matter (FPOM), usually < 1 mm; (3) scrapers (grazers), which graze on attached, growing, and photosynthesized plant tissue (primary production); and (4) predators, which feed on shredders, collectors, and scrapers. These groups, together with microbial processors and producers, are key components of the structure and function of the lotic system. Biomass or biomass turnover of the groups can be related to the ecosystem's capacity to process CPOM and FPOM (detritus) and the products of in-stream photosynthesis. It may be assumed that the functional groups will reflect changes in the relative proportions of the organic budget of the freshwater habitat. It is contended that these groups are better indicators of damage to community structure than typical species lists or diversity indexes. Techniques for separating benthic macroinvertebrates into functional groups is being developed. Thermal regime is probably the best parameter for keying sampling intervals. (Lynch-Wisconsin)
W78-05135

BIOACCUMULATION IN FISH OF CHLORINATED PHENOLS FROM KRAFT PULP MILL BLEACHERY EFFLUENTS,
Swedish Water and Air Pollution Research Lab. Stockholm.
For primary bibliographic entry see Field 5C.
W78-05138

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. I. MANIPULATION OF EXPERIMENTAL ENCLOSURES,
Tsukuba Univ., Ibaraki (Japan). Inst. of Biological Sciences.
M. Takahashi, G. T. Wallace, F. A. Whitney, and D. W. Menzel.
Marine Science Communications, Vol. 3, No. 4, p 291-312, 1977. 4 fig, 3 tab, 12 ref.

Descriptors: *Food chains, *Mercury, *Phytoplankton, *Herbivores, *Carnivores, *Nutrients, *Nutrient requirements, *Heavy metals, *Zooplankton, Ecosystems, Equipment, Chemical analysis, Methodology, *Controlled experimental ecosystem, Saanich Inlet, British Columbia, Canada.

Three enclosures each containing 1300 cubic meters of water were used to study the effect of mercury on mixed trophic levels of pelagic marine organisms in Saanich Inlet, British Columbia, Canada. A summary is given of these containers and of the methods used to maintain and sample the included water and organisms. Background information is provided for succeeding papers. (See also W78-05142 thru W78-05145) (Katz)
W78-05141

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. II. MARINE BACTERIOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
F. Azam, R. F. Vaccaro, P. A. Gillespie, E. I. Mouzsalli, and R. E. Hodson.
Marine Science Communications, Vol. 3, No. 4, p 313-329, 1977. 6 fig, 10 ref.

Descriptors: *Mercury, *Copper, *Heavy metals, *Marine bacteria, *Plankton, *Toxicity, *Respiration, Biomass, Public health, Radioactivity, Techniques, Ecosystems, Organic compounds, Chemical analysis, *ATP, *Controlled experimental ecosystems, *Methylmercury, *Glucose.

Some effects of low concentrations of added mercury on natural marine bacterioplankton were examined in Controlled Experimental Ecosystems. Heterotrophic activity, measured as D-glucose assimilation and respiration, was initially inhibited, followed by a rapid (5 days) recovery to the 'normal' level. The succeeding bacterial populations showed enhanced mercury tolerance, and were also copper tolerant although no copper additions were made to the enclosures. It is suggested that, whereas decreases in bacterial standing stocks and heterotrophic activity is only transient, the dominance of mercury- and copper- tolerant bacteria in mercury-polluted ecosystems may have implications for the biologically-mediated fate of mercury. (See also W78-05141) (Katz)
W78-05142

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. III. PHYTOPLANKTON POPULATION CYNAMICS AND PRODUCTION,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
W. H. Thomas, D. L. R. Seibert, and M. Takahashi.
Marine Science Communications, Vol. 3, No. 4, p 331-354, 1977. 7 fig, 3 tab, 21 ref.

Descriptors: *Mercury, *Heavy metals, *Phytoplankton, *Zooplankton, *Dinoflagellates, *Diatoms, *Primary productivity, Bioassay, Ecosystems, Radioactivity techniques, Water pollution effects, *Controlled experimental ecosystems, Differential grazing pressure.

The effects of inorganic mercury on natural assemblages of marine phytoplankton were studied under conditions that also included the associated zooplankton assemblages. Following the addition of mercury, there was an initial inhibition of productivity and phytoplankton as compared to a control. After several weeks of exposure bioassays revealed differences in phytoplankton taxa between exposure and control situations. It was concluded that this difference was due to differential grazing pressure. (See also W78-05141) (Katz)
W78-05143

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. IV. ZOOPLANKTON POPULATION DYNAMICS AND PRODUCTION,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
J. R. Beers, M. R. Reeve, and G. D. Grice.
Marine Science Communications, vol. 3, No. 4, p 355-394, 1977. 7 fig, 3 tab, 27 ref.

Descriptors: *Mercury, *Heavy metals, *Toxicity, *Animal metabolism, *Populations, *Zooplankton, *Food chains, *Copepods, *Mortality, *Predation, *Nutrients, Bioassay, Ecosystems, Aquatic environment, *Controlled experimental ecosystem, Zooplankton dynamics, Controlled ecosystem pollution experiment.

The taxonomic composition and abundance of the total zooplankton populations contained in three large-volume enclosures were studied after nominal concentrations of inorganic mercury were introduced into two of the enclosures. A sustained decrease in population size of the copepods Pseudocalanus and Acartia was attributed to the direct effects of mercury. In addition, the alternations in the food chain as a result of this population decrease were discussed. (See also W78-05141) (Katz)
W78-05144

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. V. GROWTH OF JUVENILE CHUM SALMON (ONCORHYNCHUS KETA),
British Columbia Univ. Vancouver. Inst. of Oceanography.
P. A. Koeller, and G. T. Wallace.
Marine Science Communications, Vol 3, No 4, p 395-406, 1977. 2 fig, 3 tab, 11 ref.

Descriptors: *Mercury, *Heavy metals, *Toxicity, *Growth rates, *Growth stages, *Juvenile growth stage, *Fish physiology, *Animal metabolism, *Chum salmon, Ecosystems, Aquatic environment, Bioassay, *Tissue analysis, *Controlled experimental ecosystem, Prey concentrations, British Columbia.

Growth of juvenile chum salmon was examined in three large-volume enclosures. It was apparent that a single dose of 5 micrograms/l-1 had no effect within the 72 day observation period. Low prey concentrations, rather than a direct toxic effect of

added mercury, was the most probable cause of the depressed growth. (See also W78-05141) (Katz)
W78-05145

EVALUATION OF A CELL CULTURE ASSAY FOR DETERMINATION OF WATER QUALITY OF OIL-REFINERY EFFLUENTS,
Oklahoma State Univ., Stillwater. Dept. of Biochemistry; Oklahoma State Univ., Stillwater. Dept. of Statistics; and Oklahoma State Univ., Stillwater. Dept. of Zoology.
D. Richardson.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 6, p 683-690, 1977. 3 fig, 2 tab, 14 ref.

Descriptors: *Toxicity, *Bioassay, *Daphnia, *Cytological studies, *Cultures, *Water quality tandards, *Water quality, *Water analysis, Industrial wastes, *Oil pollution, Bacteria, Effuents, Water pollution effects, Methodology, aboratory tests, *Cell culture assay.

his paper compared Daphnia and cell culture oassays of the toxicity of a reference compound, -cresol, and then applied the procedures to comex fractions derived from oil-refinery effluents. he authors concluded that the cell culture assay as a sensitive, reliable and reproducible method or determination of the toxicity of oil-refinery effluents. (Katz)
W78-05146

CHLORINATED HYDROCARBON RESIDUES IN THE DIET AND EGGS OF THE FLORIDA BROWN PELICAN,
Florida Univ., Gainesville. Pesticide Research Lab.
For primary bibliographic entry see Field 5C.
W78-05147

MINERAL COMPOSITION OF THE SCALES OF CATOSTOMUS COMMERSONI COMING FROM TWO DIFFERENT ENVIRONMENTS: STUDY BY ANALYTIC ELECTRON MICROSCOPY, (IN FRENCH),
Institut National de la Recherche Scientifique, Rimouski (Quebec).
R. Van Coillie, and A. Rousseau.
J Fish Res Board Can. 31(1), p 63-66, 1974.

Descriptors: *Catostomus-commersoni, Circuli, *Electron microscopy, Environment, *Metals, Osteoid, Scales, Spectrometry, Water pollution, X-ray analysis, Mineralogy, *Pollutant identification.

The metal content of scales was studied. Fish of the Catostomus commersoni subspecies were taken from a healthy environment, (the Manicouagan River) and an environment polluted by various metals (Riviere des Prairies, near Montreal). X-ray microspectro-metry was combined with electron microprobe scanning techniques, with subsequent microdensitometric scanning. Scales contained: Ca (predominant), Na, Mg, Al, K, Fe, Cu, Zn, Ba, and some Cr, Mn, Co, Ni, Sr, Ag, Cd, Cs, Hg and Pb. All metals were between the circuli in the osteoid structures. The latter category of metals, widely known for their toxicity, were more abundant in the scales of the sample from polluted waters, whereas the reverse was true for the other metals, with the exception of Al and Ba, which were found in equal quantities in both samples. Since toxic metals are more abundant in polluted waters and excess metal from the water may replace Ca in the scales, it may be inferred that the mineral content of scales is related at least in part to that of the surrounding aquatic environment--Copyright 1975, Biological Abstracts, Inc.
W78-05148

PRELIMINARY BIOCHEMICAL OBSERVATIONS OF FISHES INHABITING AN ACIDIFIED LAKE IN ONTARIO, CANADA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
W. I. Lockhart, and A. Lutz.
Water, Air and Soil Pollution, Vol. 7, No. 3, p 317-332, 1977. 1 fig, 4 tab, 72 ref.

Descriptors: *Suckers, Freshwater fish, *Lakes, *Acidic water, Fish physiology, *Biochemistry, Catfishes, Bullheads, Calcium, Environmental effects, Fish diseases, Pikes, Perches, Fish populations, Analytical techniques, Canada, Water properties, Trout, Brown trout, Metabolism, *White suckers, *Tissue analysis, Lake George, Lake Manitoba, Catostomus commersoni, Lake Herring.

Blood serum and other tissues of white suckers (Catostomus commersoni) and other species of fish wee examined in a preliminary effort to understand losses of fish from acid lakes. Maturing females of highly acid George Lake failed to show the normal degree of increase in serum Ca over males captured in the same location. Elevated serum Ca was always observed in females, relative to males, from non-acid locations when maturation stages were similar. A number of body tissues were examined to determine whether the distribution of Ca or other elements were altered and the only striking change evident in fish from George Lake was their high Mn content. Bone in particular was examined for N, Na, Mg, P, K, and Ca, and no evidence of demineralization was found. Other tests such as hemoglobin indicated that an anticipated adaptive response to asphyxia was absent. Results indicated that potential mechanisms of fish losses such as asphyxia and starvation were unlikely to have been significant. A working hypothesis was suggested: Ca dynamics may limit ovarian development and absorption of this metal at exchange surfaces may be impaired. (Klein)
W78-05159

STUDIES ON MANGROVE COMMUNITIES IN PUERTO RICO,
Puerto Rico Univ., Mayaguez. Dept. of Marine Sciences.
For primary bibliographic entry see Field 5C.
W78-05161

THE ANALYSIS AND CONTROL OF VOLATILE HYDROCARBON CONCENTRATIONS (E.G. BENZENE) DURING OIL BIOASSAYS,
Skidway Inst. of Oceanography, Savannah, GA.
L. P. Atkinson, W. M. Dunstan, and J. G. Natoli.
Water, Air, and Soil Pollution, Vol. 8, No. 2, p 235-242, 1977. 6 fig, 1 tab, 5 ref.

Descriptors: *Pollutant identification, *Phytoplankton, *Bioassay, *Absorption, *Growth rates, *Volatility, *Aromatic compounds, *Analytical techniques, *Laboratory equipment, Gas chromatography, Instrumentation, Organic compounds, Metabolism, Methodology, Oil pollution, *Benzene.

It is well known that volatile hydrocarbons such as benzene, toluene, and xylene, which are abundant in many refined oils, affect phytoplankton growth. However, experiments to determine these effects in many cases have been improperly designed resulting in questionable conclusions. Experiments presented in this paper indicate that ambient benzene concentrations reported in the published literature may be lower than stated by an order of 10 to 100. By continuous monitoring the benzene concentration decrease was observed and it was possible to determine whether the loss was due to degassing because of loose closures or biological uptake. Unless tight closures are used benzene is quickly lost to the atmosphere. Experiments demonstrated that benzene is quickly lost from cotton stoppered bioassay flasks that are typically used. Rubber stoppered flasks with little gaseous headspace showed minimum benzene loss. These experiments indicate that proper closures and analysis of the volatile pollutant concentration during bioassay experiments increase the likelihood of correct interpretation and may yield additional insights into the causation factors. (Deal)
W78-05162

RESPONSE OF SELENASTRUM CAPRICORNUTUM TO ZINC SULFIDES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-05163

BIOMONITORING WITH FISH: AN AID TO INDUSTRIAL EFFLUENT AND SURFACE WATER QUALITY CONTROL,
National Inst. for Water Research Pretoria (South Africa).
W. S. G. Morgan.
Progress in Water Technology, Vol. 9, p. 703-711, 1977. 2 fig, 2 tab, 21 ref.

Descriptors: *Monitoring, *Industrial wastes, Industrial water, *Water quality control, *Public health, Potable water, *Toxicity, *Lethal limit, Fish behavior, Fish physiology, *Bioassay, *Respiration, Methodology, *Bioindicators.

A rapid biological automonitoring system intended to complement physical-chemical monitoring techniques, has been developed which utilize the fact that fish opercular rhythms increase under toxic conditions. Any increase which is above the rate to be expected under normal conditions is monitored electronically. An inbuilt visual alarm system serves as an advance warning of the development of a critical toxic condition. The system also has the ability of controlling toxic industrial discharges, thus aiding the preservation of the quality of receiving waters. (Katz)
W78-05171

MEMBRANE FILTER RETENTION: A SOURCE OF ERROR IN THE 14C METHOD OF MEASURING PRIMARY PRODUCTION,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Environmental Research Branch.
J. W. McMahon.
Limnol Oceanogr. 18(2), p 319-324, 1973.

Descriptors: *Carbon-14 method, Error, *Filters, *Membrane filter retention, Methodology, *Phytoplankton, *Primary production, *Measurement, Pollutant identification.

The relationship between volume of water filtered and apparent specific activity of phytoplankton in which the latter decreases (com 14C ml to the -1 power) with increasing volume filtered, previously attributed to cellular damage to phytoplankton during vacuum filtration, is now considered mainly due to retention of unfixed radiotracer on the membrane filter. The retention capacity for 14C by the filter, expressed as radioactivity per milliliter filtered, is maximum for small sample volumes (less than or equal to 1 ml), decreasing to a constant value when sample volumes are larger than 100ml. This is attributed partially to absorption in the filter and probable retention of 14C bound to unknown substances in the water or on the filter which are eluted or exchanged by passage of volumes of water of 100ml or greater. This 'washing' effect permits almost all of the 14C not fixed in organisms to pass through the filter.—Copyright 1974, Biological Abstracts, Inc.
W78-05172

DRINKING WATER AND HUMAN HEALTH,
National Water Well Association, Worthington, OH.
T. E. Gass.

Water Well Journal, Vol. 32, No. 3, p 38-40, March, 1978. 2 tab, 1 ref.

Descriptors: *Potable water, *Trace elements, *Pollutant identification, Metals, Toxicity, *Water quality standards, Copper, Lead, Chromium, Cadmium, Zinc, Public health.

Large populations are exposed repeatedly, over long periods of time, to minute amounts of potentially toxic contaminants in drinking water. Unfortunately, the methods and criteria of conventional toxicology do not always prove reliable for assessing long-term toxic effects of water constituents, and there is thus great uncertainty in estimating the magnitude of the health risks some contaminants may produce. Trace metals, for example, can occur in water supply sources as a result of both natural processes and man's activities. Elements such as copper, tin, iron, manganese, zinc, chromium, sodium, magnesium, calcium, molybdenum, cobalt, vanadium, and selenium are necessary for human life functions. Adverse health effects associated with trace metals depend upon the total intake from sources such as food and sir, in addition to water. This article presents discussions of five specific trace elements (cadmium, chromium, copper, lead, and zinc), noting conditions for occurence, levels of toxicity, and drinking water standard concentrations for each. (Eberle-NWWA)
W78-05195

5B. Sources Of Pollution

WATER QUALITY IN NORTH CAROLINA COASTAL PLAIN STREAMS AND EFFECTS OF CHANNELIZATION,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
E. J. Kuenzler, P. J. Mulholland, L. A. Ruley, and R. P. Sniffen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 273, Price codes: A09 in paper copy, A01 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Rpt. No 127, 50 fig, 38 tables, 160 pp., October 1977. 88 ref, append. OWRT B-084-NC(2), 14-31-0001-5100.

Descriptors: *Channel improvement, *Water quality, Nutrients, Metals, Dissolved oxygen, *Wetlands, Flood plains, Seasonal flow, *Coastal plains, Farm wastes, Swamps, Water pollution sources, *Channelized streams, Flood plain swamps, *North Carolina, *Swamp streams.

The physical and chemical characteristics of seven small Coastal Plain streams of eastern North Carolina were studied. Three natural streams which flow through relatively undisturbed bottomland hardwood forests were compared to four streams which had been channelized for the purpose of reducing agricultural losses caused by flooding. Two or three sampling stations were established on each stream. Some stations on natural streams were essentially pristine but others received point-source inputs of livestock farm wastes. The natural streams had broad floodplains and low stream velocities even during flood stages. Spates occurred in all seasons, but high discharge, and concomitant flooding of natural swamps, were usually greatest during winter and spring. The waters of channelized streams, however, were restricted: they attained higher velocities, carried greater particulate loads, and were more turbid than natural streams. Some channelized streams were enriched by sewage, by livestock wastes, or by agricultural fertilizer. Weighted mean concentrations of the nutrient element N and P were much lower in waters of unpolluted natural streams than in rainwater, and there was a net input of these nutrients to the watershed. Concentrations and fluxes of elements such as Ca, Mg, Na, K, and Cl, however, were higher in all streams than in precipitation and the net fluxes of these elements were directed out of the watershed. (Kiger-NC State)
W78-04707

INFLUENCE OF ROAD SALTING ON THE NUTRIENT AND HEAVY METAL LEVELS IN STREAM WATER,
New Mexico Univ., Albuquerque. Dept. of Biology.
J. R. Gosz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 255, Price codes: A03 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, WRRI Report No. 093, February 1978, 40 p, 9 fig, 13 tab, 11 ref. OWRT A-057-NMEX(1), 14-34-0001-7066.

Descriptors: Water quality, Highways, *Snow removal, Salts, *Heavy metals, Roads, *Nutrients, Streams, *Water pollution sources, Soils, Highway effects, Watershed management, Highway icing, New Mexico, *Road salting effects.

The increased use of forested areas for winter recreation in the mountains has resulted in substantial road development and maintenance activities such as road salting. This study evaluated the influence of road salt on levels of nutrients, heavy metals, and sediment in streams as modified by topography. As a result of an extremely low snow pack, salt inputs and stream discharge were low. This reduced losses of nutrients and salt from the below road areas; however, the losses which did occur were strongly linked to the road salting practice. All study areas showed an accumulation of road salt because of the low discharge. The addition of massive quantities of sodium caused the release of other cations and significantly altered soil structure. The breakdown of soil structure appeared to be the major reason for large losses of sediment and heavy metals from the below road areas. Most streams had very low levels of dissolved heavy metal ions. Because of the low snow pack and discharge it was difficult to evaluate a mulching and revegetation treatment. Most of the differences between watersheds seemed a result of topographic features. Steep slopes and a large road area to below road area ratio appear most influential in altering water quality.
W78-04708

WELL INJECTION INTO A TWO-PHASE FLOW FIELD: A HELE-SHAW MODEL INVESTIGATION,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5E.
W78-04709

EFFECTS OF AN URBAN ROAD SYSTEM ON LEAD CONTENT OF AN URBAN WATER SUPPLY SOURCE,
Massachusetts Univ., Amherst. Dept. of Chemistry.
H. M. Widmer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 193, Price codes: A02 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRRC Publication No 85, Termination Report, September 1976. 18 p, 4 fig, 4 tab, 14 ref. Zajicek, O. T., ed. OWRT A-065-MASS(1).

Descriptors: *Lead, Massachusetts, *Air pollution effects, Water Pollution Sources, Reservoirs, *Dissolved solids, Sediments, *Highway effects, *Path of pollutants, Pollutant identification, Lake sediments, Humic acids, Fulvic substances, *Cambridge Reservoir(Mass).

Water and sediment samples were analyzed to measure the impact of automobile traffic on the lead content of the Cambridge Reservoir. Distance from the road, traffic volume, and water color influence the concentration of dissolved lead. Lead enters the water system in the form of soluble inorganic particulates and is removed by a sedimentation process in which colored natural organic substances, e.g., humic acids, are involved. The average concentration of lead in the upper portion of the Cambridge Reservoir sediment was 2-3 times higher than the reported average lead concentration in the sediment of lakes not exposed to transportation systems. Lead concentrations in sediments decrease with increased distance from the highway. A preliminary model for a sedimentation-solubilizatin process involving humic and fulvic substances is advanced. (Lefferts-Mass)
W78-04711

THE KINETICS OF MINERAL DISSOLUTION IN CARBONATE AQUIFERS AS A TOOL FOR HYDROLOGICAL INVESTIGATIONS, II. HYDROGEOCHEMICAL MODELS,
Tahal-Water Planning for Israel Ltd., Tel Aviv.
For primary bibliographic entry see Field 2F.
W78-04716

NON-POINT SOURCE POLLUTION SEMINAR, SECTION 108(A) DEMONSTRATION PROJECTS PROGRESS REPORTS, HELD AT CHICAGO, NOVEMBER 20, 1975. POLLUTION CONTROL IN GREAT LAKES.
Environmental Protection Agency, Chicago, IL. Office of the Great Lakes Coordinator.
For primary bibliographic entry see Field 5G.
W78-04719

USES OF PESTICIDES AND FERTILIZERS IN THE BLACK CREEK WATERSHED,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-04726

SEDIMENT CONTRIBUTIONS TO THE MAUMEE RIVER,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W78-04727

NUTRIENT CONTRIBUTIONS TO THE MAUMEE RIVER,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
L. E. Sommers, D. W. Nelson, and D. B. Kaminsky, Jr.
In: Non-Point Source Pollution Seminar, Section 108(a) Demonstration Projects Progress Reports, Held at Chicago, November 20, 1975. Report EPA-905/9-75-007, (1975). p 105-119, 1 fig, 7 tab, 6 ref. EPA G005103, G005139, G005140.

Descriptors: *Maumee River, *Black Creek watershed(IN), *Nutrients, *Surface runoff, *Tile drainage, Indiana, Black Creek Sediment Control Project(IN), Runoff, Nitrogen, Phosphorus, Nonpoint pollution, Fertilizers, Groundwater, Subsurface drainage, Rainfall simulators, Watersheds(Basins).

The nutrient content of surface runoff, tile drain effluents, and surface waters in th Black Creek watershed (Allen County, Indiana) and Maumee River was monitored in 1973-74 as part of the Black Creek Sediment Control Project. Use of a rainfall simulator on four soil types (Haskins loam, Nappanee clay loam, Moreley clay loam, and Hoytville silty clay) which had been recently fertilized indicated an average nutrient loss of 3.5% nitrogen and 3.8% phosphorus in the form of surface runoff. Water samples obtained from 283 tile outfalls in May-June 1974 showed that tile effluents from agricultural land possessed greater concentrations of nitrogen than surface water samples collected near the drainage ditch outlets. Concentrations of total phosphorus were also

higher in the tile effluents than in surface waters, except at one site. Tile effluents and surface runoff are of equal importance as sources of nutrients entering surface waters in the watershed in terms of average concentrations. Stream water samples from 13 Black Creek watershed sites and one Maumee River site showed higher median nitrogen concentrations in the watershed, but higher median phosphorus concentrations in the Maumee River. Rainfall simulation experiments indicated that soil and nutrient losses from these gently sloping soils (0.3-5.2% slope) were low. Rainfall was applied at an intensity of 6.35 cm/hr to the plots, which were fertilized with 56 kg P/ha triple superphosphate and 168 kg N/ha NH4NO3. (See also W78-04719) (Lynch-Wisconsin)
W78-04731

DISTRIBUTION AND ABUNDANCE OF BENTHIC ALGAE ALONG PHOSPHATE GRADIENTS IN KOOTENAY LAKES, BRITISH COLUMBIA,
G. L. Ennis.
Verh. Internat. Verein. Limnol., Vol 19, p 562-570, October 1975. 2 fig, 2 tab, 24 ref. National Research Council 67-3454.

Descriptors: *Kootenay Lake(B.C. Canada), *Algae, *Diatoms, *Eutrophication, *Phosphates, *Benthic flora, British Columbia(Canada), Canada, Nutrients, Mountains, Piedmont, Species diversity, Trophic levels, Fertilizers, Water pollution effect, Lakes, Bioindicators.

Variations in phosphate input to Kootenay Lake, British Columbia, Canada, provided a means of relating benthic algal distribution to nutrient levels. Kootenay is a narrow piedmont lake 105 km long by about 5 km wide, with inlets at both north and south ends and a single outlet at the western midpoint. Since 1953 phosphate fertilizer plant effluent has entered the south end while low amounts of phosphate are added at the north end. Six stations located on the lake's inlets and outlet were sampled between May-September 1973. Diatoms (Chrysophyta, Bacillariophyceae) consistently dominated the epilithic flora, but 137 taxa were identified. Sixteen taxa of Chlorophyta and 14 species of Cyanophyta were commonly observed. Diatoms were 10% more common in the north arm than elsewhere, and were more abundant in the lake in general than in other Canadian lakes. The epilithic algal community was relatively similar to other north temperate lakes, however, with diatoms, chlorophytes, and cyanophytes the only important taxa. The north arm appeared less eutrophic than the south arm, where nutrients such as orthophosphate are higher, and species diversity is lower. Nutrient levels in the west arm were intermediate. The diatom Fragilia construens and green alga Cladophora aegagropila, both eutrophic indicators, were prominent in the south and west arms. (Lynch-Wisconsin)
W78-04737

MODELING OF ACID MINE DRAINAGE AND OTHER POLLUTANTS IN THE MONOGAHELA RIVER BASIN UNDER LOW FLOW CONDITIONS,
West Virginia Univ., Morgantown. Dept. of Civil Engineering.
W. A. Sack, C. R. Jenkins, B. R. Chambers, and R. W. Lange, II.
West Virginia Department of Natural Resources, Charleston, Division of Water Resources, June 1976. 159 p, 79 fig, 20 tab, 15 ref, 1 append.

Descriptors: *Low flow, *Monongahela River Basin(WV), *Acid mine water, *Model studies, QUAL 2 model, Pollutants, Water pollution control, *West Virginia, Point pollution, Mining, Mine drainage, River basin development, River basins, Water pollution sources, ENGRMASS computer program.

Modelling of the West Virginia portion of the Monongahela River Basin at low-flow conditions using EPA's QUAL 2 model and a separate computer program (ENGRMASS) shows that of the four sub-basins modelled, only the Monongahela is appreciably affected by active mines. Abandoned deep mines are the major problem on the other sub-basins--West Fork, Tygart Valley, and Cheat Rivers. Parameters modelled were net acidity, total dissolved solids, dissolved oxygen, and ultimate oxygen demand. Other input data sources included natural stream conditions, municipalities, industries, active and abandoned deep mines, coal refuse piles, and coal preparation plants. Pollutant concentrations were estimated under existing treatment conditions and under 'best practical treatment' (BPT) for population in 1970 and 2000. Application of BPT to active mines in the Monongahela sub-basin would reduce net acidity by 92% at the Pennsylvania border, but the mainstem would still be pH limiting; all tributaries but Deckers Creek would no longer be pH limiting, however. Increased population by the year 2000 will increase alkalinity discharged into the streams. The pH limiting problem on the Tygart River would be reduced to only the RM 67.5 to 50.5 zone. Some improvement to lower Lost Creek would result, but no other improvement would occur on West Fork River. Application of BPT to 48 selected abandoned deep mines in the West Fork and Tygart Rivers would improve the entire Monongahela River mainstem to effluent-limiting conditions. (Lynch-Wisconsin)
W78-04746

WATER POLLUTION INVESTIGATION: CUYAHOGA RIVER AND CLEVELAND AREA,
ECO-LABS, Inc., Cleveland, OH.
E. M. Bently, V. L. Jackson, J. A. Khadye, and A. E. Ramm.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 696, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-905/9-74-012, December 1975. 142 p, 38 fig, 14 tab, 31 ref. 3 append. EPA 68-01-1568.

Descriptors: *Cuyahoga River(OH), *Cleveland(OH), *Water pollution control, *Model studies, *Dissolved oxygen, *Biochemical oxygen demand, Ohio, Rivers, Mathematical models, Computer programs, Lake Erie, Oxygen sag, Effluents, Industrial wastes, Sewage, Waste water treatment, Aquatic life, Stratification, Baseline studies.

Water quality data were collected for the severely-polluted lower Cuyahoga River at Cleveland, Ohio, and a mathematical computer model was developed to simulate biochemical oxygen demand (BOD) and dissolved oxygen (DO) under varying flow conditions. Municipal and industrial treatment programs to be implemented by 1978 will improve dissolved oxygen concentrations, but nonpoint runoff and benthic oxygen demand will continur to cause oxygen sag in the navigation channel during summer low flows, and the lower Cuyahoga will have difficulty supporting all but the most pollution-tolerant aquatic life. Although current DO standards will be met by the anticipated treatment, they are not adequate to protect pollution-sensitive organisms; control of nonpoint pollution sources and additional means of controlling point sources should be emphasized to reduce waste loads. The water quality data were collected in September-October 1973 at five sampling stations in the lower navigational channel. Included were depth; wind speed; water temperature; chemical and biochemical oxygen demand; dissolved, suspended, and total solids; DO; nitrate; conductivity; pH; chloride; and organic and ammonia nitrogen. The DO model consisted of three separate models: (1) one based on Streeter-Phelps equations; 82) a revised and expanded Delaware Estuary finite difference model; and 83) a time-variant model. (Lynch-Wisconsin)
W78-04748

CLOSTRIDIUM PERFRINGENS AND COLIFORM BACTERIA AS INDICATORS OF FAECAL POLLUTION,
Vattentest A. B., Uppsala (Sweden).
For primary bibliographic entry see Field 5A.
W78-04754

WATER QUALITY ASSESSMENT FOR THE PROPOSED RDX-HMX FACILITY, MCALESTER NAVAL AMMUNITION DEPOT, VOLUME I AND II.
Water and Air Research, Inc., Gainesville, FL.
For primary bibliographic entry see Field 5G.
W78-04755

FACTORS AFFECTING TRACE ELEMENT DISPERSION IN LAKE SEDIMENTS IN THE YELLOWKNIFE AREA, N. W. T., CANADA,
R. G. Jackson, and I. Nichol.
Verhandlungen, Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Vol. 19, p 308-316, October 1975. 7 fig, 1 tab, 9 ref.

Descriptors: *Trace elements, *Yellowknife(Northwest Territories Canada), *Lakes, *Sediments, *Distribution patterns, Canada, Dispersion, Canadian Shield, Waves(Water), Dissolved oxygen, Iron, Manganese, Bedrock.

Sediments, bedrock, and soils from 19 lakes in the discontinuous permafrost zone in the Yellowknife area of the Canadian Shield (Northwest Territories, Canada) were analyzed for nine trace elements and organic matter to determine factors affecting their dispersion. The elements were copper, lead, zinc, cobalt, nickel, iron, manganese, silver, and arsenic. Lake water was monitored for temperature, conductivity, dissolved oxygen, and pH. The most important factors influencing the relationship between sediment trace element composition and availability of those elements in surrounding bedrock were: (1) sediment sorting by wave action; (2) iron and manganese coprecipitation of zinc, copper, nickel, silver, and arsenic due to high dissolved oxygen conditions and a pH of 6.8-7.0 in the lake water; and (3) the organic content of the sediment. Sediments containing greater than 15-20% organic matter were associated with the development of hydromorphic geochemical anomalies related to mineralization. Organic sediments of Likely Lake, adjacent to lead-zinc-copper-silver-arsenic mineralization, were uncharacteristically high in lead, copper, and silver; organic sediments of Berry Hill Lake, adjacent to gold-arsenic mineralization, were similarly high in arsenic. At each lake 30-50 sediment samples were collected, and rock and soil samples were obtained from about 15 sites along the shore. Detailed information from nine of the lakes is presented in figures. (Lynch-Wisconsin)
W78-04758

THE DISTRIBUTION OF IRON IN A CLOSED ECOSYSTEM,
T. P. Murphy, and D. R. S. Lean.
Verhandlungen, Internationale Vereinigung Fuer Theoretische und Angewandte Limnologie, Vol 19, p 258-266, October 1975. 8 fig, 20 ref.

Descriptors: *Iron, *Ecosystems, *Phosphorus, *Sediment-water interfaces, *Limnocorrals, *Great Lakes, Distribution, Nutrients, Limiting factors, Chelation, Absorption, Phytoplankton, Periphyton, Chlorophyll, Magnesium, Seston, Canada.

In experiments utilizing closed-ecosystem limnocorrals to study roles of various nutrients and their interrelationships in Great Lakes eutrophication, not significant correlation of iron to trace metals (except magnesium) or phosphorus in the sedimenting material was found. A large amount of iron returning to the open water from the sediments was not available for biological uptake. The

periphyton community where nitrogen fixation occurred contained four times the iron concentration as where nitrogen fixation was low, and nitrogen-fixing phytoplankton had the highest 55Fe uptake. Although a low-molecular-weight substance appeared to have been secreted by the community for iron chelation, most of the iron in the seston was associated with magnesium in a molecular-size range of 1,000-10,000. Average iron sedimentation rates in the corrals were 435 mg/sq m/day (157%) in the nitrogen plus phosphorus corral, 281/sq m/sq m/day (815%) in the phosphorus corral, and 312 mg/sq m/day (141%) in the control. In the top 14 cm of sediment in a corral the amount of iron was 4,502 grams, of which 2.8 grams were in the pore water. (Lynch-Wisconsin)
W78-04762

INTERSTITIAL WATER COMPONENTS AND EXCHANGE ACROSS THE WATER SEDIMENT INTERFACE OF WESTERN LAKE SUPERIOR,
For primary bibliographic entry see Field 5C.
W78-04769

FLUX OF NUTRIENTS BY DIFFUSION THROUGH THE LAKE SEDIMENT-HYPOLIMNION INTERFACE FOR 9 LAKES IN MAINE, U.S.A.,
For primary bibliographic entry see Field 5C.
W78-04770

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970, INTRODUCTION,
Uppsala Univ. (Sweden). Inst. of Plant Ecology.
For primary bibliographic entry see Field 5C.
W78-04787

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 1, OUTFLOW STUDIES,
Uppsala Univ. (Sweden). Inst. of Plant Ecology.
For primary bibliographic entry see Field 5C.
W78-04788

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 2, PHOSPHATE, NITRATE AND AMMONIUM IN THE ARCHIPELAGO DURING 1970,
Uppsala Univ. (Sweden). Inst. of Plant Ecology.
For primary bibliographic entry see Field 5C.
W78-04789

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 3, DETERMINATION OF TOTAL PHOSPHORUS IN NATURAL WATERS,
Uppsala Univ. (Sweden). Dept. of Analytical Chemistry.
L. Gustafsson.
OIKOS Supplementum, Vol. 15, p 171-175, 1973. 2 tab, 5 ref.

Descriptors: *Phosphorus, *Nutrients, *Analytical techniques, Testing procedures, Arsenic, Silicates, Iron, Ions, Methodology, Measurement.

A sensitive and accurate method is described for determining total phosphorus in seawater, brackish water, and freshwater, especially when very low concentrations are present. The influence of silicate, arsenate, and iron ions which may be encountered is investigated, and an arsenic-removal procedure is given. In the absence of interfering arsenic, a summary of the procedure is as follows: (1) mix the water samples; (2) immediately pipette about 50 ml (Containing > 80 micrograms P) into a 100-ml Kjeldahl flask; (3) add 1.2 ml concentrated sulfuric acid; (4) add a few quartz chips and boil down to a small volume (repeat with additional water from the sample if phosphorus contents are low); (5) add 2 ml HNO3(-)HC104 (4+1) and gradually increase the temperature, shaking flask until a ring of condensed H2SO4 reaches a few cm up the flask's neck; (6) continue heating at this temperature 15-25 min; the residual solution should be colorless; (7) cool 5 min, add 10 ml water, carefully rinsing flask walls, and mix immediately; (8) heat to near boiling 10-15 min; (9) add 10-15 ml water and filter immediately; (10) wash flask and filter paper with sulfuric acid; (11) add 5 ml of 2.5% ammonium molybdate and 2 ml of 10% ascorbic acid; (12) maintain at 40C for 90 min, and measure absorbance at 830 nm in a 10 cm cell. Calibration is described. (Lynch-Wisconsin)
W78-04790

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 4, PHYTOPLANKTON DISTRIBUTION IN THE ARCHIPELAGO MEASURED AS CHLOROPHYLL A,
Uppsala Univ. (Sweden). Inst. of Plant Ecology.
G. Engstrom.
OIKOS Supplementum, Vol. 15, p 176-178, 1973. 4 fig, 3 ref.

Descriptors: *Phytoplankton, *Stockholm Archipelago(Sweden), *Chlorophyll, *Eutrophication, *Algae, Distribution patterns, Lake Malaren(Sweden), Sewage disposal, Nutrients, Diatoms, Diatoma elongatum, Thalassiosira baltica, Oscillatoria agardhii, Standing crops, Baltic Sea.

Surface water samples taken from the Stockholm Archipelago, Sweden, in 1969-70 were analyzed for chlorophyll-a to measure phytoplankton standing crop. The archipelago, on the Baltic Sea, is overloaded with nutrients received from Lake Malaren, into which Stockholm discharges its sewage. Early in 1971 biological and chemical sewage treatment was initiated. Within 20 km of Stockholm in the archipelago, Melosira spp filaments were dominant. In the center of the archipelago, 40-50 km east of Stockholm, a heavy Diatoma elongatum growth dominated in May. Further out, other diatoms were found, including Achnanthes taeniata, Chaetoceros spp, Sceletonema costatum, and Thalassiosira baltica, as well as the Dinophyceae Gonyaulax catenata. With the June closing of Lake Malaren's outlet, the Norrstrom River, Oscillatoria agardhiii dominated until the end of October. At the end of June, however, high cholorphyll values near Stockholm were due to the chlorophytes Selenastrum spp, Scenedesmus spp, Dictyosphaerium pulchellum, and Pandorina morum; in August, September, and October chlorophyll values decreased in this area. After mid-October chlorophyll values over 10 micrograms/l were found only in the central archipelago, where a bloom of the diatom Thalassiosira baltica occurred. (Lynch-Wisconsin)
W78-04791

ORGANIC CARBON AND DEOXYGENATION IN THE PAMLICO RIVER ESTUARY,
East Carolina Univ., Greenville, SC. Dept. of Biology.
G. J. Davis, M. M. Brinson, and W. A. Burke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 311, Price codes: A07 in paper copy, A01 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No 131, (UNC-WRRI-78-131), January 1978. 123 p, 55 fig, 12 tab, 77 ref, 2 append. OWRT A-088-NC(2). 14-34-0001-7070.

Descriptors: *Carbon, *Carbon cycle, *Deoxygenation, *Estuaries, North Carolina, Dissolved solids, *Organic carbon, *Path of pollutants, Distribution, Water pollution sources, Nitrogen, Nitrates, *Phytoplankton productivity, *Dissolved organic carbon, *Pamlico River Estuary(NC).

The distribution, sources and sinks of organic carbon were studied in the Pamlico River Estuary during 1975-1977. The main source of organic carbon was from phytoplankton productivity, which, together with other sources from within the estuary, provided 64% of the organic carbon inputs. The remaining 36% was mainly from tributaries. Organic carbon losses (sinks) were 80% as water column respiration and 20% as outflow. Sedimentation and benthic respiration are undetermined losses. Total organic carbon (TOC) varied seasonally with the highest levels occurring during the summer months when flow rates were low. Also, TOC normally displayed a gradient with the highest levels consistently in the upper reaches near Washington, N.C. Approximately 79% of the TOC in the estuary consisted of dissolved organic carbon (DOC) which accounted for most of the seasonal variations in TOC. Levels of particulate organic carbon (POC) were fairly constant throughout the year with the exception of sporadic increases in phytoplankton biomass. The largest input of organic carbon to the estuary is from productivity of phytoplankton which is more readily available to organisms utilizing oxygen than the more abundant and less refractory inputs from tributaries. Because of this, the regulation of inorganic nutrient sources (mainly nitrogen) is more important for controlling increases in organic loading than are tributary inputs of organic carbon. (Kiger-NC State)
W78-04816

RADIOECOLOGY,
For primary bibliographic entry see Field 5C.
W78-04820

A STUDY OF HEAT TRANSFER PROCESSES ABOVE A COOLING POND,
Argonne National Lab., IL. Radiological and Environmental Research Div.
B. B. Hicks, M. L. Wesely, and C. M. Sheih.
Water Resources Research, Vol. 13, No. 6, p 901-908, December 1977. 4 fig, 4 tab, 16 ref.

Descriptors: *Cooling water, *Illinois, *Powerplants, *Heat transfer, *Lakes, Water cooling, Nuclear powerplants, Heated water, Heat, Sampling, On-site investigations, On-site data collections, Data collections, Data processing, Measurement.

Rapid response instrumentation mounted on a fixed tower located centrally in a strongly heated cooling pond at a nuclear power facility has enabled the evaluation of the turbulent fluxes of momentum, moisture, and sensible heat. The results agreed well with evaluations based on stability-corrected bulk aerodynamic fomulations, provided all atmospheric measurements are made close to the water surface and in a location with adequate upwind fetch. The bulk formulas are those that have been verified recently over more extensive water surfaces, with a minor modification based on the finding that the surface of the cooling pond appears to be significantly smoother than that of open ocean. (Sims-ISWS)
W78-04822

LABORATORY STUDIES OF THE INFLUENCE OF THE VELOCITY OF WIND ON THE MOVEMENT OF OIL SLICKS,
Queen Mary Coll., London (England). Dept. of Civil Engineering.
J. Allen, and J. C. M. Thanarajah.
Journal of Hydraulic Research, Vol. 15, No. 4, p 297-310, 1977. 8 fig, 3 tab, 83 ref.

Descriptors: *Path of pollutants, Water pollution sources, *Laboratory tests, *Oily water, *Surfaces, *Wind velocity, Laboratory equipment, Velocity, Movement, Open channels, Velocity, Waves(Water), Data collections, Foreign research, Oil slicks, Ahlborn tank, Wind tunnel.

In order to investigate the influence of the wind upon the movement of oil slicks on water, experiments were performed using an open channel placed inside a wind tunnel. The channel was specially designed Ahlborn tank which was arranged so that the direction of flow of the water could be reversed easily, thus enabling the water to be pumped either with or against the direcion of the wind. A detailed investigation of the wave motion in the liquid also was performed, since this was clearly an important factor affecting both the velocity and the spreading of the oil. An attempt was made to relate the significant height of the waves on the water surface to the effective roughness factor, k, in the equation for the velocity distribution in the air. The results seem to be surprisingly consistent. The velocities of the oil, and of the air and water between which it was sandwiched, were measured for a wide range of oils. As the wind velocity rose, the ratio of the oil-slick velocity to the wind velocity also rose to a maximum of approximately 8% for the least viscous oil. This type of behavior persisted if there was no pumping of the water or if pumping occurred in either direction. The oils of high viscosity tended to move more slowly than the others. This was found to be true regardless of the direction of pumping, and also if there was no pumping taking place. Throughout the investigations there appeared to be no correlation between the slick velocities and the relative velocity of the air to the liquid. (Humphreys-ISWS)
W78-04847

TURBULENT DIFFUSION IN CHANNELS WITH A SURFACE COVER,
University of Science and Technology, Kumasi (Ghana), Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-04848

LONG TERM PEACE RIVER CHARACTERISTICS AS A MEASURE OF A PHOSPHATE SLIME SPILL IMPACT,
University of South Florida, Tampa. Dept. of Chemistry.
D. F. Martin, and Y. S. Kim.
Water Research, Vol. 11, No. 11, p 963-970, 1977. 2 fig, 3 tab, 30 ref.

Descriptors: *Florida, *Phosphates, *Water quality, *Phosphorus compounds, *Water pollution sources, *Chemical analysis, Chemical wastes, Analytical techniques, Fertilizers, Phosphorus, Red tide, Fish toxins, Slime, Water analysis, Nutrients, Iron, Molybdenum, Pollutant identification, *Phosphate slime spill, *Peace River(Fla), Orthophosphates.

Selected stations on the Peace River, Florida, were sampled following a spill of phosphate slime (3,800,000L) into the river in 1972. Selected chemical analyses were repeated in 1974 to determine the long-term effect of the phosphate slime spill. Constituent fluxes were calculated (kg constituent/s) for each station, and percent deviations from calculated values for successive stations also were calculated. Short-term effects of the spill were identified, and diffferences in the significant correlations also appeared. Deviations from calculated values were associated with dilution in 1972 for phosphorus, iron, and molybdnum; in 1974, the dilution effect seemed evident only for phosphorus. The implications in terms of the phosphate slime spill and the effect on red tide blooms near the mouth of the river were considered. (Henley-ISWS)
W78-04850

MEASUREMENTS OF THE SUMMER CURRENTS IN SAGINAW BAY, MICHIGAN,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W78-04851

DEVELOPMENT OF MODELS FOR PREDICTION OF SHORT-TERM FATE OF DREDGED MATERIAL DISCHARGED IN THE ESTUARINE ENVIRONMENT,
Tetra Tech, Inc., Pasadena, CA.
M. G. Brandsma, and D. J. Divoky.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 131, Price codes: A13 in paper copy, A01 in microfiche. Final Report to U.S. Army Waterways Experiment Station, Vicksburg, Mississippi. Contract Report D-76-5, May 1976. 28 fig, 4 tab, 35 ref, 5 append. DACW39-74-C-0075.

Descriptors: *Model studies, *Dredging, *Forecasting, Estuaries, Estuarine environment, Disposal, Velocity, Numerical analysis, Fluid mechanics, Solid wastes, *Dredged material, Particles.

The study provided definitive information on the environmental aspects of dredging and dredged material disposal operations and for predicting the short-term fate of dredged material discharged in the estuarine environment. Two numerical models were developed; one for the instantaneous dumped discharge, and one for fixed or moving jet discharge. The models accounted for land boundaries, depth variations in the estuary, ambient current variations in three dimensions and in time, and variations of ambient density profiles in time. The models were capable of tracking up to 12 classes of solid particles plus the fluid fraction of a discharge through convective descent, dynamic collapse, and passive diffusion phases. Although the models were quite complex, the input data requirements for most cases were simple and allowed the first-time user to run a simple case in a few hours. The model underwent limited testing, and the results produced were reasonable. In cases involving complex ambient velocities, the models were extremely dependent on good quality velocity data. (Roberts-ISWS)
W78-04854

EFFECTS OF ABANDONED LEAD AND ZINC MINES AND TAILINGS PILES ON WATER QUALITY IN THE JOPLIN AREA, MISSOURI,
Geological Survey, Rolla, MO. Water Resources Div.
J. H. Barks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 392

Descriptors: *Mine drainage, *Path of pollutants, *Zinc, *Lead, *Cadmium, *Missouri, Mine wastes, Heavy metals, Water quality, Sampling, Groundwater, Streams, Water pollution sources, *Joplin aarea(MO).

Dissolved zinc concentrations in the Joplin area, Mo., averaged 9,400 micrograms per liter in water from abandoned lead and zinc mines, some of which discharge at the surface. Contamination of the shallow aquifer (cherty limestones) by the highly mineralized mine water is limited to the immediate mining area. The quality of water in the deep aquifer (cherty dolomites and sandstone) is generally excellent. Dissolved zinc concentrations averaged 16,000 micrograms per liter in runoff from tailings areas. However, during a summer storm, runoff from a 7-acre tailings area contained maximum dissolved zinc, lead, and cadmium concentrations of 200,000; 400; and 1,400 micrograms per liter, respectively. Mine-water discharges increase dissolved zinc concentrations in receiving streams from a background of about 40 to about 500 micrograms per liter during periods of low flow. The higher concentrations are sustained during high flow by runoff from the tailings areas. Deposition of tailings on stream bottoms increases zinc concentrations in bottom material from a background of about 100 to about 2,500 micrograms per gram and increases lead concentrations in bottom material from about 20 to about 450 micrograms per gram. (Woodard-USGS)
W78-04865

EFFECTS OF ABANDONED LEAD AND ZINC MINES AND TAILINGS PILES ON WATER QUALITY IN THE JOPLIN AREA, MISSOURI,
Geological Survey, Rolla, MO. Water Resources Div.
J. H. Barks.
Paper presented at the 1977 SME Fall Meeting and Exhibit, held in St. Louis, Missouri, October 19-21, 1977. Society of Mining Engineers of AIME, No 77-AG-308, Salt Lake City, Utah, 1977. 18 p, 10 fig, 1 tab, 2 ref.

Descriptors: *Mine drainage, *Path of pollutants, *Zinc, *Lead, *Cadmium, *Missouri, Mine wastes, Heavy metals, Water quality, Sampling, Groundwater, Streams, Water pollution sources, *Joplin area(Mo).

Dissolved zinc concentrations in the Joplin area, Mo., averaged 9,400 micrograms per liter in water from abandoned lead and zinc mines, some of which discharge at the surface. Contamination of the shallow aquifer (cherty limestones) by the highly mineralized mine water is limited to the immediate mining area. The quality of water in the deep aquifer (cherty dolomites and sandstone) is generally excellent. Dissolved zinc concentrations averaged 16,000 micrograms per liter in runoff from tailings areas. However, during a summer storm, runoff from a 7-acre tailings area contained maximum dissolved zinc, lead, and cadmium concentrations of 200,000; 400; and 1,400 micrograms per liter, respectively. Mine-water discharges increase dissolved zinc concentrations in receiving streams from a background of about 40 to about 500 micrograms per liter during periods of low flow. The higher concentrations are sustained during high flow by runoff from the tailings areas. Deposition of tailings on stream bottoms increases zinc concentrations in bottom material from a background of about 100 to about 2,500 micrograms per gram and increases lead concentrations in bottom matrerial about 20 to about 450 micrograms per gram. (Woodard-USGS)
W78-04866

FACTORS AFFECTING MICRODISTRIBUTION OF STREAM BENTHIC INSECTS,
Idaho State Univ., Pocatello. Dept. of Biology.
C. F. Rabeni, and G. W. Minshall.
Oikos, Vol. 29, 1977. p 33-43. 5 tab, 6 fig, 36 ref.

Descriptors: *Aquatic insects, Aquatic drift, *Sediment, Aquatic populations, Biological communities, *Benthos, Benthic fauna, Distributions, Detritus, Currents, Methodology, *Productivity, Dissolved oxygen, *Microdistribution, *Substrates, *Riffles, *Current velocity.

The microdistribution of stream insects in relation to current velocity, substratum particle size, silt, and detritus was studied in field experiments utilizing substratum-filled trays. 31% more organisms occurred in trays placed in a riffle than in those placed in a pool. In both riffle and pool the amount of colonization for most taxa was least on the smallest substratum sizes studied (0.5-0.7 cm diam.), was greater on the 1.0-2.0 cm size, reached a maximum on the 2.5-3.5 cm size, and was markedly reduced on the largest substratum size (4.5-7.0 cm). The reduction of current velocity alone accounted for reductions in the numbers of four and five species, while the addition of a light coating of silt significantly reduced the numbers of only three species. The substratum-detritus interaction was the overriding influence on insect microdistribution under conditions of this study and current velocity and a light deposition of silt play only secondary roles. A general model was formulated to show the interaction of biotic and abiotic factors which influence the microdistribution of stream insects. (Katz)
W78-04881

WATER POLLUTION STUDIES ON LAKE ILLAWARRA, I. SALINITY VARIATIONS AND ESTIMATION OF RESIDENCE TIME,
Wollongong Univ. (Australia). Dept. of Chemistry.
J. Ellis, S. Kanamori, and P. G. Laird.
Australia Journal of Marine and Freshwater Research, Vol. 28, 1977, p 467-477. 1 tab, 2 fig, 19 ref.

Descriptors: *Salinity, *Lakes, Lagoons, Lake basins, Monitoring, On-site-investigations, Rainfall, Rainfall-runoff relationship, *Tidal marshes, Tidal effects, Tidal waters, Coastal structure, *Chlorides, Thermal water, *Water temperature, *Australia, *Flushing time, *Lake Illawarra, *Saline coastal lagoons, New South Wales.

Surface and bottom water salinities of Lake Illawarra, a saline coastal lagoon, were determined at 10 monitoring stations over a 2-year period. Mean salinity is controlled primarily by rainfall and varied from 12.8 to 31.3o/oo during the monitoring period. The rate of flushing of Lake Illawarra by tidal action and by freshwater entry was estimated from salinity variations and by mathematical modelling; for dry periods a flushing time (for reduction of a factor of e) of about 60 days was calculated for a conservative substance introduced into the lake. Mean tidal volume was 1% of the lake volume. Vertical mixing by wave action is complete within 2-4 weeks. Although the major creeks are on the western side of the lake, no significant east-west salinity gradient was found. Lake Illawarra is charcterized by the small ratio of catchment to lake area and the short distance from the very elevated watershed to the lake shores, resulting in rapid response to rainfall. The volume of direct precipitation was estimated to be comparable with creek input. (See also W78-04883 and W78-04884) (Katz)
W78-04882

WATER POLLUTION STUDIES ON LAKE ILLAWARRA, II. THERMAL BEHAVIOUR,
Wollongon Univ. (Australia). Dept. of Chemistry.
J. Ellis, and S. Kanamori.
Australian Journal of Marine and Freshwater Research, Vol. 28, 1977. p 479-484. 1 tab, 3 fig, 8 ref.

Descriptors: *Salinity, *Lakes, *Lagoons, On-site-investigations, Tidal water, Thermal variation, Water temperature, Monitoring, Methodology, Sea water, *Thermal power plant, *Thermal pollution, *Thermal stratification, Air temperature, Water pollution effects, *Australia, *Powerplants, Thermal pollution, *Lake Illawarra, New South Wales, *Vertical temperature gradients, Temperature variations.

Temperature variations in surface and bottom water at 10 monitoring stations in Lake Illawarra were determined over the period of 28 January 1972 to 31 May 1974. Except for the bay near Tallawarra Power Station, no permanent vertical temperature gradients were found. A statistically significant correlation was found between water temperature and distance from the power station, but no such relationship could be established for tidal heat flow either alone or acting together with the thermal discharge from the power station. Mean water temperature for Lake Illawarra fluctuated in the range 11.6-25.6C, compared with 15.7-24.0C for the sea adjacent to Wollongong Harbour. Seasonal maxima and minima in lake water temperature occur 3 weeks earlier than those of the sea. (See also W78-04882 and W78-04884) (Katz)
W78-04883

WATER POLLUTION STUDIES ON LAKE ILLAWARRA, III. DISTRIBUTION OF HEAVY METALS IN SEDIMENTS,
Wollongong Univ. (Australia). Dept. of Chemistry.
J. Ellis, and S. Kanamori.
Australian Journal of Marine and Freshwater Research, Vol. 28, 1977, p 485-496. 4 tab, 6 fig, 72 ref.

Descriptors: Metals, *Copper, *Zinc, *Cadmium, *Lead, Sediments, Water pollution effects, Path of pollutants, Australia, *Industrial wastes, Commercial fish, Shrimp, Sediment distribution, Sediment transport, *Heavy metals, *Lake Illawarra, *Heavy metal vertical profiles, Steel mills, Copper smelting.

Samples of recent sediments from 18 sites in Lake Illawarra showed marked enrichment of copper, zinc, cadmium, and lead. The highest concentrations were found in Griffins Bay in the north-east corner of the lake, which is closest to the Port Kemble industrial complex. Maximum enrichments for copper, zinc, and lead are respectively 4, 34, and 11 times the background concentrations found in deep cores. By comparison of vertical profiles of heavy metal concentration with historical data on the growth of metal smelting industries in the Illawarra region, the recent sedimentation rate has been estimated as 2.5-3 mm/year. A depth of 40-50 cm below the surface of the sediment marks the beginning of human influence on the lake. (See also W78-04882 and W78-04883) (Katz)
W78-04884

THE COMMON MUSSEL MYTILUS EDULIS AS AN INDICATOR OF TRACE METALS IN SCANDINAVIAN WATERS. I. ZINC AND CADMIUM,
Uppsala Univ. (Sweden). Inst. of Zoology.
For primary bibliographic entry see Field 5A.
W78-04890

CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH-DENSITY CATFISH CULTURES,
Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.
R. J. Ruane, T-Y. J. Chu, and V. E. Vandergriff.
Water Research, Vol 11, p 789-800, 1977. 8 fig, 6 tab, 18 ref.

Descriptors: *Temperature, *Heated water, *Waste water(Pollution), Population, Wastes, *Catfishes, *Productivity, Water quality, Laboratory tests, Growth rates, Nitrogen compounds, Biomass, Sedimentation rates, Biochemical oxygen demand, Aquiculture, Chemical oxygen demand, Nutrients, Ammonia nitrates, Nitrites, Coliforms, Nitrogen compounds, Thermal pollution.

Warm condenser cooling water that was discharged from a steam-electric power plant was used to achieve optimum temperature levels for high-density production of catfish. The heated water extended the catfish growing season, enhanced growth rates and increased production poundage. Characteristics of the wastewater from the high-density warm water culture (90 to 160 g of fish per liter of water and average water temperature of 28.2C) were evaluated including evaluation of settleable solids, suspended solids, biochemical oxygen demand, chemical oxygen demand, total and soluble phosphates, ammonia nitrogen, organic nitrogen, nitrate, and nitrite nitrogen, and fecal coliform bacteria for hourly and daily variations and for the effects of feeding on waste production. Unit waste loads were computed and compared to limits promulgated by the U.S. Environmental Protection Agency. A pilot-scale sedimentation basin was evaluated for reducing settleable solids, suspended solids, chemical oxygen demand, and phosphates. Difficulties in reducing fecal coliforms were discussed. (Klein)
W78-04898

55FE IN PACIFIC OCEAN PLANKTON,
Oregon Coll. of Education, Monmouth.
C. D. Jennings.
Marine Biology, Vol. 44, 1977. p 223-226. 2 fig, 14 ref.

Descriptors: *Iron, *Metals, Pacific Ocean, Zooplankton, Plankton, *Radioactivity, *Radioecology, *Radioactive wastes, Monitoring, Path of pollutants, Copepods, Laboratory analysis, Nuclear tests, Mururoa Atoll.

The specific activity of 55Fe in plankton increased from below detectable limits at 20 deg N to a maximum of 130 nCi/g Fe at 20 deg S and then decreased to 5 nCi/g Fe at 50 deg S. Along an east-west track near 15 deg S a peak of 90 nCi/g Fe occurred at 135 deg W. It is suggested that this maximum is the result of fallout from French nuclear tests at Mururoa Atoll (22 deg S; 139 deg W). The increase in 55Fe at high latitudes observed in previous studies in the North Atlantic Ocean and North Pacific Ocean did not occur in the South Pacific Ocean which supports the suggestion that belts of high tropospheric fallout accounted for the increase in the Northern oceans. (Katz)
W78-04903

ON THE DISTRIBUTION OF PARTICULATE METALS, CHLOROPHYLL AND SESTON IN THE BALTIC SEA,
Biologische Anstalt Helgoland (West Germany).
H. P. Weigel.
Marine Biology, Vol. 44, 1977, p 217-222. 3 tab, 3 fig, 29 ref.

Descriptors: *Copper, *Iron, *Zinc, *Cadmium, *Lead, *Metals, *Phytoplankton, Chlorophyll, *Primary productivity, Water quality, Laboratory tests, Seston, Salinity, Carbon, Carbon cycle, Path of pollutants, *Baltic Sea, Particulate matter, *Particulate metals, Photic layer, Hydrography.

During the end of the phytoplankton spring bloom, about 100 water samples were taken at 23 stations in the Baltic Sea. The samples were analyzed for particulate Cu, Fe, Zn, Cd, and Pb by atomic absorption as well as for chlorophyll and seston. Two different water masses could be differentiated and these were separated by the halocline. The concentrations of particulate metals are in accordance with those published by other authors. No significant differences could be calculated between mean values of particulate metal concentrations in the two water bodies. Correlations between particulate metal concentrations and chlorophyll, seston, phytoplankton carbon and cell-count were calculated for both photic layer and deeper waters. Significant correlations were found only in the photic layer. The importance of standing crop for metal accumulation in seston is discussed. (Katz)
W78-04904

THE PERSISTENCE OF CHRONICALLY ACCUMULATED HYDROCARBONS IN THE HARD SHELL CLAM MERCENARIA MERCENARIA,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W78-04905

ZINC AND CADMIUM IN THE PACIFIC HAKE MERLUCCIUS PRODUCTUS OFF THE WESTERN U.S. COAST,
Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5C.
W78-04907

ORGANOCHLORINE RESIDUES IN FISH AND FISHERY PRODUCTS FROM THE NORTHWEST ATLANTIC,
Fisheries and Marine Service, Halifax (Nova Scotia).
G. G. Sims, J. R. Campbell, F. Zemlyak, and J. M. Graham.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 6, p. 697-705, 1977. 1 fig, 7 tab, 6 ref.

Descriptors: *Polychlorinated biphenyls, *DDT, Fish physiology, *Animal metabolism, *Pesticide residues, *Crustaceans, *Chlorinated hydrocarbon pesticides, *Lipids, *Dieldrin, *Commercial fish, *Commercial shellfish, Gas chromatography, Water pollution, Canada, *Bluefin tuna, Northwest Atlantic Ocean.

The residues of PCBs and DDT metabolities were determined in fish, including many commercially important species, collected off the Atlantic Coast of Canada during 1971 and 1972. The results of analyses of 261 samples representing 29 species of crustacea, bivalves and finfish, indicated widespread distribution of these contaminants and preferential accumulation in lipid rich specimens. On all the species examined, only the bluefin tuna contained residues consistently greater than 1 microgram/gram (3-4 micrograms/gram). (Katz)
W78-04916

ORGANIC COMPOUNDS IN AN INDUSTRIAL WASTEWATER: A CASE STUDY OF THEIR ENVIRONMENTAL IMPACT,
Massachusetts Inst. of Tech. Cambridge. Dept. of Chemical Engineering.
G. A. Jungclaus, V. Lopez-Avila, and R. A. Hites.
Environmental Science and Technology, Vol 12, No 1, p 88-96, 1978. 5 fig, 2 tab, 21 ref.

Descriptors: *Organic compounds, *Degradation, Volatility, *Sediments, *Phenols, *Industrial wastes, *Industrial water, *Herbicides, *Ethers, Gas chromatography, Mass spectrometry, Water pollution effects, Water pollution sources, Public health, Animal populations, Environmental effects.

The wastewater and receiving waters and sediments from a specialty chemicals manufacturing plant were extensively analyzed for organic compounds. The composition of the river water reflected the composition of the wastewater except that some of the compounds appeared to degrade or volatilize in the river. The long-term, low-level exposure to this wide variety of chemicals may have contributed to the lack of biota in this part of the river. (Katz)
W78-04918

NITROGEN CYCLING IN A MARINE PLANKTONIC FOOD CHAIN: NITROGEN FLUXES THROUGH THE PRINCIPAL COMPONENTS AND THE EFFECTS OF ADDING COPPER,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5C.
W78-04921

URBAN RUNOFF QUALITY IN NORTHERN GUAM,
Guam Univ., Agana. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W78-04944

THE EFFECTS OF SECONDARILY TREATED SEWAGE EFFLUENT ON THE WILLIMANTIC/SHETUCKET RIVER,
Connecticut Univ., Storrs. Biological Sciences Group
For primary bibliographic entry see Field 5C.
W78-04945

ERTS-1 DETECTION OF ACID MINE DRAINAGE SOURCES,
Ambionics Inc., Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04957

SATELLITE STUDIES OF TURBIDITY, WASTE DISPOSAL PLUMES AND POLLUTION-CONCENTRATING WATER BOUNDARIES,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5A.
W78-04959

PROJECT DEVELOPMENT AND TECHNICAL DEVELOPMENT PLAN. NEW YORK BIGHT PROJECT.
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 5G.
W78-04969

SURFACE CURRENTS OF THE NORTHEAST CHUKCHI SEA,
Bureau of Land Management, Groton, CT.
G. L. Hufford, B. D. Thompson, and L. D. Farmer.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 14. Transport, p 10-38, March 1977. 13 fig, 1 tab, 11 ref, append.

Descriptors: *Ocean currents, *Ocean circulation, *Baseline studies, *Water pollution, Oil pollution, Pollutants, Resources development, Alaska, *Outer Continental Shelf, *Chukchi Sea, Surface currents, Pollutant transport.

During August 1976, a detailed study of the surface currents of the northern Chukchi Sea and western Beaufort Sea coasts was attempted from helicopters from the icebreaker USCGC GLACIER. The objective of this report is to describe the surface circulation during open water. The investigation was conducted primarily in the region between Icy Cape and Point Barrow and seaward to the pack ice edge. A chart of this study area is shown. Analysis of the surface currents inside the 18m depth contour taken in August 1976, in the Chuckchi Sea show a southerly flow under the influence of the prevailing easterly-northeasterly winds and that this flow is reversed with little observable time lag when the wind is from the southwest or west. The statistical correlation between wind and water movement gives a means for predicting the rate of movement of pollutants released into this arctic coastal environment. The importance of this southerly flow is that if oil moving offshore or in a spill were to occur offshore, oil could become entrained into the current and be carried south rather than north as the surface currents closer to shore might suggest. (Sinha - OEIS)
W78-04975

CURRENT MEASUREMENT IN POSSIBLE DISPERSAL REGIONS OF THE BEAUFORT SEA,
Washington Univ., Seattle. Dept. of Oceanography; and Washington Univ., Seattle. Applied Physics Lab.
K. Aagaard, and D. Haugen.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 14. Transport, p 39-95, March 1977. 48 fig. 03-5-022-67.

Descriptors: *Ocean currents, *Dispersion, *Baseline studies, *Pollutants, Sea ice, Alaska, Resources development, *Outer Continental Shelf, *Beaufort Sea, Current measurements, Tidal currents, Pollutant transport.

The objective of this work is to obtain long-term Eulerian time series of currents at selected locations on the shelf and slope of the Beaufort Sea. Such measurements are necessary to describe and understand the circulation on the shelf and the exchange between the shelf and the deep Artic Ocean. At lease in late winter the currents on the inner shelf appear to be slow. Long-term mean currents are extremely small. The two measurements made north of Norwhal Island showed these small displacements to have been west southwest. On the outer shelf an entirely different situation prevails. Measurements made at 100 m under the ice from May-September showed the flow to reach over 55 cm sec-1, and even over a 3 month period the mean flow was 13 cm sec-1 toward the east. The most remarkable feature observed was the dominance of the motion by low-frequency variations with a typical time scale of 10 days. These oscillations represent bursts of speed as high as 50 cm sec-1 or more; they are directed eastward and are aligned approximately with the shelf edge. The implication of these measurements with respect to the transport and dispersal of pollutants on the Beaufort shelf is that the ice-covered inner and outer shelf represent very different advective regimes. Over the former, currents are weak and net displacements are small. However, over the outer shelf there are strong currents and pollutants can be transported very long distances. (Sinha - OEIS)
W78-04976

EFFECTS OF SEASONABILITY AND VARIABILITY OF STREAMFLOW ON NEARSHORE COASTAL AREAS,
Alaska Univ., Inst. of Water Resources.
For primary bibliographic entry see Field 4A.
W78-04977

GULF OF ALASKA STUDY OF MESOSCALE OCEANOGRAPHIC PROCESSES (GAS-MOP),
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
S. P. Hayes, and J. D. Schumacher.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 14. Transport, p 251-328, March 1977. 29 fig, 3 tab, 13 ref.

Descriptors: *Ocean circulation, *Baseline studies, *Advection, *Diffusion, Resources development Alaska, Oil pollution, *Outer Continental Shelf, Pollutant transport, Mesoscale circulation, Gulf of Alaska, Petroleum development.

The objective of this research was to describe the mesoscale oceanic circulation on the continental shelf in the Gulf of Alaska in order to characterize the intermediate scale advective and diffusive processes. These processes are inherently important to the assessment of potential pollution problems due to OCS development. From the data collected and analyzed to date, several preliminary conclusions can be drawn: (1) the shelf break flow is dominated by the Alaskan current system; (2) this system varies in intensity and structure as it proceeds from Yakutat to Unimak Pass; (3) in the Northeast Gulf of Alaska over half of the nontidal variance of the current occurs with time scales of less than a week; (4) the oceanic response to the wind changes character from the midshelf region where it is consistent with Ekman setup to the inner shelf region where direct windstau setup becomes more important; (5) near the Copper River the mean flow is low and complex; (6) near Kodiak Island the shelf break flow is intense; however, on the shelf itself the flow is weak and tidally dominant; and (7) throughout the Gulf of Alaska a seasonal trend is clear with higher velocities occurring in winter. (Sinha - OEIS)
W78-04978

NUMERICAL STUDIES OF ALASKAN REGION,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
J. A. Galt, J. E. Overland, C. S. Smyth, Y. J. Han, and C. H. Pease.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 14. Transport, p 329-406, March 1977. 31 fig, 5 ref.

Descriptors: *Baseline studies, *Ocean currents, *Models, *Oil spills, *Water pollution, Alaska, Computers, Resources development, Meteorology, *Outer Continental Shelf, Pollutant transport, Puget Sound(WA).

A synopsis of modeling efforts in support of OCSEAP work around Alaska is presented. Included are program development for an advanced spill model for use anywhere along the Alaskan coast, diagnostic model studies of ocean surface currents around Kodiak, advection trajectory model studies in the Gulf of Alaska, a coastal marine meteorology model applied along the southeast Alaskan coast, a study of the circulation of the Bering Sea, and a report on the status of computer hardware and software in support of the modeling efforts. The basic framework of the advanced oil spill model has been completed. Documentation the form of a programmers and users manual is being written describing the special features of the overall model and the available algorithms. (Sinha - OEIS)
W78-04979

BRISTOL BAY OCEANOGRAPHIC PROCESSES (B-BOP),
National Oceanic and Atmospheric Administration, Boulder, CO. Pacific Marine Environmental Lab.
J. D. Schumacher, and R. L. Charnell.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 14. Transport, p 407-472, March 1977. 15 fig, 1 tab, 4 ref, 3 append.

Descriptors: *Ocean circulation, *Baseline studies, *Advection, *Diffusion, Resources development, Alaska, Resources development, *Outer Continental Shelf, Bristol Bay, Pollutant transport.

Beginning in autumn 1975, investigations were begun in Bristol Bay to relate oceanic advective and diffusive processes to potential pollution problems due to OCS development. Two specific goals were to describe the general water circulation in the study area for both summer and winter regimes; and to determine the spatial and temporal variability of the velocity field and obtain indications of spatial coherence. The Bering Shelf is oceanic in nature, and the Central Shelf water is highly stratified and bounded on the shoreward perimeter by a structure front separating it from a well-mixed coastal water. Current meter records can be characterized as dominantly tidal with low net flow. The net flows, however, confirm the counterclockwise flow around the shoreward perimeter of the Bay and the northwest flow along the slope. Winter circulation is poorly resolved; however, current reversals and phase differences in low-frequency periodicity are suggested. Heat budget analyses have been preliminarily examined and bottom-mounted pressure gage and atmospheric data have been collected. (Sinha - OEIS)
W78-04980

STD MEASUREMENTS IN POSSIBLE DISPOERSAL REGIONS OF THE BEAUFORT SEA,
Washington Univ., Seattle. Dept. of Oceanography.
K. Aagaard.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 14. Transport, p 473-507, March 1977. 21 fig, append. 03-5-022-67.

Descriptors: *Baseline studies, *Ocean circulation, *Dispersion, *Advection, Resources development, Alaska, Pollutants, Oil pollution, *Outer Continental Shelf, Pollutant transport, Season variations, Beaufort Sea.

Through a series of CTD sections across the Beaufort Sea shelf the seasonal hydrographic sequence from fall to spring in one year, and from fall to winter the next, have been traced. Not only are there large seasonal changes in he hydrography, but conditions are also different from one year to the next. The Beaufort Sea shelf is certainly not neutral with respect to the Arctic Ocean to the north. Rather there are one or more forms of interaction, in which water and the substances it transports are exchanged between the shelf and the offshore regions. The most dramatic evidence of exchange is the series of four sections from fall 1976, in which an intense subsurface current core appears to be sweeping up the slope and onto the shelf, flooding at least one section to the innermost station with dense, saline water. The general thrust of this work is toward understanding the diffusive and advective processes which transport and disperse pollutants and substances of biological and geological importance. (Sinha-OEIS)
W78-04981

YUKON DELTA COASTAL PROCESSES STUDY,
Houston Univ., Houston, TX. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W78-04982

LAGRANGIAN SURFACE CURRENT MEASUREMENTS ON THE OUTER CONTINENTAL SHELF,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorological Labs.
D. V. Hansen.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 14. Transport, p 554-573, March 1977. 7 fig.

Descriptors: *Baseline studies, *Resources development, *Ocean currents, *Oil spills, Alaska, *Outer Continental Shelf, Pollutant transport, Gulf of Alaska, Bering Sea, Lagrangian measurements.

The objectives of this work are to obtain Lagrangian current data for assessment of probable trajectories of oil spills in the Gulf of Alaska and the S.E. Bering Sea using drogued free drifting buoys located several times daily by a satellite positioning system. During the 1976 field season nine buoys were deployed in the Gulf of Alaska, primarily off Yakutat, and three were deployed in the S.E. Bering Sea. Results show that at least during summer conditions, materials released on the surface between Yakutat and Kayak Island will move generaly westward at typical speeds of 10 miles/day or less. There is a pronounced tendency for movement inshore across the shelf, rather like the seasonal transport of pelagic organisms across the shelf in Sprin, and for involvement of surface materials in an eddy west of Kayak Island, off the Copper River. The high percentage of buoys that have gone ashore on the approaches to or inside of Prince William Sound suggest these likely impingement points for oil spilled on the surface over any part of te OCS as far away as Yakutat. Oil from the more distanc points is likely to be well weathered before reaching the Prince William Sound area. (Sinha-OEIS)
W78-04983

STUDY OF CLIMATIC EFFECTS ON FAST ICE EXTENT AND ITS SEASONAL DECAY ALONG THE BEAUFORT-CHUKCHI COASTS,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
R. G. Barry.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 14. Transport, p 574-743, March 1977. 10 fig, 15 ref, 5 append.

Descriptors: *Baseline studies, *Resources development, *Sea ice, Climate, Hazards, Oil spills, Alaska, *Outer Continental Shelf, *Fast-ice, Pollutant transport, Ice break-up, Beaufort Sea, Chukchi Sea.

The most significant hazard to petroleum development along the Beaufort Sea coast is posed by the occurrence of sea ice. A 'calendar' of the fast-ice regime on the Beaufort Sea coast provides a tentative framework for seasonal scheduling of operations in the nearshore zone. Hazards to petroleum development are identified within the fast-ice zone. These include: the occurrence of grounded ice masses within the 20m isobath, as a result of winter extension of the fast-ice edge; shear and pressure ridge features exerting significant forces on structures or bottom gouging will tend to occur further seaward in late winter; grounded ice ridges are discontinuous along the coast and therefore may not contain under-ice oil spills located within the fast-ice zone. The period of stable fast-ice inside about the 15m isobath extends approximately from February to early May. (Sinha-OEIS)
W78-04984

MECHANICS OF ORIGIN OF PRESSURE RIDGES, SHEAR RIDGES AND HUMMOCK FIELDS IN LANDFAST ICE,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W78-04985

CIRCULATION AND WATER MASSES IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W78-04991

MODELING OF TIDES AND CIRCULATIONS OF THE BERING SEA,
Rand Corp., Santa Monica, CA.
For primary bibliographic entry see Field 2L.
W78-04996

COASTAL METEOROLOGY OF THE ALASKAN ARCTIC COAST,
Washington Univ., Seattle. Polar Research Center.
For primary bibliographic entry see Field 2B.
W78-04997

NORTON SOUND/CHUKCHI SEA OCEANOGRAPHIC PROCESSES (N-COP),
Washington Univ., Seattle. Dept. of Oceanography; and National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 2L.
W78-04998

ALTERATIONS OF TERRACE DEPOSITS AND BEACHES OF THE COLORADO RIVER IN GRAND CANYON,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2J.
W78-05004

DETERMINATION OF NITRATE BY ANION EXCHANGE WITH ULTRAVIOLET DETECTION,
Iowa State Univ., Ames. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-05011

SOLUTION, DIFFUSION AND SORPTION IN THE UPPER LAYER OF LAKE SEDIMENTS: V. THE DIFFERENTIATION OF THE PROFUNDAL SEDIMENTS OF AN OLIGOTROPHIC MOUNTAIN LAKE (FELDSEE,

HOCHSCHWARZWALD) BY SEDIMENT WATER INTERACTION, (IN GERMAN),
Freiburg Univ. (West Germany). Limnologisches Inst.
U. Tessenow.
Arch Hydrobiol Supplement B 47(3), p 325-412, 1975.

Descriptors: *Sediment-water interface, *Lake sediments, Oligotrophy, Lakes, *Diffusion, Sorption, Iron, Manganese, Phosphates, *Feldsee(West Germany), *Oxidation-reduction potential.

The redox and concentration conditions at the sediment water interface of the lake investigates (in West Germany) lead to a strong differentiation of the Fe, Mn and phosphate contents in the sediments according to lake depth. A loss of mobile compounds from the upper anerobic region occurs with subsequent accumulation in the very deepest anaerobic region and in the lower part of the aerobic region. The results of this is a migration of relatively mobile Fe, Mn and P compounds from the sediment region around the maximum depth into the sediments of maximum depth and the sediments of the aerobic/anerobic transition zone. This migration causes a partial separation of Fe, Mn, P. There is also permanent migration of Fe(II)-and phosphate ions by diffusion from the deeper sediment layers into the surface layer of the sediment. (See also W75-03571)--Copyright 1975, Biological Abstracts, Inc.
W78-05015

LAND USE CHANGE DETECTION WITH LANDSAT-2 DATA FOR MONITORING AND PREDICTING REGIONAL WATER QUALITY DEGRADATION,
Arkansas Univ., Fayetteville. Dept. of Geology.
H. MacDonald, K. Steele, W. Waite, R. Rice, and M. Shinn.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-10091, Price codes: A10 in paper copy, A01 in microfiche. Final Report, January, 1977, 207 p, 80 fig, 17 tab, 67 ref, 1 append. NAS 5-20810.

Descriptors: *Satellites, *Remote sensing, *Water analysis, *Land use, *Water quality, *Mapping, *Water pollution sources, Surface waters, Surface runoff, Pollutant identifications, Data collections, Monitoring, Sampling, Analytical techniques, Sampling, Hydrologic data, Hydrology, Storm runoff, *Arkansas, *Nonpoint source pollution, *LANDSAT.

A research program was conducted to compare gross water quality data with gross changes in land use and to investigate the feasibility of using LANDSAT-derived land use mapping for monitoring and predicting regional degradation of water quality. The tested hypothesis was that the quality of surface water at any given point within a watershed might be an indicator of land use above that point. Comparison between LANDSAT-1 and -2 imagery provided evidence of significant land use changes in Arkansas during 1972-75; historical water quality data were not available in areas of maximum change. Water quality sampling programs were conducted concurrently with the LANDSAT investigation. Point source pollution has been throughly monitored by analysis of water quality data. Nonpoint pollution sources are great in number and have rarely been cited as major pollution sources. Most nonpoint pollution results from surface runoff. The highly variable nature of surface runoff is affected by land use, rainfall intensity and duration, and antecendent conditions. A comprehensive water analysis program requires monitoring of point and nonpoint source pollution, surface runoff and land use. Stormwater runoff quality analyses are essential at stream segments where land usage indicates a significant impact. LANDSAT imagery data are essential to the monitoring of water quality; the updating of LANDSAT-derived land use maps provides a technique for defining, monitoring and predicting changes in regional water quality. (Seip-IPA)
W78-05018

LINE SOURCE DISPERSION WITH APPLICATION TO MIXING IN RIVER CHANNELS,
Clarkson Coll. of Technology, Potsdam, NY. Dept. of Civil and Environmental Engineering.
H. T. Shen.
Water Resources Bulletin, Vol. 14, No. 1, p 35-45, February 1978. 4 fig, 22 ref.

Descriptors: *Dispersion, *Solutes, *Rivers, *Model studies, Mathematical models, Water pollution, Channels, Mixing, Waste dilution, Uniform flow, Flow, Channel flow, *Path of pollutants, Hydraulics, Lime sources, Nonconservative solutes.

Two-dimensional solutions for transient dispersion of nonconservative dispersants in uniform flow resulting from a transverse line source of variable concentration were obtained using multiple integral transformations. In general, the solutions were in integral forms, which can be evaluated efficiently using Filon's quadratures. Examples were presented for cases of practical interest. Applicability of the solution for modeling dispersion in natural river channel where the distribution of flows across the channel is nonuniform was discussed. (Sims-ISWS)
W78-05021

PSEUDO-LAGRANGIAN DISPERSION ESTIMATES FROM CURRENT METERS,
Ontario Ministry of the Environment, Toronto. Water Resources Branch.
For primary bibliographic entry see Field 2H.
W78-05040

THERMAL WEDGING IN LAKE MACATAWA, MICHIGAN: LONG-TERM IMPACT OF CHANNELIZATION,
Rice Univ., Houston, TX. Dept. of Geology.
For primary bibliographic entry see Field 2H.
W78-05041

DETERMINATION OF TRANSPORT MODEL PARAMETERS IN GROUNDWATER AQUIFERS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soil and Water Engineering.
V. V. N. Murty, and V. H. Scott.
Water Resources Research, Vol. 13, No. 6, p 941-947, December 1977. 1 fig, 5 tab, 20 ref.

Descriptors: *Dispersion, *Groundwater, *Aquifers, *Mathematical models, Equations, Solutes, Aquifer characteristics, Groundwater movement, Mass transfer, Optimization, Digital computers, Transport model, Inverse problem, Concentration polynomials.

The hydrodynamic dispersion coefficients in groundwater aquifers can be determined from observed values of solute concentrations. For a two-dimensional aquifer in which the concentrations of a solute are known, an algorithm was developed to determine the values of longitudinal and transverse dispersivities. Concentration polynomials were developed by using double interpolation for a set of selected values of longitudinal and transverse dispersivities. With two of the polynomials, Newton's method was used to find the roots which are the values of the longitudinal dispersivity and the ratio of longitudinal dispersivities to transverse dispersivities. With more than two polynomials, an optimization approach was used in arriving at the values of longitudinal dispersivities and transverse dispersivities. The methods converged to the true values for a good initial estimate of the values. (Visocky-ISWS)
W78-05043

RAPID CITY COMBATS THE EFFECTS OF URBAN RUNOFF ON SURFACE WATER,
Environmental Protection Agency, Pierre, SD.
S. M. Pirner, and L. L. Harms
Water and Sewage Works, Vol. 125, No. 2, p 48-53, February 1978. 11 fig, 2 tab, 15 ref.

Descriptors: *Urban runoff, *South Dakota, *Water quality, *Surface waters, Data collections, Water pollution sources, On-site investigations, On-site data collections, Chemical oxygen demand, Phosphorus, Suspended solids, Specific conductance, Water pollution, Pollutants, Cities, Watersheds(Basins), *Rapid City(SD), Total suspended solids, Volatile suspended solids

The primary basin selected for this study is referred to as the Meade Street drainage basin and is located in the southeast portion of Rapid City, South Dakota, which has a population of 43,836 according to 1970 census. The total contributing area of the watershed was 2.70 sq miles, which comprises about 20% of the total city land area. Approximately 70% of the basin has been developed, and consists primarily of middle-class, single-family dwellings, together with the usual scattering of multiple-family units, light industry, shopping markets, and roadside services. Impervious surfaces such as paved streets, driveways, parking lots, and rooftops cover about 19% of the total land surface of the basin. Upper reaches of the watershed remain as grasslands and evergreen forests. The study indicated that runoff contributed gross quantities of sediment to the watershed, and that treatment should focus primarily on solids removal. However, it was cautioned that a substantial portion of the sediment contained in the runoff samples appeared as colloidal particles that will not be removed by simple clarification. (Humphreys-ISWS)
W78-05044

BENTHIC INVERTEBRATES AS WATER QUALITY INDICATORS IN THE PENOBSCOT RIVER, MAINE,
Maine Univ. at Orono. Dept. of Entomology.
For primary bibliographic entry see Field 5A.
W78-05053

NON-POINT WATER QUALITY MODELING IN WILDLAND MANAGEMENT: A STATE-OF-THE-ART ASSESSMENT VOL. II: APPENDIXES.
Forest Service (USDA), Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 949, Price codes: A25 in paper copy, A01 in microfiche. Report to Environmental Protection Agency, Athens, Georgia. Report No. EPA-600/3-77-078, 1977. 568 p. 1HB617, EPA-IAG-D5-0660.

Descriptors: *Forecasting, *Water pollution sources, *Watershed management, Hydrologic cycle, Sediments, Pollutants, Model studies, Water quality control, *Wildlands, *Non-point pollution.

Vol. 2 (appendixes) contains the model evaluation forms and watershed inventories compiled as the basis for the conchisions reached and presented in Volume 1 relating wildland management activities with an inventory of monitored watersheds having data suitable for model development and testing. A summary references the models by number and predictive category. (See also W78-03417) (Wares-IPA)
W78-05055

RESUSPENSION OF PLUTONIUM FROM CONTAMINATED LAND SURFACES: METEOROLOGICAL FACTORS,
Environmental Monitoring and Support Lab., Las Vegas, NV. Office of Research and Development.
P. N. Lem, J. V. Behar, and F. N. Buck.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 645, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/4-77-037, July 1977. 28 p, 2 fig, 2 tab, 122 ref.

Descriptors: *Soil erosion, *Soil analysis, *Soil contamination, Radioactivity, Radioactive wastes, Dusts, Wind erosion, Particle size, Meteorology, Mathematical models, Bibliographies, Reviews, Water pollution sources, *Plutonium, Resuspension process, Transport modeling, Particle dispersion.

A literature review is presented in a discussion of the relevance of meteorological factors on the resuspension of plutonium from contaminated land surfaces. The physical processes of resuspension based on wind erosion work are dependent on air-related factors such as velocity, turbulence, density, and viscosity; on ground features such as specific gravity and moisture; on the soils roughness, cover, obstructions, temperature, and topography; on meteorological factors of wind velocity distribution and moisture content; on surface properties of roughness, area of erodible surface, vegetative cover, and cohesiveness of individual particles; and on particle properties of size/frequency distribution, density, and shape. Some of the models developed to simulate the resuspension of materials for predicting airborne concentrations of plutonium are reviewed, and the significance of some of the parameters used in the different models is discussed. The interplay of meterological factors measured, discussed, or implied in the literature is discussed; however, a satisfactory mathematical formulation of the resuspension process has not yet been devised. (Wares-IPA)
W78-05056

MERCURY DISPERSAL FROM LODE SOURCES IN THE KUSKOKWIM RIVER DRAINAGE, ALASKA,
Geological Survey, Menlo Park, CA.
H. Nelson, B. R. Larsen, E. A. Jenne, and D. H. Sorg.
Science, Vol. 198, No. 4319, November 1977, p 820-824, 2 fig, 1 tab, 18 ref.

Descriptors: *Water pollution sources, *Path of pollutants, *Mercury, Rivers, Alaska, Sediments, River systems, Drainage systems, *Kuskokwin River(Alas).

Mercury content of the Kuskokwim River is due to cinnabar particles in bottom sediments near mineralized areas. Cinnabar-rich sediment disperses the greatest distance in the finest size fraction, extending farther downstream in tributaries than in the main river. Mining activity appears to artificially increase the dispersal distance. On the basis of the average Hg content measured and discharge estimates at the river mouth, it was calculated that a total of 16,700 kg of Hg/year enters the marine environment from the Kuskokwim River. Of this total Hg content, 80% is transported by water, 19% within suspended sediments, and 1% within bed load sediment. (Chilton-ORNL)
W78-05060

LEAD CONCENTRATIONS IN ALGAE AND PLANTS GROWN OVER LEAD CONTAMINATED SEDIMENTS TAKEN FROM SNOW DUMPS IN OTTAWA, CANADA,
Ottawa Univ. (Ontario). Dept. of Chemistry.
J. B. Milne, and M. Dickman.
Journal of Environmental Science and Health, Environmental Science and Engineering, Vol. A12, Nos. 4 and 5, 1977, p 173-189, 2 fig, 3 tab, 18 ref.

Descriptors: Environmental effects, Pollution, *Lead, Algae, Food chains, Snow, Solubility, Canada, *Air pollution effects, Path of pollutants, *Automobile exhaust(Lead emission).

Results of the investigation indicated that algae and Vallisneria americanum grown over sediments contaminated by lead principally from car exhaust, concentrated lead to a significant degree. It was concluded that this lead was transported from the sediment as soluble lead rather than as fine sediment carried by convection currents in the water. It was also concluded that crustaceans, molluscs and fish feeding on these algae are likely to ingest appreciable amounts of lead. (Chilton-ORNL)
W78-05071

HEAVY METALS FROM WASTE DISPOSAL IN CENTRAL PUGET SOUND,
Washington Univ., Seattle. Lab. of Radiation Ecology.
W. R. Schell, and A. Nevissi.
Environmental Science and Techn., Vol 11, No 9, September 1977, p 887-893, 5 fig, 3 tab, 25 ref.

Descriptors: *Heavy metals, Environmental effects, *Water pollution sources, *Waste disposal, Sewage disposal, Waste treatment, Heavy elements, Metals, Lead, Cadmium, Zinc, Mercury, Copper, Nickel, Sediments, Seawater, *Puget Sound(Wash), Biota, Washington.

The results of the measurement of heavy metals in Central Puget Sound waters show that effluent from the West Point sewage outfall does not greatly increase the existing concentrations of the heavy metals measured in the water column and in the biota. Concentrations of Pb and Cd in Central Puget Sound were higher than the average open seawater values while concentrations of the other heavy metals were at or below the open seawater values. The enrichment of heavy metals in sediment layers was determined from the values obtained at the surface when compared with those values obtained from layers which were over 50 years old. Total input of Cu, Pb, and Zn from all sources into Puget Sound is greater than the input from the sewage treatment plant. (Chilton-ORNL)
W78-05073

ENVIRONMENTAL CHEMISTRY OF COPPER IN TORCH LAKE, MICHIGAN,
Texas Univ. at Dallas, Richardson. Center for Environmental Studies.
J. M. Lopez, and G. F. Lee.
Water, Air, and Soil Pollution, Vol. 8, No. 4, October 1977, p 373-385, 7 fig, 4 tab, 12 ref.

Descriptors: Environmental effects, *Water pollution sources, Lakes, *Copper, Sediments, Chemistry, Deposition(Sediments), Suspensions, Solubility, Aqueous solutions, Fish, Algae, Toxicity, *Torch Lake(Mich), Michigan, Lakes, Tailings deposits(Lakes).

Potentially mineable amounts of Cu, contained in tailings deposits and sediments of Torch Lake, are widespread throughout Keweenaw Peninsula. Leaching tests demonstrated that sediments and shore Cu tailings deposits can release potentially significant amounts of Cu when suspended in lake water. Up to 100 microg/l of apparently dissolved Cu were found in the waters at a time of reported spills of cupric ammonium carbonate but relatively high Cu concentrations were found in the lake all year round. Higher Cu concentration values were found in waters which had been affected by Cu mine tailings discharges than in those which had not. Reports of fish and algal populations suggested the occurrence of Cu in a relatively nontoxic form, probably due to the fact that Cu appears to be controlled by hydrous oxides of Fe and Mn and not by solubility relationships of Cu compounds. Sorption onto the surfaces of these minerals could result in reduced toxicity of Cu. (Chilton-ORNL)
W78-05081

ECOLOGY OF A NEW ENGLAND SALT MARSH,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5C.
W78-05093

AN OUTDOOR MODEL SIMULATING A BALTIC SEA LITTORAL ECOSYSTEM,
Swedish Water and Air Pollution Research Lab. Stockholm.
For primary bibliographic entry see Field 5C.
W78-05096

WATER QUALITY EVALUATION OF A LOWER POOL ELEVATION FOR PROPOSED ARCADIA LAKE, OKLAHOMA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
K. W. Thornton, D. E. Ford, R. W. Hall, R. L. Eley, and D. L. Robey.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 003, Price codes: A04 in paper copy, A01 in microfiche. Technical Report Y-77-3, May 1977. 50 p, 28 fig, 1 tab, 5 ref.

Descriptors: *Arcadia Lake(OK), *Reservoirs, *Water quality, *Simulation analysis, *Model studies, *Elevation, Oklahoma, Lakes, Mathematical models, Algae, Eutrophication, Stratification, Winds, Coliforms, Dissolved oxygen, Multiple-purpose reservoirs, Flood control, Alternative planning, Water supply, Recreation, WORRS model.

To supplement an earlier report evaluating water quality of the proposed Arcadia Lake reservoir on the Deep Fork River near Arcadia, Oklahoma at a pool elevation of 311 m, this report considers a pool elevation of 305 m. The lower elevation would improve dissolved oxygen conditions, but somewhat worsen algal blooms. All projected uses of the reservoir (flood control, municipal and industrial water supply, and general recreation) would be satisfied by lake water quality at the 305-m elevation, as predicted by an improved version of the Water Quality for River-Reservoir Systems model (WORRS). The model was calibrated with meteorological data, and streamflow, physical, chemical, and biological data for 1970 and 1973 in the upper Deep Fork River. Simulation runs indicated that: (1) thermal stratification would be intermittent during the summer; (2) release temperatures may be about 7C warmer than natural downstream temperatures during the summer and early fall; (3) dissolved oxygen generally will be greater than 5 mg/l, with some anoxic periods during intermittent stratification; (4) based on aesthetic criteria, manganese will violate drinking water standards most of the time and iron occasionally in the headwaters of the impoundment; (5) state fecal coliform bacteria standards generally will be met except in headwaters and after storms; and (6) two or three major algal blooms can be expected each year. (Lynch-Wisconsin)
W78-05107

AQUATIC FIELD SURVEYS AT IOWA, RADFORD, AND JOLIET ARMY AMMUNITION PLANTS, VOLUME III - MICROBIOLOGICAL INVESTIGATIONS, IOWA AND JOLIET ARMY AMMUNITIONS PLANTS,
Environmental Control Technology Corp., Ann Arbor, MI.
For primary bibliographic entry see Field 5A.
W78-05114

CHEMICAL DEGRADATION OF MILITARY STANDARD FORMULATIONS OF ORGANOPHOSPHATE AND CARBAMATE PESTICIDES I. CHEMICAL HYDROLYSIS OF DIAZINON,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, MD.

E. P. Meier, M. C. Warner, W. H. Dennis, Jr., W. F. Randall, and T. A. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 051, Price codes: A03 in paper copy, A01 in microfiche. Technical Report 7611, November 1976. 31 p, 11 fig, 5 tab, 10 ref.

Descriptors: *Degradation(Decomposition), *Diazinon, *Pesticides, *Hydrolysis, *Organophosphorus pesticides, *Waste disposal, Acids, Bioassay, Daphnia, Fish, Sunfishes, Rainbow trout, Toxicity, Lethal limit, Pesticide residues, Chemcontrol, Insecticides, Water pollution control.

A study of degradation and disposal methods for the organophosphate pesticide diazinon concludes that strong acid (HCl) hydrolysis degrades diazinon at an acceptable rate, but that before adoption residual toxicity must be reduced or eliminated. Diazinon, which was widespread military and civilian use as an insecticide, generates wastes in three forms: as unserviceable surplus, as excess finished formulation, and as contaminated empty containers. Three currently-used military standard formulations were studied: (1) 47.5% emulsifiable concentrate, (2) 2% dust, and (3) 0.5% oil solution. Degradation methods investigated were strong acid and strong base hydrolysis. Aquatic bioassays, with daphnia, bluegills, and rainbow trout were performed on the final reaction mixtures to determine the reduction in toxicity resulting from chemical treatment. The Department of the Army set the following standards for acceptable methods: (1) low cost and simplicity, with a minimum of reagents and equipment; (2) a reaction time of < 1 week and preferably < 1 day; (3) active ingredient concentration and formulation toxicity reduction by at least 99.9%--an EC50 or LC50 is acceptable; (4) disposal of reaction products in an environmentally acceptable manner. The principal organic product of strong acid hydrolysis was found to be 4-methyl-6isopropyl-2-pyrimidinol, and the principal phosphorus compound was assumed to be diethyl thiophosphoric acid; neither is toxic to aquatic species. (Lynch-Wisconsin)
W78-05120

PERSISTENCE OF AZINPHOSMETHYL IN SOIL,
Environmental Protection Agency, Wenatchee, WA. Field Studies Section.
D. C. Staiff, S. W. Comer, J. F. Armstrong, and H. R. Wolfe.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 265, Price codes: A02 in paper copy, A01 in microfiche. Bulletin of Environmental Contamination and Toxicology, Vol. 13, No. 3, p 362-368, 1975. 4 tab, 6 ref.

Descriptors: *Azinphosmethyl, *Soil contamination, *Pesticide residues, *Persistence, *Hazards, *Toxicity, Pesticides, Soils, Organophosphorus pesticides, Insecticides, Environmental effects, Parathion.

Eight years of tests with azinphosmethyl show that when a high concentration of this organophosphorus pesticide is present as a result of spillage on soil, it may persist for a long time. As azinphosmethyl is orally as toxic as parathion, spillage hazards should be considered equal, especially regarding children and animals. Four years after contamination with undiluted 18.1% liquid emulsifiable concentrate of azinphosmethyl, the 7662 ppm reported at 2.5-7.5 cm was comparable to the near-fatal parathion ingestion at 8634 ppm by a child. Initial soil levels reported for the 18.1% concentration applied to sandy loam (and exposed to normal weathering were very high (25,000-70,944 ppm at the 0-2.5 cm level), but by the end of the first year levels decreased to 33-50% of the original levels. Thereafter the rate of disappearance slowed; by the end of the third year average levels at the two depths were 5218 and 5240 ppm. From the fourth to the eighth years levels at the lower depth were consistently higher than in the top layer, and after eight years levels were 967 and 850 ppm. In tests of leaching, concentrations dropped off rapidly during the first year, with relatively small amounts found thereafter. Emphasis should be given to digging up contaminated soil areas and disposing of the material where it will not be a hazard to small children, animals, or the general environment. (Lynch-Wisconsin)
W78-05121

LIMNOLOGICAL AND FISHERIES SURVEY OF THE UPPER SKUNK RIVER, IOWA,
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
J. R. Jones, D. M. Coon, and R. W. Bachmann.
Iowa State J Res. 48(3), p 255-266, 1974.

Descriptors: Carp, Chlorophyll, Fisheries, *Iowa, Limnological studies, Nutrients, Planktonic, River, Surveys, Water quality, Upper Skunk River(Iowa), Sewage effluents, Water pollution.

In 1970, water-quality data and fish samples were collected from stations along a 50-km reach of the Skunk River near Ames, Iowa. High levels of plant nutrients and planktonic chlorophylls were found. Treated sewage effluents introduced at Story City and Ames produced measureable changes in several chemical parameters. Fewer fish species were found than had been reported in 1892. Present distributions were correlated with the geological structure of the stream channel. The greatest diversity of fish species was upstream from Ames, where the bedrock is close to the surface, forming a heterogeneous streambed of pools and riffles. In the southern part of this reach a low-diversity ichthyofauna dominated by carp was found in a more homogenous substrate of shifting sand. These geological factors seemed more important in determining fish distributions along the river than did the observed water-quality differences.--Copyright 1974, Biological Abstracts, Inc.
W78-05124

TRANSFORMATION OF S35-LABELLED SULPHATE IN AEROBIC AND FLOODED SOIL CONDITIONS,
Indian Agricultural Research Inst., New Delhi. Nuclear Research Lab.
For primary bibliographic entry see Field 2G.
W78-05152

5C. Effects Of Pollution

EFFECTS OF PHYTOPLANKTON ON DISSOLVED OXYGEN CONCENTRATION IN CATFISH PONDS,
Auburn Univ., AL. Water Resources Research Inst.
C. E. Boyd, E. Johnston, C. S. Tucker, R. Romaire, and J. Davis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 184, Price codes: A03 in paper copy, A01 in microfiche. WRRI Bulletin 30, November 1977. 35 p, 11 fig, 9 tab, 19 ref. OWRT A-0420-ALA(3).

Descriptors: Algae, *Fishkills, Simulation analysis, *Catfish ponds, *Dissolved oxygen, Phytoplankton, *Cyanophyta, Water pollution effects, Fisheries, *Computer models, Model studies, Alabama, Die-offs(Fish), Water pollution control, Potassium permanganate, Pollution abatement.

Dense populations of blue-green algae frequently develop in fish ponds at Auburn, Alabama, during windy weather in March and early April. Massive die-offs of the algae can be expected when surface scums form durig prolonged periods of calm, clear, warm weather between mid April and mid May. Dissolved oxygen concentrations decline following die-offs, and fish kills may occasionally result unless emergency aeration is employed. A computer simulation model for nighttime decline in dissolved oxygen concentrations was developed for channel catfish ponds. The application of potassium permanganate to waters with critically low concentrations of dissolved oxygen did not improve conditions for fish survival. In fact, potassium permanganate should not be applied to ponds with oxygen depletion problems because it kills algae and increases the organic matter available for microbial decomposition. Treatment of channel catfish production ponds with three periodic applications of simazine totaling 1.3 mg/liter drastically reduced phytoplankton density. However, extended periods of low dissolved oxygen concentrations following simazine applications resulted in decreased fish yields as compared to control ponds.
W78-04710

EFFECTS OF DESTRATIFICATION ON DEPTH DISTRIBUTION OF FISH,
Oklahoma Cooperative Fishery Research Unit., Stillwater.
G. E. Gebhart, and R. C. Summerfelt.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 102, No EE6, p 1215-1228, December 1976. 6 fig, 2 tab, 40 ref. OWRT A048-OKLA(3).

Descriptors: *Dissolved oxygen, *Fish, *Distribution patterns, *Fish behavior, *Oklahoma, *Stratification, Distribution, Fish conservation, Water temperature, Summer, Freshwater, Effects, Water quality, Reservoirs, Lake of the Arbuckles(Okla).

Observations in Lake of the Arbuckles, Oklahoma, in 1973-1975 have indicated that depth distributions of gizzard shad, white crappie, freshwater drum, and black bullhead were markedly affected by conditions of stratification. During stratification, the distribution of all species except the bullhead was limited largely to oxygenated water above the hypolimnion. Fish depth distribution increased substantially after the fall overturn. Operation of an axial flow pump in the summers of 1974-1975 appeared to cause turnover one month earlier than shown for 1973 and for the data collected by others for 1969-1970. (Bell-Cornell)
W78-04713

DISTRIBUTION AND ABUNDANCE OF BENTHIC ALGAE ALONG PHOSPHATE GRADIENTS IN KOOTENAY LAKES, BRITISH COLUMBIA,
For primary bibliographic entry see Field 5B.
W78-04737

LIGHT-SATURATED PHOTOSYNTHESIS BY PHYTOPLANKTON SIZE FRACTIONS IN THE NEW YORK BIGHT, USA,
Lamont-Doherty Geological Observatory, Palisades, NY.
T. C. Malone.
Marine Biology, Vol 42, No 4, p 281-292, 1977. 11 fig, 4 tab, 49 ref. NOAA 03-4-043-310 and 04-5-022-22.

Descriptors: *New York Bight(NY), *Phytoplankton, *Photosynthesis, *Carbon assimilation, *Eutrophication, New York, Hudson River, Algae, Net plankton, Nannoplankton, Water temperature, Indicators.

The response of phytoplankton size fractions to environmental changes was studied in the lower Hudson Estuary and apex of the New York Bight using data gathered for 1975-76 summer and winter phytoplankton blooms. Cell size and chain length,

which influence residence time in the euphotic zone, are important factors in phytoplankton population dynamics and trophic interactions. Copepods favor large cells for grazing, and cell size is also related to suspension in stratified media and distribution in convection cells and upwelling systems. Net plankton blooms were found to occur in late winter (February), and nannoplankton blooms in summer (June). Water temperatures were 2-8C and 18-24C, respectively. Nannoplankton and net plankton assimilation numbers were higher during bloom periods than during transition periods of rapid temperature change (8-18C). Differences in assimilation numbers between size fractions could account for summer nannoplankton dominance, but not winter net plankton dominance. Assimilation numbers were exponential functions of temperature between 8-24C for nannoplankton, and 8-20C for net plankton. Below 8C, net plankton assimilation numbers declined with temperature. Assimilation numbers were occasionally correlated with dissolved inorganic nitrogen. (Lynch-Wisconsin)
W78-04738

PHYTOPLANKTON IN LAKE HJALMAREN,
Uppsala Univ. (Sweden). Inst. of Ecological Botany.
E. Willen.
Abstracts of Uppsala Disserations from the Faculty of Sciences, No 378, ISBN 91-554-0412-X, 1976. 4 fig, 2 tab, 7 ref.

Descriptors: *Phytoplankton, *Lake Hjalmaren(Sweden), *Eutrophication, *Trophic levels, Water pollution, Sewage disposal, Sewage treatment, Lakes, Sweden, Oligotrophy, Mesotrophy, Phosphorus, Nutrients, Algae, Indicators, Nitrogen.

Phytoplankton investigations from 1966-73 in Lake Hjalmaren, a shallow eutrophic lake in a fertile agricultural district near Orebro, Sweden, showed 350 taxa. Cyanophyta, diatoms, and Chlorophyta were richest in species. Of the lake's four basins--Hemfjarden, Mellanfjarden, Storhjalmaren, and Ostra Hjalmaren--Hemfjarden had a higher species diversity (4.13 calculated from Shannon's formula) than Storhjalmaren (2.34), in spite of the fact that the former is more highly polluted than the latter. It appears that the heavy pollution is offset by water circulation, which provides a constant nutrient supply and prevents Cyanophyta shading. Phytoplankton biomass and nutrient concentrations were higher in Hemfjarden-Storhjalmaren than in Storhjarden):10 (Mellanfjarden):3 (Storghalmaren):1(Ostra Hjalmaren). Chlorophyll-a concentration-total phytoplankton volume showed a moderately strong correltion (r=0.71-0.79). Phytoplankton chlorophyll-a content varied from 0.7% in Storhjalmaren-Ostra Hjalmaren to 1.4% in Hemfjarden. Annual primary production was 420 g C/sq m in Hemfjarden, 320 in Mellanfjarden, 170 in Storhjalmaren, and 75 in Ostra Hjalmaren. Comparison with earlier studies showed a decrease of desmids, indicating increased eutrophication. The largest pollution source is biologically treated sewage from Orebro; phosphorus removal was begun in 1975. Data for Lakes Vattern (oligotrophic), Vanern (oligo-mesotrophic), Hjalmaren (ertrophic), and Malaren (eutrophic) indicated nitrogen loadings of 1.3, 2.9, 4.2, and 11.2 g/sq m, and phosphorus loadings of 0.07, 0.17, 0.25, and 0.74 g/sq m. (Lynch-Wisconsin)
W78-04739

ORTHOPHOSPHATE CONCENTRATION AND FLUX WITHIN THE EPILIMNIA OF TWO CANADIAN SHIELD LAKES,
S. Levine.
Verh. Internat. Verein. Limnol., Vol 19, p 624-629, October 1975. 5 fig, 12 ref.

Descriptors: *Orthophosphate, *Nutrient flux, *Phosphorus, *Rigler bioassay method, Canadian Shield, Canada, Phosphates, Epilimnion, Lakes, Nutrients, Eutrophication, Algae, Ontario(Canada), Bioassay, Experimental Lakes Area(Ontario Canada), Analytical techniques.

The Rigler bioassay method was used to estimate orthophosphate concentrations in Experimental Lakes 227 and 302 South in northwestern Ontario, Canada. Orthophosphate is believed to be the form of phosphorus most readily available to algae; of the two available means of estimating its concentration, the Rigler bioassay is more sensitive than the Lean method. Lake 227 received .024 g of phosphorus as H3P04 and .31 g of nitrogen as NaN03 per sq m per week during the summers of 1973-74. For phosphorus this was 20 times the natural load. The south basin of Lake 302 was unfertilized. Integrated eqilimnetic samples were analyzed for total dissolved phosphorus and suspended phosphorus, and water temperature was measured. Orthophosphate-phosphorus concentrations were very low during summer stagnation, and maximum estimated concentrations in both lakes centered around .015 micrograms/l; during dense algal blooms in Lake 227 the concentration dropped below .001 micrograms/l. With fall turnover concentrations increased, but high concentrations (.2-2.3 micrograms/l) did not develop until late winter when algal biomass declined to minimum values. Total dissolved phosphorus remained fairly constant in both lakes throughout the year, averaging 5 micrograms/l in Lake 302 South and 8 micrograms/l in Lake 227. Almost all Millipore filtrate phosphorus was colloidal. Suspended phosphorus varied roughly in proportion to algal biomass and chlorophyll-a changes. (Lynch-Wisconsin)
W78-04740

THE SALINE LAKES OF SASKATCHEWAN,
For primary bibliographic entry see Field 2H.
W78-04741

PRIMARY PRODUCTIVITY AND PHYTOPLANKTON OF LAKES ON THE EASTERN CANADIAN SHIELD,
M. L. Ostrofsky, and H. C. Duthie.
Verhandlungen, Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Vol 19, p 732-738, October 1975. 3 fig, 2 tab, 12 ref.

Descriptors: *Primary productivity, *Phytoplankton, *Lakes, *Canadian Shield, Alakalinity, Conductivity, Bogs, Photosynthesis, Heterotrophy, Quebec(Canada), Labrador Peninsula(Canada), Acidic water, Depth, Color.

Eight Canadian Shield lakes on the Quebec-Labrador peninsula were studied for phytoplankton and primary productivity. Lakes Atilla, Yasinki, Sakami, and Bereziuk are located in the James Bay drainage, and Lakes Atikonak, Lobstick, Michikamau, and Gabbro drain into the Atlantic Ocean. The lakes were all low in alkalinity (pH range of 6.1-6.6), conductivity (16.3-32.7 micromhos/cm), and dissolved nutirent salts, but were colored to varying degrees because of bog influence. Phytoplankton biomass was largely comprised of Chrysophyceae and Bacillariophyceae. The most numerous species in all lakes were the Chrysophyceae Dinobryon divergens and D. bavaricum, and the diatoms Tabellaria fenestrata and Asterionella formosa. Except of Lake Michikamau, the Labrador lakes, shallower and with dendritic shorelines merging with bogs, had more epilithic and terraqueous phytoplankton. Maximum biomass ranged from 51-536 mg/cu m. Typical carbon assimulation-depth curves had distinct maxima at 0.5-1.0 m (4.73-8.22 mg C/cu m/hr), with rates rapidly decreasing with increased depth. Michikanau Lake, with very transparent water, was the only exception, having no distinct maximum. Maximum rates, similar in all lakes, reflected similar dissolved nutrient concentrations. Michikanau Lake's maximum was only 2.16 mg C/cu m/hr. Area production rates varied from 46-267 mg C/sq m/hr. Heterotrophic productivity may be equal to or greater than photosynthetic production in some lakes. (Lynch-Wisconsin)
W78-04743

WATER QUALITY EFFECTS OF POTENTIAL URBAN BEST MANAGEMENT PRACTICES: A LITERATURE REVIEW,
Wisconsin Dept. of Natural Resources, Madison. Bureau of Water Quality.
For primary bibliographic entry see Field 5G.
W78-04744

SUMMARY REPORT 1975: FOOD PROTECTION AND TOXICOLOGY CENTER, UNIVERSITY OF CALIFORNIA, DAVIS.
California Univ., Davis. Food protection and Toxicology Center.
(1975). 86 p, 2 fig, 10 tab, 55 ref. NSF BMS 74-21783 A01 and BMS 75-22756 EPA 68-01-2254.

Descriptors: *Toxins, *Environmental effects, *Water pollution, *Air pollution, *Soil contamination, *Pesticide residues, *Agricultural chemicals, Toxicity, Foods, California, Ecosystems, Pesticides, Parathion, Chlorinated hydrocarbon pesticides, Chemicals, Pollutants, Biomagnification, Path of pollutants.

Since its founding in 1965, the Food Protection and Toxicology Center of the University of California, Davis, has concentrated on three aspects of environmental toxicology: (1) fate and effects of pesticides and other toxicants in the environment; (2) transport of toxicants through air, water, and soil; and (3) effects of agricultural chemicals on farm employee health. Water-related research reported here includes: (1) the environmental impact of chlorinated hydrocarbons project, covering escape of these chemicals from the soil into surface and ground water; and (2) the Monterey Basin pilot montoring project, a total environmental monitoring effort which includes surface, wastewater, and marine biota sampling. Other research projects summarized deal with the insecticides toxaphene and chlordane; detoxification of pesticides; effects of chlorinated hydrocarbons on birds and rodents; chemico-biological interacrtions in rhesus monkeys; organophosphate toxicity; mammalian metabolism of chlorinated hydrocarbons; uptake and excretion of hexchlorobenzene by growing lambs; competitive inhibition of nitrosamine formation; metabolism of aflatoxin B1; systems approach to pesticide contamination control in the San Joaquin Valley (mathematical simulation of ecosyste.. pesticide dynamics, pesticide chemical transformations in air, pesticide dissipation and persistence in soil); and parathion as a public health hazard. (Lynch-Wisconsin)
W78-04745

PHYTOPLANKTON IN SEVEN MONOMICTIC LAKES NEAR ROTORUA, NEW ZEALAND,
E. A. Flint.
New Zealand Journal of Botany, Vol 15, No 2, p 197-208, 1977. 1 fig, 3 tab, 48 ref, 1 append.

Descriptors: *Phytoplankton, *Trophic levels, *Rotorua(New Zealand), *Lakes, New Zealand, Eutrophication, Mesotrophy, Oligotrophy, Zooplankton, Water chemistry, Monomictic lakes, Indicators.

Trophic levels in seven monomictic lakes near Rotorua, New Zealand, were determined by means of phytoplankton samples collected in 1970-71. Results were compared with similar data from 1955-56. Based on phytoplankton species composition and abundance, the lakes were classified as: (1) eutrophic--Lakes Okara and Ngapouri, characterized by algal blooms; (2) mesotrophic--Lakes Rotokakahi and Okataina, where Analbaena spiroides was usually present but no blooms occur; and (3) oligotophic--Lakes Okareka, Rotoma, and

Tikitapu, in which Cyanophyta were rarely seen or absent. Lakes Okaro and Ngapouri are small and shallow, with catchment soils of high natural fertility; Lakes Okataina and Rotoma are large and deep, with low-fertility catchment soils; the remaining three lakes are intermediate in size and depth, with catchment soils of medium to low fertility. Trophic levels in Lakes Rotokakahi, Okataina, and Okareka classify differently if measured by zooplankton or water chemistry. In Lake Rotokakahi the predominance of large algal cells suggests slight eutrophication, whereas its zooplankton and benthic fauna are characteristic of oligotrophy; chemically it is mesotrophic. Lake Okataina is chemically oligotrophic, although its phytoplankton and zooplankton, benthic fauna, and water chemistry. (Lynch-Wisconsin)
W78-04749

STUDIES ON THE LORICA STRUCTURE IN CHRYSOPHYCEAE,
Copenhagen Univ. (Denmark). Inst. of Plant Anatomy and Cytology.
J. Kristiansen.
Svensk Botanisk Tidskrift, Vol 66, p 184-190, 1972. 4 fig, 24 ref.

Descriptors: *Chrysophyceae, *Lorica, *Algae, *Chrysophyta, Plant morphology, Microfibrils, Denmark, Ponds, Lakes, Electron microscopy, Dinobryon pediforme, Dinobryon suecicum, Stenocalyx klarnetii, Epipyxis utriculus, Bitrichia chodatii, Chrysophyxis bipes, Eutrophication.

Electron microscopy was used to study the morphology of the lorica of six species of Chrosophyceae: Dinobryon pediforme, D. Surcicum, Stenocalyx klarnetii, Epipyxis utriculus, Bitrichia chodatii, and Chrysophyxid bipes. Specimens obtained in Danish lakes and ponds were fixed in iodine (Lugol solution) and dried on carbon-coated grids. The lorica generally is composed of cellulose microfibrils. Very little is known of the mechanism of lorica construction or secretion of the cellulose microfibrils. A spiral lorica structure was evident for D. pediforme. As in other Dinobryon species, the microfibrils are depositited in loops, but are arranged in oblique rows, forming a helical construction. The undulating nature of the lorica walls may be related to a helix associated with dense zones of the microfibril loops. In D. Suecicum, the lorical has a prominent spiral ridge. Microgibrils are deposited in loops, but the orientation is turned almost 90 degrees. This structure may be regarded as a further development of that of D. pediforme, and is very similar to Stenocalyx; it is possible that this species belongs to Stenocalyx rather than Dinobryon, evidenced also by the lorica's brownish color and the method of sexual reproduction. Electron microscopy proved that the scales of Epipyxis utriculus are composed of distinct microfibrils and are not amorphous as was previously reported. Bitrichia chodatii has a three-part lorica. The lorica of Chrysopyxis bipes has a very characteristic shape. (Lynch-Wisconsin)
W78-04750

THE FINE STRUCTURE OF SOME PELAGIC FRESH WATER DIATOM SPECIES UNDER THE SCANNING ELECTRON MICROSCOPE. I,
Uppsala Univ. (Sweden). Dept. of Quaternary Geology.
For primary bibliographic entry see Field 2H.
W78-04751

FRESHWATER ALGAL VEGETATION IN THE AZORES,
Vaxtbiologiska Institutionen, Uppsala (Sweden).
C. Johansson.
Separata do Boletim da Sociedade Broteriana, Vol. 50, p 117-141, September 1976. 15 fig, 1 tab, 14 ref.

Descriptors: *Azores Islands, *Algae, *Islands, Portugal, Cyanophyta, Chromophyta, Chlorophyta, Chrysophyta, Dispersion, Biotopes, Data collections, Baseline studies, Freshwater.

Freshwater algae in the Azores were collected in the summer of 1975 on the islands of Terceira, S. Jorge, Pico, and Faial. Virtually all species are found in Europe, most with wide distribution. Sea birds are a very important means of algal dispersion, and man is becoming increasingly important. Aerial algae are the most important group of freshwater algae on the islands. Aerial algae are those that do not grow in water, or at least can grow for periods without being immersed in water. Eight biotopes were studied and the algal vegetation of each is described: (1) rock surfaces in craters (Santa Barbara, Pico das Calderinhas, Calderia); (2) streams (Ribeira do Cavalete, Caldeira); (3) fumaroles (Furnas do Enxofre); (4) cave walls (Serra do Topo area, Furna do Frei Matias); (5) ravine sides and bottoms (Pico das Calderinhas area, Pico do Areeiro area, Serra do Topo area); (6) epiphytic algae on vascular plants and bryophytes (Ribeira da Fonte, Pica de Areeiro area, Pico Volcano, Calderia); (7) lakes (Lagoa do Capitao, Caldeira); and (8) steep road sides (Pica das Caldeirinhas area). A checklist shows 45 taxa of Cyanophyta, 87 taxa of Chromophyta, and 24 taxa of Chlorophyta. The nine islands in the archipelago are all of volcanic origin. The climate is oceanic, with small variations in temperature, large amounts of precipitation, and high humidity. Mean annual temperature is 17.5C. (Lynch-Wisconsin)
W78-04752

ROTORUA PHYTOPLANKTON RECONSIDERED (NORTH ISLAND OF NEW ZEALAND),
Vaxtbiologiska Institutionen, Uppsala (Sweden).
K. Thomasson.
Internationale Revue der Gesamten Hydrobiologie, Vol. 59, No. 5, p 703-729, 1974. 5 fig, 2 tab, 66 ref.

Descriptors: *Rotorua(New Zealand), *Phytoplankton, *Desmids, *Algae, *Classification, New Zealand, *North Island(New Zealand), Lakes, Volcanoes, Monomictic lakes, Species composition, On-site data collections.

An extensive taxonomy of the phytoplankton of nine lakes in the Rotorua lake district on the North Island of New Zealand is based on a collection made in March 1968. The nine lakes studied were Okareka, Okataina, Rotoiti, Rotokawau, Rotoma, Rotomahana, Rotorua, Tarawera, Taupo, and Tikitapu. All of the lakes are warm, monomictic, softwater lakes, mostly volcanic in origin. At the time of sampling, surface temperatures were 20-22C and the thermocline was at 15-20 m. There is no period of winter stability. Altitude ranges from 279-416 m, area from 1.4-606.1 sq km, and maximum depth from 25-174 m. The phytoplankton of the lakes contains a large number of taxa, many of which are abundant; the composition of the plantonic communities is harmonic and well-balanced. Desmid flora are particularly varied and abundant. The rich occurrence of Staurastrum sexangulare, S. unicorne v. gracilis, and S. rosei is characteristic. Euastrum ad Micrasterias are surprinsingly rare. Cyanophyta are sparse, and such common plants as pediastrum and Scenedesmus are infrequent. Peridonium taxa with sculptured plates are common. The last volcanic eruption in the area was Tarawera in 1886; there is nothing about the plankton composition to indicate the violent character of such eruptions. The abundance of hot springs likewise does not seem to affect the planktonic population. Individual comments on selected taxa are included. (Lynch-Wisconsin)
W78-04753

CLOSTRIDIUM PERFRINGENS AND COLIFORM BACTERIA AS INDICATORS OF FAECAL POLLUTION,
Vattentest A. B., Uppsala (Sweden).
For primary bibliographic entry see Field 5A.
W78-04754

WATER QUALITY ASSESSMENT FOR THE PROPOSED RDX-HMX FACILITY, MCALESTER NAVAL AMMUNITION DEPOT, VOLUME I AND II.
Water and Air Research, Inc., Gainesville, FL.
For primary bibliographic entry see Field 5G.
W78-04755

EFFECTS OF CADMIUM, MERCURY, AND SILVER ON MARINE ANIMALS,
National Marine Fisheries Service, Milford, CT. Milford Lab.
A. Calabrese, F. P. Thurberg, and E. Gould.
Marine Fisheries Review, Vol. 37, No. 4, p 5-11, April 1977. 2 fig, 2 tab, 27 ref.

Descriptors: *Cadmium, *Mercury, *Silver, *Hazards, *Environmental effects, *Marine animals, Toxicity, Mullusks, Crustaceans, Fish, Long Island Sound(Milford CT), Adsorption, Sublethal effects, Estuarine environments.

Several species of fish, mollusks and crustaceans collected from Long Island Sound near Milford, Connecticut were exposed to cadmium, mercury and silver as a part of the study on mortality rates and physiological and biochemical changes caused by these heavy metals. Results of the experiments indicate that the order and degree of metal toxicity vary with salinity, metal salt form and life stage of the species. At early life stages the species were more sensitive to mercury and silver than cadmium. Mercury and silver were taken up very readily by tissues of juvenile and adult animals, while cadmium was taken up to a far lesser degree. The order of toxicity in adult animals was reversed from that observed in juvenile stages, with cadmium producing more severe effects than either mercury or silver, despite the much lower rate of cadmium uptake. Examination of tissues from metal-exposed crustaceans and finfish has revealed two basic effects of sublethal metal challenge. (1) Induction of enzymes that are either directly attacked or are involved in the mobilization of energy or participate in the production of metabolites for biosynthesis causes a chronic demand for metabolic energy. (2) The loss of ligand sensitivity interferes with the regulation of the enzyme reaction rates. Since the concentrations of heavy metal pollutants are greatest in the estuarine and inshore coastal waters, their effects represent a serious impairment to the recruitment of fish stock. (Harris-Wisconsin)
W78-04757

FACTORS AFFECTING THE STRUCTURE OF LIMNETIC CRUSTACEAN ZOOPLANKTON COMMUNITIES IN CENTRAL ONTARIO LAKES,
G. W. Sprules.
Verh. Internat. Verein. Limnol., Vol. 19, p 635-643, October 1975. 3 fig, 5 tab, 24 ref.

Descriptors: *Lakes, *Zooplankton, *Killarney Provincial Park(Ontario Canada), *Species diversity, *Hydrogen ion concentration, Ecology, Canada, Crustaceans, Mountains, Ecosystems, Air pollution effects, Water pollution effects, Regression analysis.

Evidence of a strong relationship between low levels of diversity of zooplankton and fish species and low pH levels was found in a study of 47 lakes in or near Killarney Provincial Park on the northeast shore of Georgian Bay (Ontario, Canada). Stepwise regression analysis of total zooplankton species on 28 physical and chemical variables indicated a positive association with pH,

which alone accounts for 53% of the variation in plankton species numbers, a positive association with lake length (18%), and a negative association with lake depth (7%). Addition of total fish species as an independent variable accounts for 80% of the variation in number of zooplankton species. This strong association may result from zooplankton and fish species numbers each being correlated with the same limnological variables. The lakes, situated in the La Cloche mountains, are noted for their exceptional clarity, low pH and TDS, and often impoverished fish and zooplankton faunas. Thirty-seven of the lakes have a pH below 6.0, resulting from airborne industrial pollutants. The total pH range is 3.8-7.0. Number of zooplankton species ranges from 1-16, while fish species vary from 0-17. Diaptomus minutus is the sole zooplankter in five lakes, and constitutes 77->90% of individuals in the other lakes. Low zooplankton diversities in low-pH lakes may result partly from the direct effect of low pH, and partly from increased interspecific competition associated with low fish species diversity. (Lynch-Wisconsin)
W78-04759

PRELIMINARY STUDIES ON THE KINETICS OF UTILIZATION OF ACETATE BY BACTERIOPLANKTON IN MIKOLAJSKIE LAKE,
Warsaw Univ. (Poland). Dept. of Environmental Microbiology.
S. Szymankowski.
Acta Microbiologica Polonica, Vol 25, No 4, p 345-352, 1976. 6 fig, 1 tab, 6 ref.

Descriptors: *Acetate, *Phytoplankton, *Mikolajskie Lake(Poland), *Adsorption, Tracers, Temperature, Oxygen requirements, Eutrophication, Depth, Kinetics.

The kinetics of utilization of acetate by bacterioplankton was measured at three sites on Mikolajskie Lake, Poland by using a modification of a substrate tracing method originally developed by Wright and Hobbie (1965, 1966). The highest rate of acetate utilization was observed in July. The longest acetate utilization time was found to occur in September in the Hypolimnion. Other months showed significant differences in utilization time, with July and August the only exceptions. The latter two months had identical utilization times. The kinetics of acetate utilization showed a decrease with drop of temperature and degree of oxygen saturation, though the former was not so strong as the combined effect of decreased temperature and oxygenation. In all cases the acetate utilization rate dropped with the increase in the water depth. Thus the utilization rate of acetate was generally the highest in the epilimnion and the lowest in hypolimnion. Isotopic techniques such as the one used in this study are used to determine the rate of uptake of dissolved organic matter by heterotrophic planktonic bacteria. (Harris-Wisconsin)
W78-04760

A HYPOTHESIS TO EXPLAIN THE SUCCESSION FROM CALANOIDS TO CLADOCERANS DURING EUTROPHICATION,
D. C. McNaught.
Verhandlungen, Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Vol 19, p 724-731, October 1975. 1 fig, 1 tab, 26 ref. EPA 800536.

Descriptors: *Calanoids, *Cladocerans, *Trophic levels, *Zooplankton, *Foods, *Speciation, Eutrophication, Oligotrophy, Mesotrophy, Crustaceans, Species composition, Succession, Lake Superior, Lake Ontario, Bosmina, Daphnia, Diaptomus, Copepods, Model studies, Bioindicators.

Crustacean zooplankton species composition, long regarded as a eutrophication indicator with larger species replacing smaller ones, is often explained in terms of size-selective predation. It is suggested in this paper that size of food is equal importance. Evolutionary responses to variable phytoplankton foods include: (1) evolution of generalists and specialists regarding selective algal grazing by zooplankton; (2) increased filtering capacity; (3) increased ingestion rate and efficiency; and (4) increased digestion efficiency. Responses to fish predation include: (1) small adult size at maturity; (2) evolution of biotic potential (r-selection organisms with high intrinsic birth rates (b sub max) or low death rates); and (3) reduced visibility, especially of larger adults. Examples from oligotrophic Lake Superior and mesotrophic lake Ontario are given to support these trends. Adaptation values yielded by a model predicted that the calanoid copepod Diaptomus, a nannoplankton specialist, would be successful in Lake Superior because of high ingestion rate at a low cell densities, and high ingestion efficiency at small cell sizes. Bosmina would not be successful due to low filtering capacity. In Lake Ontario the feeding generalist Bosmina was predicted successful because of ingestion efficiency on small and large cells alike, small size at maturity, and high intrinsic birth rate. Field data confirmed these predictions, but not those for Daphnia. (Lynch-Wisconsin)
W78-04761

THE DISTRIBUTION OF IRON IN A CLOSED ECOSYSTEM,
For primary bibliographic entry see Field 5B.
W78-04762

NUTRIENT KINETICS AND THE NEW TYPOLOGY,
F. H. Rigler.
Verhandlungen, Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Vol 19, p 197-210, October 1975. 2 fig, 44 ref.

Descriptors: *Nutrients, *Phosphorus, *Kinetics, *Classification, *Holism, *Reductionism, *Limnological theory, Typology, Cycling nutrients, History, Lakes, Limnology, Chlorophyll, Model studies, Theoretical analysis.

An analysis of two opposing limnological viewpoints--holistic and reductionistic--is followed by an evaluation of phosphorus kinetics studies. Holists deal with properties of the intact system, while reductionists study isolated components. Five schools of holists have arisen, and all still persist: (2) typology (c. 1910), a static, closed approach geared to constant lake properties; (2) correlation (c. 1925, which studies dynamic interactions between components; (3) experimental (c. 1940), in which one variable is artificially altered, and homeostasis and multiple interactions are emphasized; (4) kinetic (c. 1950), where nutrient cycling replaces the static approach; and (5) input-output (c. 1960), an open system stressing the importance of incoming nutrients, frequently using predictive models. Models assume a steady state and ignore complexities uncovered by the other schools, but provide a greatly simplified description of the lake. Holists and reductionists make diametrically opposed assumptions about the nature of lakes; holists differ among themselves primarily in selection of facts. The reductionist subdivides the whole into subsystems, which is valid only if there are no interactions among subsystems. Early experiments on phosphorus kinetics revealed inter- and intra-zonal fluxes; due to the complexity of the intact system, a shift toward reductionism occurred in the form of laboratory experiments with pure cultures. Recent work involving total phosphorus-chlorophyll correlation is proving more productive. (Lynch-Wisconsin)
W78-04763

EFFECT OF FUNGICIDE RATE, SPRAY INTERVAL; TIMING OF SPRAY APPLICATION, AND PRECIPITATION IN RELATION TO CONTROL OF PHYTOPHTHORA LEAF BLIGHT OF TARO,
Hawaii Univ., Honolulu. Dept. of Plant Pathology.
For primary bibliographic entry see Field 3C.
W78-04764

EXPERIMENTAL STUDIES ON THE STRESSING OF SUBMERGED FLOWING WATER MACROPHYTES, (IN GERMAN),
U. Glaenzer, W. Haber, and A. Kohler.
Arch Hydrobiol 79(2), p 193-232, 1977.

Descriptors: *Bioindicators, Chemicals, Submerged macrophytes, Water pollution effects, *Potamogeton coloratus, *Ranunculus fluitans.

Experiments were conducted in the laboratory and in the open air with submerged macrophytes exposed to different chemical influences. The individual reactions of the species were different. Potamogeton coloratus was seriously harmed while Ranunculus fluitans was nearly resistant. Other species reacted in an extremely sensitive manner to 1 chemical substance while not at all to others. Submerged macrophytes can apparently be used as indicators for the pollution of running water. Copyright 1978, Biological Abstracts, Inc.
W78-04765

LAKE EUTROPHICATION AND THE LIMITING CO2 CONCEPT: A SIMULATION STUDY,
J. R. Lehman, D. B. Botkin, and G. E. Likens.
Verhandlungen, Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Vol 19, p 300-307, October 1975. 6 fig, 1 tab, 17 ref.

Descriptors: *Eutrophication, *Lakes, *Carbon dioxide, *Limiting factors, *Simulation analysis, Phytoplankton, Model studies, Ontario(Canada), Seston, Nutrients, Carbon, Nitrogen, Phosphorus, Canada, Analytical techniques, Canadian Shield.

Simulation experiments for Experimental Lake 227 (northwestern Ontario), based on data given by Schindler (1971 b) were conducted, including a control run without artificial fertilization and a eutrophication run in which 10 micrograms PO4-P/l and 150 micrograms NO3-N/l were added weekly. A small chrysophyte was dominant at 10 million cells/l, and initial nutrient conditions were 2 micrograms PO4-P/l and 10 micrograms NO3-N/l in accordance with Schindler's findings. The simulation model predicts seston carbon concentrations of 600-750 micrograms/l before fertilization, and 3000-3500 after nutrient addition; for nitrogen the figures are 40-50 and 550-700, and for phosphorus 1-3 and 30-50. These concentrations are substantiated by actual data. The simulation indicates that nitrogen and phosphorus limit the standing crop at nutrient loading and carbon dioxide invasion rates measured in experimental lake 227, but dissolved inorganic carbon (DIC) concentrations affected plankton composition and species succession. Tripling of nutrient additions produced carbon limitation of phytoplankton standing crop, but the high nutrient loading rates and low carbon dioxide invasion rate necessary for such limitation would be unusual (though predictable) in nature. Data and simulation indicate that a form of interspecific competition, perhaps for dissolved carbon dioxide, rather than zooplankton grazing alone, is responsible for suppression of dominant chrysophytes in the fertilized lakes. (Lynch-Wisconsin)
W78-04766

CHEMICO-TROPHIC ATTRIBUTES OF DETRITAL AGGREGATES IN A NEW MEXICO ALKALINE RESERVOIR,
P. A. Buscemi, and J. H. Puffer.
Verhandlungen, Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Vol 19, p 358-366, October 1975. 10 fig, 1 tab, 12 ref.

Descriptors: Reservoirs, *Alkalinity, *Ute Reservoir(NM), *Zooplankton, *Detritus, Organic matter, *New Mexico, Alamogordo Reservoir(NM), Aggregates, Phytoplankton, Bosmina longirostris, Particulates, Trophic level.

Vertical water samples collected from alkaline Ute Reservoir, New Mexico, at subsurface, 6 m, and 15 m were analyzed for characteristics of detrital aggregates, and quantitative zooplankton samples were collected at one-meter intervals. It was concluded that: (1) dissolved organic matter may be concentrated as particulate organic matter in a recyclic process; and (2) such detrital aggregates constitute the principal, if not sole, nutrient source for some grazing zooplankton genera, when green algal populations are low. One such zooplankter is Bosmina longirostris. Chemical analysis of water samples taken from Ute and Alamogordo Reservoirs in September-October 1968 showed that bicarbonate and carbonate alkalinity were present (P=0-4 ppm; T=94-184 ppm), and SO4 and Ca(+) ions were unusually high (SO4, 214-330 ppm; Ca, 92-486 ppm). The pH of Ute Reservoir ranged from 7.6-8.0, and total residues were very high (811-1883 mg/l). The size range of detrital aggregates was 10-100 micrometers (average 40 micrometers). Calcium carbonate particles found in the aggregates had rounded shapes similar to those found in samples of atmospheric dust, suggesting that aggregate mineral nuclei are aeolian, and hence terrestrial, in origin. Particles of this kind are extremely numerous, ranging up to 105,000 particles/l, compared with 20,000 phytoplankton cells/l. (Lynch-Wisconsin)
W78-04767

PHOSPHORUS SUPPLY IN UNDISTURBED LAKES IN KEJIMKUJIK NATIONAL PARK, NOVA SCOTIA (CANADA),
J. Kerekes.
Verhandlungen, Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Vol 19, p 349-357, October 1975. 4 fig, 2 tab, 22 ref.

Descriptors: *Kejimkujik National Park(Canada), *Lakes, *Phosphorus, *Flushing rate, *Oligotrophy, Canada, Nutrients, Trophic levels, Bogs, Peat, Stratification, Chlorophyll, Model studies, Nova Scotia(Canada).

Surveys of 17 oligotrophic lakes in Kejimkujik National Park, Nova Scotia, Canada show that in undisturbed lakes total phosphorus and chlorophyll-a concentrations, greatly dependent on phosphorus availability, bear a curvilinear relationship to flushing rate. Total phosphorus begins to decline when the flushing rate exceeds an optimum of about seven times per year. Due to high flushing rates, some lakes had exceptionally high hydraulic loading of phosphorus, which would rank them high among eutrophic lakes on an ordinary phosphorus loading/mean depth model. The high flushing rate, however, prevents nutrient accumulation in the epilimnion, which retains an oligotrophic character, whereas the thermocline and hypolimnion act as a nutrient trap. Nutrient concentrations continue to increase with the advance of summer stratification. A modification of the phosphorus-loading/mean depth model is proposed which compensates for high hydraulic loading. Flushing rates of 1-418 times per year were observed in the 17 lakes. Very clear lakes (5 Hazen units) had low flushing rates and drainage basins lacked peat deposits. Highly colored lakes either have had flushing rates or were surrounded by bogs. Salinity in the lakes varied from 12-24 mg/l, mean total phosphorus from 5-10 mg P/cu m, and mean chlorophyll-a from 1-3 mg/cu m. In lakes with high flushing rates, hypolimnion total phosphorus in summer increased to 40-60 mg P/cu m. (Lynch-Wisconsin)
W78-04768

INTERSTITIAL WATER COMPONENTS AND EXCHANGE ACROSS THE WATER SEDIMENT INTERFACE OF WESTERN LAKE SUPERIOR,
G. E. Glass, and J. E. Poldoski.
Verh. Internat. Verein. Limnol., Vol 19, p 405-420, October 1975. 6 fig, 5 tab, 30 ref.

Descriptors: *Lake Superior, *Interstices, *Sediment-water interfaces, *Taconite, *Water pollution sources, Minnesota, Tailings, Iron ore, Water quality, Pollutants, Water pollution effects, Great Lakes, Industrial wastes, Beaver Bay(MN), Hovland(MN), Reserve Mining Company, Silver Bay(MN).

Two sampling cruises in western Lake Superior in July and September 1972 assessed effects on water quality of iron ore (taconite) tailings discharged at Silver Bay, Minnesota. The exchange of dissolved components between interstitial and overlying water from materials deposited on the lake bottom was also investigated. Two areas were sampled, one at Beaver Bay near the tailings discharge point, and one at Hovland (MN), a considerable distance upcurrent from Silver Bay. At Beaver Bay cummingtonite-grunerite was the major component of suspended solids and upper sediment layer; at Hovland levels were below detection (1%). Layer thickness at Beaver Bay ranged from 10 cm to 90 m. The tailings layer was much denser, coarser, and more porous than natural sediments. Manganese, potassium, suspended solids, and turbidity in the overlying water were all higher at Beaver Bay than at Hovland. Concentrations in sediment interstitial water were much higher than in the overlying water. Beaver Bay was higher than Hovland in silica, copper, manganese, calcium, and magnesium, but lower in phosphate. In the sediment, organic carbon and organic hydrogen were higher at Hovland. In 12 undisturbed core samples of overlying water and sediment, these changes were noted in the overlying water after 1600 hours: silica, calcium, magnesium, sodium, potassium, and manganese increased and oxygen decreased to 5 mg/l; copper, iron, and phosphorus showed little change. (Lynch-Wisconsin)
W78-04769

FLUX OF NUTRIENTS BY DIFFUSION THROUGH THE LAKE SEDIMENT-HYPOLIMNION INTERFACE FOR 9 LAKES IN MAINE, U.S.A.,
S. A. Norton, and D. R. Sasseville.
Verh. Internat. Verein. Limnol., Vol. 19, p 372-381, October 1975. 5 fig, 2 tab, 19 ref.

Descriptors: *Lakes, *Sediment-water interfaces, *Nutrient flux, *Trophic level, *Diffusion, *Maine, Sediments, Hypolimnion, Nutrients, Interstices, Cultural effects, Eutrophication, Oligotrophy.

Closely-spaced interstitial water samples from sediment cores plus overlying bottom water from nine lakes in Maine were studied to determine nutrient flux by diffusion through the sediment-water interface. Samples were analyzed for potassium, sodium, calcium, magnesium, iron, manganese, silica, and phosphorus. It was concluded that: (1) concentration gradients of the nutrients were considerably higher than previously reported, primarily due to finer resolution in this study; (2) a 'reactive' layer exists at or near the sediment surface with concentrations of some elements, especially phosphorus, higher than above or below this layer; (3) several cores from the profundal zone in the same lake were very similar; (4) profiles differed markedly from lake to lake; (5) diffusion coefficients appeared strongly related to water content; (6) diffusion contributed significant amounts of many species to bottom waters; and (7) diagenetic reactions were dominated by the solution of diatoms, followed by solution of iron and manganese; subaqueous weathering of silicate minerals contributed minor alkalies and alkali earths to the interstitial waters. Trophic levels of the lakes studied ranged from eutrophic Annabessacook Lake to oligotrophic Moosehead Lake and from very culturally developed to relatively undeveloped. All lakes had alkalinities of ≤ 30 ppm $CaCO_3$. (Lynch-Wisconsin)
W78-04770

PRIMARY PRODUCTION IN FOUR SMALL LAKES IN THE CANADIAN ROCKY MOUNTAINS,
G. L. Fabris, and U. T. Hammer.
Verh. Internat. Verein. Limnol. Vol. 19, p 530-541, October 1975. 5 fig, 4 tab, 29 ref. National Research Council of Canada A-1412

Descriptors: *Primary productivity, *Lakes, *Oligotrophy, *Phytoplankton, Rocky Mountain region, *Canada, Nannoplankton, Banff National Park(Canada), Altitude, Trophic levels, Water temperature.

Vertical and areal profiles of productivity for Herbert, Norman, Eiffel, and Helen Lakes in Banff National Park in the Rocky Mountains of western Canada showed that higher primary production rates were directly associated with higher water temperatures and higher total dissolved solids, and inversely with increasing altitude. Phytoplankton primary production rates were measured during the ice-free period of 1965 using the carbon-14 technique. The lakes varied in altitude from 1,615 m (Herbert Lake) to 2,320 m (Helen Lake), in depth from 1.75 m (Norman Lake), to 13.5 m (Eiffel Lake), and in area from 1.5 ha (Norman Lake) to 7.8 ha (Eiffel Lake). Water temperatures were lower in the higher-altitude lakes. Herbert and Helen Lakes are dimictic, with thermal stratification most notable in Herbert Lake, and much weaker in Helen Lake. Eiffel Lake, which may be a subpolar dimictic type, was characterized by poor thermal stratification. Norman Lake, as a perennial pond, stratified only during short periods in the open season. Areal primary production rates ranged from 9-601 mg C/sq m/day, while volumetric rates varied from 3.1-94.0 mg C/cu m/day. Annual production during the ice-free period varied from 2.5-48.5 g C/sq m. Maximum rate of carbon assimilation per unit volume varied from 1.5-5.8 mg C/cu m/hr. Various indices monitored indicate that these lakes tend to be oligotrophic. Comparisons of total phytoplankton and nannoplankton primary production rates were also made. (Lynch-Wisconsin)
W78-04771

PHOSPHORUS REMOVAL AND WATER QUALITY IMPROVEMENTS IN GRAVENHURST BAY, ONTARIO,
For primary bibliographic entry see Field 5D.
W78-04772

HYDROBIOLOGICAL STATE OF THE NADARBAZEVI RESERVOIR DURING THE FIRST YEARS OF ITS FILLING WITH FRESHWATER, (IN GEORGIAN),
For primary bibliographic entry see Field 2H.
W78-04773

COMPARATIVE INTERSTITIAL WATER AND SEDIMENT CHEMISTRY IN OLIGOTROPHIC AND MESOTROPHIC LAKES, MAINE, U.S.A.,
D. R. Sasseville, S. A. Norton, and R. B. Davis.
Verhandlungen, Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Vol. 19, p 367-371, October 1975. 4 fig, 1 tab, 6 ref.

Descriptors: *Lakes, *Oligotrophy, *Mesotrophy, *Sediments, *Agriculture, *Palynology, *Maine, Trophic levels, Interstices, Chemical analysis, Nutrients, Dating, Pollen, Sediment-water interfaces, Environmental effects, Cultural effects, Diffusion.

Samples of sediment and interstitial water from two oligotrophic lakes (Emden Pond, Tunk Lake) and tow mesotrophic lakes (China Lake, Fish River Lake) were analyzed chemically to assess effects of human cultural activities. Agriculture and construction of dwellings has been intense around Emden Pond and China Lake, while Tunk Lake and Fish River Lake were relatively undeveloped. Results showed a cultural impact upon sediment chemistry, but not all chemical components changed in the same manner. However, average core values for the biologically-important elements phosphorus and sulfur, as well as water content and organic matter, were highest in the two oligotrophic lakes. Vertical variations in sediment chemistry (K2O, MgO, phosphorus, and sulfur) were correlated with the presence of European man through dating of Ambrosia and Rumex pollen. Diffusion-controlled interstitial water chemistry profiles indicated movement of potassium, sodium, and silicon dioxide to or through the sediment-water interfaces. Profiles generally showed increasing concentrations of all parameters with depth. For silicon dioxide, levels increased steadily down to about 5 cm, where constant values of 20-45 ppm were attained. A pronounced 'reactive' layer with higher concentrations of dissolved species was present in all lakes at a depth of 1-5 cm, perhaps acting as a nutrient-supply reservoir for the overlying water. (Lynch-Wisconsin)
W78-04774

THE ABUNDANCE AND SIGNIFICANCE OF PHYTOFLAGELLATES AND NANNOPLANKTON IN THE ST. LAWRENCE GREAT LAKES, 1. PHYTOFLAGELLATES,
M. Munawar, and I. F. Munawar.
Verhandlungen, Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Vol 19, p 705-723, October 1975. 6 fig, 4 tab, 20 ref.

Descriptors: *Phytoflagellates, *Great Lakes, *Plant populations, *Phytoplankton, *Sampling, *Laboratory techniques, *Data collections, Flagellates, Lake Erie, Lake Huron, Lake Superior, Lake Ontario, Biomass, Nannoplankton, Chrysomanadinae, Cryptomonadinae, Dinaphyeinae.

Sampling of 14 stations on Lakes Huron, Ontario, Erie, and Superior showed much higher phytoflagellate populations than reported in the past; this is due primarily to improved preservation, concentration, and enumeration techniques, in particular the Uttermohl inverted microscope procedure. Phytoflagellates were, in fact, found to dominate phytoplankton communities at both nearshore and offshore stations. Highest average percentages were in Lake Superior (over 70%), followed by Lake Ontario (over 50%), Lake Erie (23-47%), and Lake Huron (11-26%). Phytoflagellate percentage abundance was related to primary production rate and production/biomass quotients (activity coefficient). Phytoplankton biomass was higher at nearshore than offshore stations in Lakes Ontario and Huron, the reverse in Lake Erie, and about equal in Lake Superior. In lake Huron, phytoplankton biomass was 16 times greater at the nearshore Saginaw Bay station than at the offshore stations. Phytoflagellate populations were dominated by Chrysomonadinae, Cryptomonadinae, and Dinophycinae. Motile forms of Chlorophyta and Euglenophyta were observed sporadically, but were not abundant. In terms of biomass, the most important genera were Ochromonas, Dinobryon, Chrysochromulina, Cryptomonas, Katablepharis, Rhodomonas, Certium, Gymnodinium, and Peridinium. The nannoplankton species Cryptomonas erosa, Chrysochromulina parva, Rhodomonas minuta, and katablepharis ovalis were by far the most abundant numerically at all stations. (Lynch-Wisconsin)
W78-04775

A MALLOMONAS POPULATION,
Vaxtbiologiska Institutionen, Uppsala (Sweden).
K. Thomasson.
Svensk Botanisk Tidskrift, Vol 64, No 3, p 303-311, 1970. 2 fig, 2 tab, 19 ref.

Descriptors: *Mallomonas, *Phytoplankton, *Lilla Hastastjarn(Sweden), *Dystrophy, *Algae, Sweden, Lakes, Mallomonas fastigiata, Oligotrophy, Color, Data collection methods.

A water sample taken from Lilla hastastjarn, a small dystrophic body of water in Varmland, Sweden. In August 1963 proved an almost pure culture of the phytoplanktonic genus Mallomonas (Chrysophyceae). The majority of the population was Mallomonas fastigiata, followed by M. acaroides v. crassisquama. M. fastigiata is generally confused with M. caudata in the literature. Lilla Hastastjarn, which is stained brown, is located in an oligotrophic area; comparative chemical data are given for Lilla Hastastjarn and the nearby lakes L. Horrsjon, S. Horrsjon, and Yngen. Alkalinity (HC03) was 0, 0.019, 0.012, and 0.299 respectively; pH was 5.6, 6.2, 5.9, and 7.4; conductivity was 20, 21, 22, and 47; and color (mg Pt/l) was 35, 40, 20, and 5. A planktonic checklist is given for Lilla Hastastjarn for five years (1964-68). Two interesting benthic species present are seldom reported for Swedish waters, the epiphytic diatom Actinella punctata, and the metaphytic desmid Docidium undulatum. The data on Mallomonas indicate that some of the more heavily-studied lakes in the region should be re-examined in terms of better identification of their algal flora through high-power microscopy. (Lynch-Wisconsin)
W78-04776

ACTINOTAENIUM COSMARIUM AND STAURODESMUS IN THE PLANKTON OF ROTORUA LAKES,
Vaxbiologiska Institutionen, Uppsala (Sweden).
K. Thomasson.
Svensk Botanisk Tidskrift, Vol 67, p 127-141, 1973. 6 fig, 24 ref.

Descriptors: *Rotorua(New Zealand), *Desmids, *Actinotaenium, *Cosmarium, *Staurodesmus, *Phytoplankton, Lakes, New Zealand, North Island(New Zealand), Monomictic lakes, Water temperature, Distribution, Classification, Algae.

Phytoplankton of the warm, monomictic lakes in the Rotorua district on the North Island of New Zealand are rich in desmids, including members of the cosmopolitan genera Actinotaenium, Cosmarium, and Staurodesmus. Most of these desmids are also common in northern hemisphere lakes. The high frequency of dividing cells is notable, indicative of a favorable environment. The following taxa are discussed in this paper, based on collections made in March 1968: Actinotaenium diplosporum, A. globosum, A. turgidum; Cosmarium amplum, C. bioculatum, C. contractum, C. contractum v. ellipsoideum, C. contractum v. minutum, C. contractum v. retusum, C. lundellii v. corruptum, C. lundelliiv. ellipticum, C. melanosporum, C. melanosporum, C. monochondrum v. fallax, C. perfissum, C. pseudarctoum, C. reniforme; Staurodesmus convergens v. laportei, S. cuspidatus v. curvatus, S. glaber, S. glaber v. limnophilus, S. leptodermus v. subcorniculatus, S. megacanthus, S. megacanthus v. orientalis, S. mucronatus v. parallelus, S. pachyrhynchus, S. pachyrhynchys v. pseudopachyrhynchus, s. pachyrhynchus v. tenerus, S. phimus, S. spetsbergensis, S. spetsbergensis v. limneticus, S. trangularis, and S. unicornis v. gracilis. (Lynch-Wisconsin)
W78-04777

HETEROTROPHIC UTILIZATION OF PHYTOPLANKTON METABOLITES BY THE MICROBIOTA OF SUNFISH LAKE, ONTARIO,
D. T. Waite, and H. C. Duthie.
Verhandlungen, Internationale Vereinigung fuer Theoretische und Angewandte Limnologie, Vol 19, p 672-681, October 1975. 2 fig, 4 tab, 27 ref.

Descriptors: *Sunfish Lake(Ontario Canada), *Phytoplankton, *Metabolites, *Food chains, *Detritus, Canada, Heterotrophy, Algae, Ecosystems, Food webs, Photosynthesis, Bacteria, Zooplankton.

Acceptability of three types of phytoplankton metabolities as nutrient sources for microbiota in Sunfish Lake (Ontario, Canada) was examined. Metabolities were typed as: (1) extracellular products, released as waste or by-products of photosynthesis (phototrophic zone); (2) water-soluble compounds, which contribute to the dissolved organic material pool upon cell lysis and leaching (Phototrophic and tropholytic zones); and (3) water-insoluble materials, forming part of the precipitationg particulate material in the lake; these could provide food for benthic organisms and zooplankton. It was concluded that: (1) extracellular products are not utilized by lake microbiota; no significant difference was found between gross and new estimated extracellular production; (2) water-soluble metabolities are readily utilized by bacteria and algae under certain circumstances; and (3) water-insoluble metabolities, which occur at all lake depths, generally appear to be utilized only in the warm aerobic epilimnion by bacteria. Sunfish Lake is a small meromictic lake in southern Ontario, with a surface area of 8.3 ha and a maximum depth of 20 m. For the experiments, axenic unialgal cultures of Anacystis nidulans, Chlamydomonas angulosa, and Navicula pelliculosa were treated with carbon-14, and radioactive metabolities were combined with water samples from Sunfish Lake. (Lynch-Wisconsin)
W78-04778

CHEMICALS USED TO CONTROL FISH AND AQUATIC PLANTS IN ILLINOIS, I. AN EVALUATION OF FISH TOXICANTS.
Illinois Natural History Survey, Urbana. Aquatic Biology Section.
For primary bibliographic entry see Field 5G.
W78-04779

CHEMICALS USED TO CONTROL FISH AND AQUATIC PLANTS IN ILLINOIS, A REVIEW OF THE AQUATIC HERBICIDES USED IN ILLINOIS,
Illinois Natural History Survey, Urbana. Aquatic Biology Section.
For primary bibliographic entry see Field 5G.
W78-04780

BIOLOGICAL SURVEY OF PINKHAM CREEK AND THE NORTH PLATTE RIVER IN THE VICINITY OF COWDREY, COLORADO, AUGUST 24, 1972,
Environmental Protection Agency, Denver, CO. Surveillance and Analysis Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 955, Price codes: A02 in paper copy, A01 in microfiche. EPA Report S and A/TSB-11, November 1972. 9 p, 1 fig, 2 tab, 1 append. S and A/TSB-11.

Descriptors: *Pinkham Creek(CO), *North Platte River(CO), *Suspended solids, *Water pollution effects, *Benthic fauna, Rivers, Mine wastes, Effluents, Waste water disposal, Industrial wastes, Insects, Stoneflies, Mayflies, Caddisflies.

A survey of benthic fauna in Pinkham Creek and at its confluence with the North Platte River near Cowdrey, Colorado, Following an industrial discharge of suspended solids into the creek, indicated few negative effects. The Ozark-Mohoning Company, a fluorspar mining and processing company, discharged the suspended solids into the creek about four miles above the confluence point

on June 18, 1972. Samples collected at the same time indicated total solids of about 1600 mg/l just downstream, compared with 224 mg/l upstream. The biological survey was conducted on August 24, 1972; at the upstream Pinkham Creek station 19 taxa were collected, with a density of 60/sq ft. Composed predominantly of stoneflies and mayfloes, the community was indicative of a clean-water environmental. No significant change was observed at the downstream station, except for a small decrease in diversity (11) and density (52/sq ft). Pollution-sensitive stoneflies and mayflies again were dominant. A black band around most rocks was the only possible evidence of pollution. In the North Platte, the station upstream from the Pinkham Creek confluence comprised 22 taxa with a density of 407/sq ft, dominated by caddisflies at 370/sq ft. Mayflies and stoneflies were also present. Downstream, 18 taxa with a density of 57/sq ft were recorded: a significant decline in caddisflies reflected incomplete recolonization following stream recovery from the mining discharge. (Lynch-Wisconsin)
W78-04781

BACTERIOLOGICAL INVESTIGATIONS OF THE UPPER SOUTH PLATTE RIVER BASIN. MAY 1972, JULY 1972, SEPTEMBER 1972,
Environmental Protection Agency, Denver, CO. Surveillance and Analysis Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 949, Price codes: A04 in paper copy, A01 in microfiche. EPA Report S and A-TSB-6, December 1972, 46 p, 12 fig, 6 tab, 3 ref, 2 append. S and A-TSB-6.

Descriptors: *Bacteria, *Coliforms, *South Platte River(CO), *Swimming, *Water pollution control, *Water quality standards, Rivers, Recreation, Water sports, Denver(CO), Colorado, Pollution abatement, Storm runoff.

Bacteriological surveys were carried out in mid-1972 to determine wherther present fecal and total coliform levels in the South Platte River above Denver, Colorado, comply with standards required for a proposed B3 reclassification to permit body contact water recreation (swimming and inner-tube floating). Fecal coliforms exceeded the Class B3 standards at one of four stations in May, four of 19 stations in July, and one of seven in September. Total coliforms were exceeded at no stations in May, one of 19 in July, and one of seven in September. Violations, attribiuted to storm runoff, can be eliminated, except during major runoff periods, by: (1) controlling the periodic discharge from the Centennial Racetrack horse barns by diversion into a leaching pond; and (2) construction of a settling pond for removal of suspended solids from wastewater from the Kassler Water Treatment Plant filter sand-washing operation. The proposed reclassification area extends from Union Avenue in Littleton, Colorado, to Waterton, Colorado. Class B3 standards require total coliform density not to exceed 1000/100 ml average per month, nor to exceed this figure in 20% of samples; the single sample maximum is 2400/100 ml. Fecal coliforms shall not exceed 100/100 ml, and fecal streptococcus shall not exceed 20/100 ml; both are monthly sample averages. Bear Creek, which joins the South Platte downstream of the study area, was also sampled. (Lynch-Wisconsin)
W78-04782

THE EDGE OF THE ARROWHEAD,
Minnesota Marine Advisory Service, Duluth. Office of Sea Grant.
For primary bibliographic entry see Field 2H.
W78-04784

EFFECTS OF ENVIRONMENTAL CHANGES ON MARSH VEGETATION WITH SPECIAL REFERENCE TO SALINITY,
Tulane Univ., New Orleans, LA.
A. E. Smalley, and L. B. Thien.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-22616, Price codes: A06 in paper copy, A01 in microfiche. Report NASA-CR-147585, February 1976. 14 fig, 26 tab, 135 ref. NAS-9-14501.

Descriptors: *Marsh plants, *Salinity, *Louisiana, *Species composition, *Succession, Marshes, Tidal marshes, Wetlands, Mississippi River, Reviews, Bibliographies, Bayous, Seasonal, Bayou Terre aux Boeufs(LA).

A one-year study was conducted in 1975 and early 1976 to determine the relationship of salinity to seasonal composition variation in five Louisiana tidal marshes. The study area is located along Bayou Terre aux Boeufs in the sub-delta marshes of southeastern Louisiana, and included Pertain Lagoon, Bayou Gaudet, Bottle Lagoon, Dead Duck Pass, and Drum Bay. These marshes are inactive delta formations with saline mineral deposits of marine origin. Salinity regimes were established on the basis of peak soil salinity (PSS). At a PSS of 10 ppt or less, as in Petan Lagoon and Bayou Gaudet, Spartina patens occurs as the dominant species or in pure stands; the vegetation of Petain Lagoon is succeeding in favor of pure S. patens. At PSS levels of 10-20 pt (e.g., Bottle Lagoon) the dominant species throughout the year is Distichlis spicata; also important are Spartina alterniflora and S. patens, with Juncus roemerianus present to a lesser degree. With PSS levels at 15-25 ppt, as at Dead Duck Pass, J. roemerianus dominates, followed by S. alterniflora; S. patens and D. spicata are minor. Areas with high PSS (>20ppt) and regular flooding, as in Drum Bay, are characterized almost totally by S. alterniflora communities. Species composition is the most stable during April to mid-July. An extensive literature review and bibliography is included. (Lynch-Wisconsin)
W78-04785

THE CONTRIBUTION OF AGRICULTURE TO THE EUTROPHICATION OF SWISS WATERS, I. RESULTS OF DIRECT MEASUREMENTS IN THE DRAINAGE AREA OF VARIOUS CHANNELS,
R. Gachter, and O. J. Furrer.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-30641, Price codes: A03 in paper copy, A01 in microfiche. Translation No. 1809, p 1-34, 1975, 12 fig, 17 tab, 19 ref. Translated from Schweizerische Zeitchrift fur Hydrologie, Vol. 34, No. 1, p 41-70, 1972.

Descriptors: *Switzerland, *Lakes, *Drainage area, *Eutrophication, *Agricultural runoff, Nonpoint pollution, Agriculture, Nutrients, Phosphorus, Nitrogen, Trophic levels, Limiting factors, Waste water treatment, Watersheds(Basins).

Relative nutrient contributions from agriculture were estimated from a review of results from seven studies of drainage areas of several Swiss lakes and rivers. From areas used for agriculture only, phosphorus inputs were 69 kg/sq km/yr for the lower alpine region, and 35 kg for the lowlands; nitrogen inputs were 1634 and 2102 kg/sq km/yr respectively. From areas used only for forestry, phosphorus inputs were 0.4 and 0.1 kg/sq km/yr for the two regions, and nitrogen inputs were 82 and 959 kg/sq km/yr. In Swiss lakes algal growth is generally phosphorus limited, but sometimes also nitrogen limited. Nutrients enter the lake from the atmosphere, soils, and wastewater. Higher nitrogen concentrations in lowland soils are apparently due to more intensive microbiological mobilization, and increased use of nitrogenous fertilizers. Agricultural nutrient contributions to the lakes depend on cultivation methods, population density, and effectiveness of wastewater treatment. In Switzerland probably more than 70% of the nitrogen discharged into lakes originates from soils in the drainage area, compared with less than 50% of the phosphorus. With balanced growth, algae assimilate nitrogen and phosphorus in a weight ratio of about 7:1. In lower alpine lakes the N:P ratio was about 30, and in lowland lakes about 80. Drainage areas studied were for Lakes Alpnach, Sarner, Hallwiler, Murten, Pfaffik, and Greifen, and the Rivers Linth and Limmat. (Lynch-Wisconsin)
W78-04786

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970, INTRODUCTION,
Uppsala Univ. (Sweden). Inst. of Plant Ecology.
M. Waern.
OIKOS Supplementum, Vol. 15, 1973. p 153-194, 29 fig, 3 tab, 60 ref.

Descriptors: *Nutrients, *Stockholm Archipelago(Sweden), *Lake Malaren(Sweden), *Algae, *Eutrophication, *Water pollution effecs, *Sewage disposal, Norrstrom River(Sweden), Saline water-freshwater interfaces, Baltic Sea, Indicators, Phosphorus, Nitrogen, Lakes, Phytoplankton, Limiting factors.

This collection of seven papers describes 1970 studies of effects of sewage discharges from the city of Stockholm, Sweden, into adjacent Lake Malaren and the Stockholm Archipelago. The present investigation began in 1967, following pilot projects from 1963-67 which dealt with pollution distribution in the form of total phosphorus, transparency, and benthic algae. The present study focuses on primary effects of the nutrients inputs (i.e., on algal growth), while parallel investigations conducted by the city of Stockholm have studied secondary effects, including oxygen conditions, total phosphorus, and PO4-P in deeper water. Sewage discharged into freshwater Lake Malaren is carried by the Norrstrom River into the brackish archipelago in the Baltic Sea, creating nutrient enrichment and algal blooms. These papers deal with: (1) rates of discharge of Lake Malaren into the Stockholm Archipelago and nutrient levels; (2) phosphate, nitrate, and ammonium in the archipelago; (3) a method for determining total phosphorus; (4) phytoplankton distribution in the archipelago as measured by chlorophyll-a; (5) a zone of abnormal Cladophora glomerata growth near Stockholm; (6) effects of sewage on the growth and distribution of Chara aspera and Fucus vesiculosus; and (7) limiting factors for Oscillatoria agardhii and Aphanizomenon flos-aquae. (Lynch-Wisconsin)
W78-04787

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 1, OUTFLOW STUDIES,
Uppsala Univ. (Sweden). Inst. of Plant Ecology.
M. Waern, and S. Pekkari.
OIKOS Supplementum, Vol. 15, p 155-163, 1973. 9 fig, 7 ref.

Descriptors: *Stockholm Archipelago(Sweden), *Nutrients, *Phosphorus, *Discharge(Water), *Lake Malaren(Sweden), Baltic Sea, Saline water-freshwater interfaces, Indicators, Lakes, Sewage disposal, Water pollution.

Discharge rates from Lake Malaren, near Stockholm, Sweden, into the Stockholm Archipelago in the Baltic Sea were monitored in 1969-70. The lake, which receives Stockholm's domestic treated sewage effluent, is discharged by the Norrstrom River into the sea. A halocline at 6-10 m separates outflowing surface water (salinity 1%-4%) from inflowing cold deep water (1-5C, 30-50 m deep, salinity 5%). With an average of 170 cu m/sec (5,360 million cu m/year), the discharge from Lake Malaren is greatest along the Swedish Baltic coast south of the Gulf of Bothnia. 1969 was characterized by a warm and dry summer, a winter discharge, a spring flood, and a very small discharge of 1-2 million cu m/day in summer and fall which resulted in sewage accumulation in the

archipelago near Stockholm. Phosphorus content was 350e400 micrograms/ l at its maximum in late autumn of 1969. A small discharge the following winter spread sewage outwards under the ice, but the brief but vigorous spring flood of 1970 ultimately carried the accumulation to more remote parts of the archipelago. Daily water levels and discharge rates are given for the lake and archipelago for the two years, and a series of maps shows phosphorus and nitrogen concentrations. (Lynch-Wisconsin)
W78-04788

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 2, PHOSPHATE, NITRATE AND AMMONIUM IN THE ARCHIPELAGO DURING 1970,
Uppsala Univ. (Sweden). Inst. of Plant Ecology.
M. Waern, and L. Hubinette.
OIKOS Supplementum, Vol. 15, p 164-170, 1973. 1 tab, 1 fig, 13 ref.

Descriptors: *Stockholm Archipelago(Sweden), *Phosphates, *Nitrates, *Ammonium compounds, *Nutrients, Algae, Lake Malaren(Sweden), Baltic Sea, Oscillatoria, Eutrophication, Sewage disposal, Saline water-freshwater interfaces, Lakes, Water pollution sources.

The spatial and temporal distribution of inorganic nitrogen and phosphorus is surface waters in the vicinity of Stockholm, Sweden is described. Water samples were collected from a research vessel between February-December 1970. Lake Malaren, a freshwater lake rich in nitrate-nitrogen, is discharged into the brackish Stockholm Archipelago in the Baltic Sea, which has a shortage of nitrate for assimilation. Disregarding Stockholm sewage effluent, total phosphorus in the lake (720 micrograms/l) is twice that in the sea, and total nitrogen (700 micrograms/l) is three times the level in the sea. Following the spring flood, sewage phosphate from Stockholm acts as a nitrate trap. Algae may nearly exhaust the nitrate in the lake, while in the archipelago a heavy Oscillatoria bloom creates a zone of high excess phosphate. The 1970 spring flood discharged 2,600 million cu m of freshwater from Lake Malaren, with a nitrate-nitrogen concentration of about 300 micrograms/l; freshwater nitrate extended far out into the archipelago and was an important contribution to the diatom bloom in spring. The transport of treated sewage was reflected in high April ammonium concentrations, with a maximum at Solofjarden, 25 km east of Stockholm. An extensive table giving the results of the monitoring effort is included. (Lynch-Wisconsin)
W78-04789

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 4, PHYTOPLANKTON DISTRIBUTION IN THE ARCHIPELAGO MEASURED AS CHLOROPHYLL A,
Uppsala Univ. (Sweden). Inst. of Plant Ecology.
For primary bibliographic entry see Field 5B.
W78-04791

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 5, THE ZONE OF ALGAL LOW STANDING CROP NEAR STOCKHOLM,
Uppsala Univ. (Sweden). Inst. of Plant Ecology.
L. Norin, and M. Waern.
OIKOS Supplementum, Vol. 15, p 179-184, 1973. 6 fig, 16 ref.

Descriptors: *Algae, *Cladophora glomerata, *Stockholm Archipelago(Sweden), *Water pollution effects, *Lake Malaren(Sweden), Standing crops, Baltic Sea, Lakes, Nutrients, Toxicity, Nitrogen, Sewage disposal, Ammonium compounds.

Experiments to determine causes of changes in growth patterns of the alga Cladophora glomerata near Stockholm, Sweden showed that the observed stubby growth and dark green color were positively correlated with polluted water. It had been noted that C. glomerata growing near the shores of Stockholm, both in freshwater Lake Malaren and brackish Stockholm Archipelago in the Baltic Sea, grew in small dark-green tufts, compared to much larger lighter-green plants further from the shore. Sewage from Stockholm is discharged into the lake, which is carried by the Norrstrom River into the archipelago. Widening of this zone of dwarfed dark-green plants during summer corresponds to the accumulation of polluted water beginning when spring outflow ceases and when very little water flows through the river. It was not determined which factors in the polluted water are responsible for the phenomenon, but heavy nitrogen fertilization may be important, especially combined with an excess of ammonium. Plants transferred between zones in each water body, and between fresh and brackish water, confirmed that the effects are environmental rather than genetic. Heavy metal toxicity could account for the changed appearance of the plant, but no significant pattern has yet been found. The dwarfism could result from rapid ripening followed by zoospore formation. (Lynch-Wisconsin)
W78-04792

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 6, EFFECTS OF SEWAGE WATER ON BENTHIC VEGETATION,
Uppsala Univ. (Sweden). Inst. of Plant Ecology.
S. Pekkari.
OIKOS Supplementum, Vol. 15, p 185-188, 1973. 3 fig, 8 ref.

Descriptors: *Sewage disposal, *Water pollution effects, *Chara aspera, *Fucus vesiculosus, *Gulf of Bothnia, *Stockholm Archipelage(Sweden), Benthic flora, Saline water-freshwater interfaces, Baltic Sea, Brahestad(Finland), Finland.

Effects of sewage water on the benthic plants Chara aspera and Fucus vesiculosus in the Stockholm Archipelago of Sweden and in the Gulf of Bothnia (Baltic Sea) were investigated. Chara aspera is a common plant in parts of the Baltic Sea with almost fresh water, for example the innermost part of the Gulf of Bothnia and in the Tvarminne area in southwestern Finland. Normal plants are found in the Stockholm Archipelago 50 km from Stockholm, but in the inner waters, polluted by sewage, thay have disappeared. In a zone 25-30 km from Stockholm plants range from very reduced in size (at 25 km) to abnormal specimens with naked, elongated branchlets and cortex only at the base of the stem (25-30 km offshore). The marine plant Fucus vesiculosus has been found in various freshwater enclaves, including in shallow water of the harbor of Oregrund and near Brahestad (Finland) in the northern end of the Gulf of Bothnia. Its occurrence intermingled with freshwater vegetation is thought to be the result of sewage effluents from the towns. Total phosphorus near the sewage discharge of Brahestad was 24.5 micrograms/l in August 1968, compared with 7.7 micrograms/l in the outer part of the archipelago. Salinity values were 2.80% and 2.83% respectively. (Lynch-Wisconsin)
W78-04793

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 7, ALGAL BIOTEST OF STOCKHOLM ARCHIPELAGO WATERS - QUALITATIVE ASPECTS,
Lantbrukshogskolan, Uppsala (Sweden). Institutionen for Vaxtfysiologi.
K. E. R. Melin, and P. E. B. Lindahl.
OIKOS Supplementum, Vol. 15, p 189-194, 1973. 6 fig, 8 ref.

Descriptors: *Algae, *Limiting factors, *Oscillatoria agardhii, *Aphanizomenon flos-aquae, *Nutrients, Cyanophyta, Trace elements, Stockholm Archipelago(Sweden), Lake Malaren(Sweden), Phosphates, Nitrates, Nitrogen fixation, Eutrophication, Phytoplankton.

Certain nutrients were added to water samples taken from the Stockholm Archipelago and Lake Malaren, Sweden, to determine chemical limiting factors for the Cyanophyta Oscillatoria agardhii and Aphanizomenon flos-aquae. Inoculations from cultures of the algae were added to water samples enriched with various combinations of phosphate, nitrate, and chelated trace elements. The latter included iron, zinc, manganese, cobalt, copper, boron, and molybdenum, with Na3-versenol as chelator. O. agardhii was stimulated by addition of nitrate alone or combined with chelated trace elements where water samples had a natural 10:1 ratio of nitrogen directly available to algae and phosphate-phosphorus. At a ratio of 100:1, addition of phosphate combined with chelated trace elements stimulated O. agardhii. A. flos-aquae, which is probably able to fix molecular nitrogen, was stimulated by the addition of phosphate, chelated trace elements, or a combination. In five samples where O. agardhii responded to nitrogen or nitrogen plus trace elements, A. flos-aquae responded to nitrogen in only one case, probably due to its apparent nitrogen-fixing ability. Both algae were stimulated by the addition of trace elements, alone or in combination with phosphorus or nitrogen, in about half the surface water samples. (Lynch-Wisconsin)
W78-04794

INFLUENCE OF CYMOTHOIDAE (CRUSTACEA, ISOPODA, FLABELLIFERA) ON SOME HERMATOLOGICAL CONSTANTS OF THE HOST FISHES, (IN FRENCH),
Monpellier-2 Univ. (France). Lab. Physiology Invertebres.
B. Romestand, and J.-P. Trilles.
Z Parasitenkd 52(1), p 91-96, 1977.

Descriptors: Crustaceans, *Cymothoidae, Host fishes, *Hermatological constants, *Fish parasites, Anilocra-physodes, Boops-boops, Emetha-audouini, Maena-maena, Meinertia-oestroides, Pagellus-erythrinus.

Some hematological constants (number of erythrocytes-Hb rate-hematocrit-mean blood corpuscule volume-mean corpuscular Hb concentration-mean corpuscular Hb) were studied in nonparasitized and parasitized telost fishes (Boops boops, Maena maena, Pagellus eythrinus). The parasites are cymothoid isopods (Meinertia oestroides, Anilocra physodes, Emetha audouini). The parasitized fishes are anemic, resulting from a decreasing number of erythrocytes in circulation. The spleen undergoes hypertrophy and hypervascularization.--Copyright 1978, Biological Abstracts, Inc.
W78-04801

PROBLEMS RELATED TO WATER QUALITY AND ALGAL CONTROL IN LOPEZ RESERVOIR, SAN LUIS OBISPO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 5G.
W78-04802

A MODELING APPROACH FOR PREDICTING NUTRIENT INFLUENCES ON LAKES AND THEIR WATERSHEDS,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
S. A. Bucci, C. A. Carlozzi, and G. B. Oakland.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 312, Price codes: A03 in paper copy, A01 in microfiche.
Massachusetts Water Resources Research Center,

Amherst, Publication No. 81, August 1976. 32 p, 2 fig, 2 tab, 45 ref. OWRT A-071-MASS(1), 14-31-0001-5021.

Descriptors: Management, Lakes, Ecosystems, New York, *Model studies, Watersheds(Basins), *Nutrients, Mathematical models, Statistical models, Water pollution effects, Hydrological data, Dissolved solids, Chlorophyll, Phytoplankton, Chemicals, *Oneida Lake(NY).

Effective implementation of environmental management programs is hindered by an incomplete understanding of complex ecosystems and by insufficient analytical procedures to apply existing knowledge to real problems. With ecological information in a more tractable form, a resource manager will be able to elicit the important descriptor variables for the system (s)he administers. From these system descriptors, one can establish which variables can be manipulated physically, politically, and economically; and then incorporate the revised set of indicators into a unified management scheme. A model was developed for Oneida Lake, New York, which focused on the interchange among a number of dissolved chemical substances and chlorophyll a between October 1967 and August 1968. Various multivariate statistical techniques were used to analyze the nutrient effects on phytoplankton response. The resulting mathematical equation is an unbiased model for the lake system which reflects the interacting nature of its components and which has predictive capabilities. This modeling approach illustrates a procedure for incorporating the effect of variable interactions into a system's model and for eliciting key chemical descriptors in any lake system. It yields a usable, analytical tool for evaluating the present status of a lake and for predicting its future condition. (Lefferts-Mass)
W78-04814

ORGANIC CARBON AND DEOXYGENATION IN THE PAMLICO RIVER ESTUARY,
East Carolina Univ., Greenville, SC. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-04816

EFFECT OF SPRAY IRRIGATION OF MUNICIPAL WASTEWATER ON SOIL INVERTEBRATE POPULATIONS AND THE POTENTIAL INFLUENCE ON PHYSICAL FACTORS OF SOIL,
State Univ. of New York Coll. of Environmental Science and Forestry. Dept. of Environmental and Forestry Biology.
D. L. Dindal.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 355, Price codes: A03 in paper copy, A01 in microfiche. Center for Environmental Research, Cornell University, Ithaca, New York. Completion Report, December 1977. 26 p, 3 fig, 4 tab, 14 ref. OWRT B-048-NY(1). 14-31-0001-5130.

Descriptors: *Municipal wastewater irrigation, *Soil microarthropods, Earthworms, *Terrestrial invertebrate communities, Species diversity, Population dynamics, *Soil physical factors, Heavy metals, Waste water disposal, Water pollution effects.

Soil invertebrate samples were collected for three years from four effluent treated and untreated sites at The Pennsylvania State University. In general, the species diversity and populations of most soil microarthropods decreased on irrigated sites. This group of soil organisms is comprised of fungivores such as collembolans and oribatid mites, predators and fungivores represented by the prostigmatid mites and predaceous mesostigmatid mites. One taxon of mites, the fungivorous astigmatids, remained unchanged by treatment. This finding is important in irrigation studies since population increases in astigmatids on a site are indicative of anaerobic conditions. Total numbers and biomass of earthworms increased with treatment. Wastewater applications selected against two species and selected for seven species of earthworms. The latter is most dramatically seen on a mixed oak area where earthworms increased from zero on the control to 600 per square meter in treated stands. Earthworms on treated sites have no effect on soil bulk density changes, whereas, a direct relationship exists between worm biomass and soil porosity. Formation of specific sized water stable soil aggregates appears to be related to presence and population increases of specific species of earthworms. Although there is no gross trace metal uptake by earthworms and no heavy metal toxicity occurring as a result of irrigation, different earthworm types and life stages accumulate Cu, Zn and Cd in species specific concentrations.
W78-04818

RADIOECOLOGY,
Halsted Pres, division of John Wiley and Sons: New York, N. Y. Isreal Program for Scientific Translations: Jerusalem, Isreal, 1973. 371p. Klechkovskii, V.M., Polikarpov, G.G., Aleksakhin, R.M. (Ed.).

Descriptors: *Radioecology, Radioactivity, Dosimetry, Ecology, Fallout, Fish, Food chains, Forests, Genetics, Soils, Radioisotopes.

Described are: the behavior of natural radionuclides in soils; the behavior of artificial radionuclides in the atmosphere, their fallout and distribution on the earth's surface; aspects of the contamination of the soil-plant cover treatment of the behavior of radionuclides in soils; the peculiar behavior of radionuclides in forest stands; radioation conditions in the human environment and the effect of ionizing radiation on populations and cenoses with respect to radiation genetics. Other sections discuss some stuidies and aims of futher research concerned with the effect of oinizing radiation on forest biogenocenoses; dosimetric aspects of radioecology; migration of artificial radionuclides in biological and food chains with the participation of wild and farm animals; some aspects of the effect of ionizing radiation on animals; and various radioecological aspects of Far North landscapes. The radioecology of marine and freshwater plants and animals are studied as are various aspects of radionuclide migration in seas and oceans, including the part played by the form of radionuclides in water during their migraton in the aquatic environment and the buildup of artificial radionuclides in fish. Ten talbes and 58 figures (6 in color) are included throughout; each contribution ends with a detailed list of references. The book was translated from the Russian version published in 1971.--Copyright, 1974, Biological Abstracts Inc.
W78-04820

A NEW METHOD OF MONITORING WATER QUALITY IN A STREAM RECEIVING SEWAGE EFFLUENT, USING CHIRONOMID PUPAL EXUVIAE,
Bristol Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-04880

FACTORS AFFECTING MICRODISTRIBUTION OF STREAM BENTHIC INSECTS,
Idaho State Univ., Pocatello. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-04881

CONCENTRATION OF CADMIUM IN AQUATIC PLANTS AND ALGAL MASS IN FLOODED RICE CULTURE,
European Atomic Energy Community, Ispra (Italy). Biology Div.
P. Reiniger.
Environmental Pollution, Vol. 14, 1977, p 297-311 3 tab, 6 ref.

Descriptors: *Cadmium, *Heavy metals, Water pollution effects, *Aquatic plants, *Aquatic soil, Aquatic algae, Aquatic weed, *Rice, On-site-investigations, Water pollution, Water treatment, *Flooded rice soil, Bioaccumulation, Waste accumulation.

Concentrations of Cd in aquatic plants on a flooded rice soil contaminated with Cd, largely exceeded cadmium concentrations found in leaves and roots of rice plants. The accumulation of Cd by the algal mass was considerable, with a concentration factor of around 10,000 relative to the surface water. The quantity of Cd accumulated by the algal mass in a rice field may be comparable to that in the leaves of the rice plants. (Katz)
W78-04885

INHIBITED HATCHING SUCCESS OF MARINE FISH EGGS BY POWER PLANT EFFLUENT,
Occidental Coll., Los Angeles, CA. Dept. of Biology
K. E. Ehrlich.
Marine Pollution Bulletin, Vol. 8, No. 10, 1977, p 228-229. 1 tab, 5 ref.

Descriptors: *Thermal power plant, *Fish eggs, *Aquiculture, Water pollution effects, Fish physiology, *Fish reproduction, On-site-investigation, Laboratory tests, California, Marine fish, Cooling water, *Electric power, Effluents, *California Grunion, Leuresthes tenuis, Nonthermal component, Hatching success.

The hatching success of California grunion (Leuresthes tenuis) was significantly reduced by a non-thermal component of the effluent from an electricity generating station. The embryos appeared to develop normally morphologically but showed reduced viability with respect to hatching. (Katz)
W78-04886

TRACE METALS IN SCALLOPS FROM WITHIN AND AROUND TWO OCEAN DISPOSAL SITES,
Environmental Protection Agency, Narragansett, RI.
G. Pesch, B. Reynolds, and P. Rogerson.
Marine Pollution Bulletin, Vol. 8, No. 10, 1977, p 224-228. 2 tab, 6 fig, 13 ref.

Descriptors: *Metals, Water pollution effects, Delaware, New Jersey, Marine, Waste disposal, *Silver, *Aluminum, *Cadmium, *Cobalt, *Chromium, *Copper, *Iron, *Manganese, *Nickel, *Lead, *Zinc, *Titanium, Atlantic Ocean, Toxicity, Path of pollutants, Currents(Water), *Vanadium, Scallops, *Sea scallop tissues, *Metal distribution.

The areal distributions of the concentrations of 13 metals in sea scallop tissues were examined in the vicinity of two ocean disposal sites located off the U.S. mid-Atlantic coast. Patterns of metals distribution show that: (1) Five specific metals may be used as identification tags for individual wastes disposed at the two sites, and (2) disposed materials tend to be transported by currents south and southwest from the disposal sites, and (3) biological availability and potential toxicity of metals pose a threat to marine biota. (Katz)
W78-04887

FISH TOXICITY OF JET FUELS--I. THE TOXICITY OF THE SYNTHETIC FUEL JP-9 AND ITS COMPONENTS,
California Univ., Berkeley. Sanitary Engineering Research Lab.
D. Jenkins, S. A. Klein, and R. C. Cooper.
Water Research, Vol. 11, p 1059-1067, 1977. 8 fig, 6 tab, 10 ref.

Descriptors: *Fuels, *Toxicity, *Freshwater fish, *Shiners, *Rainbow trout, Oil wastes, Laboratory tests, Bioassay, Lethal limit, Growth stages, Environmental effects, Salmonids, Trout, Mortality, *Jet fuels, Fuel JP-9, *Flagfish, *Golden shiner, RJ-4, RJ-5, MCH, Bioaccumulation.

The toxicity of the jet fuel JP-9 and its components RJ-4, RJ-5 and MCH was assessed in static bioassays on the warm water fish, golden shiner (Notemigonus chrysoleucas). As determined by the 96-h LC50 values unemulsified fuel JP-9 was 235 times less toxic, RJ-4 was 196 time less toxic, RJ-5 was 7700 times less toxic and MCH was 3.3 times less toxic than the corresponding emulsified materials. In continuous flow bioassays with the water soluble fraction of the fuel and its components the effect on egg hatchability and fry development of flagfish (Jordanella floridae) and rainbow trout (Salmo gairdneri) was studied. The accumulation of fuels in fish bodies was studied and it was found that flagfish can tolerate a total body burden of 0.5 mg MCH wet weight without lethality. It was also found that body burdens of 0.43 mg RJ-4 and 0.27 mg RJ-5 on a wet weight basis will produce 50% mortality in rainbow trout. Voiding of MCH from fish bodies occurs readily in fuel-free water, but RJ-4 and RJ-5 were retained in the tissues. (Klein)
W78-04888

TOLERANCE OF ESTUARINE BENTHIC DIATOMS TO HIGH CONCENTRATIONS OF AMMONIA, NITRITE ION, NITRATE ION AND ORTHOPHOSPHATE,
Groningen Rijsuniversiteit (Netherlands). Dept. of Systematic Botany.
W. Admiraal.
Marine Biology, Vol. 43, p 307-315, 1977. 4 fig, 4 tab, 28 ref.

Descriptors: *Diatoms, *Primary productivity, *Nitrogen compounds, *Phosphate, *Ammonia, *Nitrates, *Nitrites, *Growth rates, Estuaries, Benthos, Hydrogen ion concentration, Photosynthesis, Water quality, Laboratory tests, Marine algae, *Orthophosphates, The Netherlands.

Ten species of benthic diatoms were cultured unialgally in synthetic media with various concentrations of ammonia ($NH_4^+ + NH_3$), nitrite ion, nitrate ion, and orthophosphate. Most of the species grew well in media with very high concentrations of nitrite ion (1 to 10 mg-at N l-1), nitrate ion (about 16.9 mg-at N l-1) and orthophosphate (at least 0.9 mg-at P l-1). Ammonia concentrations higher than 0.5 mg-at N l-1 inhibited growth of the cultures. The rate of photosynthesis of diatoms from the field and from cultures was also inhibited by 0.5 mg-at N l-1 of ammonia under certain conditions. Inhibition of photosynthesis by ammonia was strongly enhanced by high irradiance and high pH. It was unlikely that nitrite ion, nitrate ion, and orthophosphate attained concentrations high enough to be inhibitory in the field, but concentrations of ammonia may have been high enough for inhibition to occur. A clear relationship between sensitivity of the diatoms and their occurrence on more or less polluted mudflats was not found. (Klein)
W78-04889

MERCURY STRESS ON JUVENILE BAY SCALLOPS, ARGOPECTEN IRRADIANS, UNDER VARIOUS SALINITY TEMPERATURE REGIMES,
National Marine Fisheries Service, Milford, CT. Milford Lab.
D. A. Nelson, A. Calabrese, and J. R. MacInnes.
Marine Biology, Vol 43, p 292-297, 1977. 2 fig, 2 tab, 13 ref.

Descriptors: *Mercury, *Salinity, *Temperature, *Toxicity, Juvenile Growth Stage, Thermal stress, Invertebrates, Shellfish, Mollusk, Water quality, Laboratory tests, *Bioassay, Argopecten irradians, *Scallops, Bay scallops.

Survival of Juvenile bay scallops after 96 h of exposure to mercury at various salinity and temperature regimes was studied. Scallop survival was significantly affected by mercury concentration and by salinity, as well as by the interaction between temperature and concentration and between temperature and salinity. Toxicity of mercury at low concentrations was enhanced by high temperature and low salinity, whereas at high mercury concentrations this effect diminished. (Klein)
W78-04891

THE EFFECTS OF FREE CHLORINE AND CHLORAMINE ON GROWTH AND RESPIRATION RATES OF LARVAL LOBSTERS (HOMARUS AMERICANUS),
Woods Hole Oceanographic Institution, MA.
J. M. Capuzzo.
Water Research, Vol 11, p 1021-1024, 1977. 3 fig, 3 tab, 12 ref.

Descriptors: *Chlorine, *Organic compounds, *Lobsters, *Metabolism, *Growth rates, *Respiration, *Larval growth stage, Invertebrates, Laboratory tests, Larvae, Growth stages, Crustaceans, Aquatic life, Bioassay, *Chloramine.

The length, dry weight and standard respiration rate of larval lobsters were monitored for 19 days following a 60 min exposure at 25C to 1.0 mg/l applied free chlorine and 1.0 mg/l applied chloramine. Compared to control organisms, significantly lower increases in dry weight and significant reductions in standard respiration rates were measured among exposed organisms; greater differences were detected among chloramine exposed organisms. From these results it was concluded that acute exposure to either free chlorine or chloramine resulted in subsequent reductions in growth and metabolic activity of larval lobsters. (Klein)
W78-04892

EFFECTS OF NATURALLY OCCURRING AQUATIC ORGANIC FRACTIONS ON CADMIUM TOXICITY TO SIMOCEPHALUS SERRULATUS (DAPHNIDAE) AND GAMBUSIA AFFINIS (POECILIIDAE),
Savannah River Ecology Lab., Aiken, SC.
J. P. Giesy, Jr., G. J. Leversee, and D. R. Williams.
Water Research, Vol 11, p 1013-1020, 1977. 5 tab, 55 ref.

Descriptors: *Cadmium, *Toxicity, Water quality, *Daphnia, *Livebearers, *Organic compounds, *Ions, Analytical techniques, Chemical analysis, Ponds, Wells, Chemistry, Invertebrates, Zooplankton, Fish, Bioassay, Binding capacity, Musguito fish, Ganbusia, LC 50, Cadmium binding capacity.

Cadmium toxicity to Simocephalus serrulatus and Gambusia affinis in soft well water, highly organic pond water well water containing various organic fractions isolated from pond water was determined and compared to Cd binding capacity of each water type. Pond organics were separated into three nominal molecular diameter fractions using ultrafiltration. Cadmium binding capacity was determined using selective ion electrodes. Pond water and organic fractions bound Cd, reducing the amount of free Cd 2+ as determined by Cd selective ion electrode. Whole pond water reduced Cd toxicity to S. serrulatus but had little effect on Cd toxicity to G. affinis. The three larger molecular diameter organic fractions reduced Cd toxicity to S. serrulatus, while the smallest fraction slightly increased Cd toxicity. Cadmium 96-h LC50 values could be predicted from Cd binding capacities determined by selective ion electrode. (Klein)
W78-04893

TOXICITY OF CHLORINE TO JUVENILE SPOT, LEIOSTOMUS XANTHURUS,
Environmental Research Lab., Gulf Breeze, FL.; and Environmental Research Lab., Narragansett, RI.
D. P. Middaugh, A. M. Crane, and J. A. Couch.
Water Research, Vol 11, p 1089-1096, 1977. 9 fig, 1 tab, 25 ref.

Descriptors: *Chlorine, *Toxicity, *Resistance, *Juvenile growth stage, Fish, *Temperature, *Thermal stress, Estuaries, Bioassay, Lethal limit, Effluents, Water quality, Laboratory tests, Chlorination, Environmental effects, Tissue analysis, *Spot, Bioaccumulation, Leiostomus xanthurus, Sensitivity, Histopathology, Avoidance tests, Histology.

The sensitivity of juvenile spot to total residual chlorine (TRC) in flowing seawater was investigated. Incipient LC50 bioassays, histopathology, avoidance tests and the combined effect of thermal stress and TRC were used to assess sensitivity. Estimated incipient LC50 values were 0.12 mg 1-1 TRC at 10C and 0.06 mg 1-1 TRC at 15C. Histological examination of spot used in the incipient LC50 bioassay at 15C and sacrificed while alive indicated pseudobranch and gill damage occurred in individuals exposed to a measured TRC concentration of 1.57 mg 1-1. Spot exposed to lower concentrations of TRC, 0.02-0.06 mg 1-1 at 15C and sacrificed alive showed no consistent tissue damage. Spot demonstrated temperature dependent avoidance responses to TRC. At 10C, a concentration of 0.18 mg 1-1 was required for significant avoidance; at 15 and 20C, spot showed significant avoidance of TRC concentrations as low as 0.05 mg 1-1. Simultaneous exposure of spot to thermal stress (5, 10 or 13C above the acclimation temperature of 15C) at measured TRC concentrations of 0.05, 0.07 and 0.34-0.52 mg 1-1 demonstrated a significant increase in sensitivity to TRC with increased temperature and exposure times for some of the groups tested. (Klein)
W78-04895

THE ACUTE TOXICITY OF SIX MONOCYCLIC AROMATIC CRUDE OIL COMPONENTS TO STRIPED BASS (MORONE SAXATILIS) AND BAY SHRIMP (CRAGO FRANCISCORUM),
National Marine Fisheries Service, Tiburon, CA. Tiburon Lab.
P. E. Benville, Jr., and S. Korn.
California Fish and Game, Vol 63, No 4, p 204-209, 1977. 2 tab, 18 ref.

Descriptors: *Organic compounds, *Toxicity, *Aromatic compounds, *Oil, *Striped bass, *Shrimp, Laboratory tests, *Bioassay, Mortality, Lethal limit, Sea basses, Marine fish, Crustaceans, Water quality, Analytical techniques, Gas chromatography, *Oil, Oil pollution, *Bay shrimp, Morone saxatilis, Crago franciscorum, *Benzene, *Toluene, *Ethylbenzene, *P-xylene, *M-xylene, *O-xylene.

The acute toxicities of benzene, toluene, ethylbenzene, p-xylene, and o-xylene were determined for striped bass and bay shrimp by static bioassay. The 96-h LC50's ranged from 2.0 to 11 micro 1/1 (ppm), for striped bass and from 0.49 to 20 micro 1/1 (ppm) for bay shrimp. Solubilities of these aromatics were determined by gas chromatography in 16C seawater with a salinity of 25 o/oo as part of the procedure for dosing the animals. The solubilities were 1400, 330, 180, 180, 210, and 230 micro 1/1 (ppm), respectively, which was high enough to be lethal to striped bass and bay shrimp. The toxic effect of the aromatics was more latent in shrimp than in fish as demonstrated by the difference in the 24- and 96-h tests. (Klein)
W78-04896

ABSORPTION OF IRON AND GROWTH OF HYDRILLA VERTICILLATA (L.F.) ROYLE,
Florida Univ., Gainesville. Inst. of Food and Agricultural Sciences.

F. M. Basiouny, L. A. Garrard, and W. T. Haller.
Aquatic Botany, Vol 3, p 349-356, 1977. 3 fig, 1 tab, 24 ref.

Descriptors: Aquatic plants, *Iron, *Growth rates, *Absorption, Nutrients, Chlorophyll, Plant tissues, Plant physiology, Metabolism, Nutrient requirements, Laboratory tests, Biomass, Plant growth, Manganese, Tissue analysis, Bioaccumulation, *Hydrilla verticillata, *FeEDTA.

Increasing levels of FeEDTA to the nutrient solution in which Hydrilla verticillata was growing resulted in changes in the overall growth and development of the plants. Tissue levels of Fe and chlorophyll increased as Fe levels in the nutrient solution were increased from 0 to 8.0 ppm. Hydrilla absorbed and accumulated Fe in much larger amounts than were required for its optimum growth. The highest tissue Fe concentration was obtained with 6.0 ppm Fe in the growing medium. However, the best growth was obtained at 8 ppm Fe. Increasing levels of Fe in the nutrient solution resulted in progressive decrease in Mn uptake by the plants. Under the conditions of this study, best growth and greatest dry weight of Hydrilla were obtained at an exceptionally high Fe/Mn ratio (85). (Klein)
W78-04897

CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH-DENSITY CATFISH CULTURES,
Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.
For primary bibliographic entry see Field 5B.
W78-04898

GAS-LIQUID CHROMATOGRAPHY DETERMINATION OF RESIDUES OF METHANESULFONATE OF META-AMINOBENZOIC ACID ETHYL ESTER IN FISH,
Fish and Wildlife Service, Warm Springs, GA. Southeastern Fish Control Lab.
For primary bibliographic entry see Field 5A.
W78-04899

UPTAKE, METABOLISM AND EXCRETION OF THE MOLLUSCICIDE N-TRITYLMORPHOLINE BY THE TROPICAL FOOD FISH SAROTHERODON MOSSAMBICUS (PETERS),
Centre for Overseas Pest Research, London (England).
P. Matthiessen.
Journal of Fish Biology, Vol. 11, p 497-509, 1977. 7 fig, 1 tab, 15 ref.

Descriptors: *Toxicity, *Metabolism, *Molluscicides, Absorption, Pesticides, Fish physiology, Path of pollutants, Laboratory tests, Analytical techniques, Environmental effects, Fish, Bioaccumulation, Excretion, *N-trityl-morpholine(Frescon), *Sarotherodon mossambicus, Tissue analysis, *Tropical food fish.

Uptake, metabolism, and excretion of radiolabelled N-tritylmorpholine (Frescon) were studied in the tropical food fish Sarotherodon mossambicus. After 55 h exposure to sub-lethal solutions, concentration factors in the whole fish were as high as 1300 (up to 40 mg/kg), at least 80% of the absorbed activity being unchanged Frescon. Approximately 40% of this activity was found in bone, 16% in gut, 16% in muscle, and 10% in gill. The bile was found to be a route of Frescon excretion, and recovering fish excreted 50% of the absorbed activity in 55 h. The applicability of these results to the field situation was discussed. (Klein)
W78-04900

GROWTH OF THE CARRAGEENAN-PRODUCING TROPICAL RED SEAWEED HYPNEA MUSCIFORMIS IN SURFACE WATER, 870 M DEEP WATER, EFFLUENT FROM A CLAM MARICULTURE SYSTEM, AND IN DEEP WATER ENRICHED WITH ARTIFICIAL FERTILIZERS OR DOMESTIC SEWAGE,
Lamont-Doherty Geological Observatory, Palisades, NY.
K. C. Haines.
In: 10th European Symposium on Marine Biology, Ostend, Belgium, Vol. 1, p 207-220, 1975. 8 fig, 4 tab, 8 ref.

Descriptors: *Rhodophyta, *Growth rates, *Primary productivity, *Plant growth, *Nutrition requirements, Ammonia, Aquatic plants, Effluents, Algae, Water types, Metabolism, Nitrates, Phosphates, Nutrients, Iron, Metals, Vitamins, Carbon, Nitrogen, Aquiculture, *Marine algae, *Hypnea musciformis, Tissue analysis, Carrageenan.

Growth of Hypnea musciformis in the effluent of an upwelling mariculture system on St. Croix, Virgin Islands, in which 870 m deep water was used to grow planktonic algae which were then fed to bivalve shellfish, was about five times faster than growth in unaltered deep water and about 3 times faster than in surface seawater. Growth was positively correlated with ammonia concentration in the water supplied to the seaweed, but there was no correlation with nitrate or phosphate concentration. The growth stimulation by the effluent from the shellfish mariculture system was achieved by enriching deep water with ammonia plus a chelated iron-trace metals-vitamins mix, but was not achieved by enriching the deep water with ammonia alone or with chelated mixture alone. Increasing the ammonia supply while keeping the chelated mixture constant produced an increasing growth rate. Enrichment of deep water with 4% primary-treated sewage and 35% secondary-treated sewage also increased growth of H. musciformis relative to its growth in deep water alone. Carbon, nitrogen, and carrageenan contents of the seaweed grown under various nutritional conditions were presented. (Klein)
W78-04902

ON THE DISTRIBUTION OF PARTICULATE METALS, CHLOROPHYLL AND SESTON IN THE BALTIC SEA,
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 5B.
W78-04904

THE PERSISTENCE OF CHRONICALLY ACCUMULATED HYDROCARBONS IN THE HARD SHELL CLAM MERCENARIA MERCENARIA,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
P. D. Boehm, and J. G. Quinn.
Marine Biology, Vol 44, 1977, p 227-233. 1 tab, 2 fig, 30 ref.

Descriptors: *Oil, *Oil pollution, Water pollution effects, On-site-investigations, *Mollusks, *Clams, Animal biochemistry, Persistence, Rhode Island, Animal physiology, Path of pollutants, Commercial fishing, *Commercial shellfish, *Aquiculture, Laboratory tests, Monitoring, *Petroleum hydrocarbons, Hard shell clams, *Narragansett Bay(RI), Providence River(RI), *Hydrocarbon depuration, *Hydrocarbon persistence.

Hard shell clams from the chronically polluted environment of the Providence River, USA, were transferred to a clean laboratory system located in lower Narrangasett Bay, Rhode Island. The hydrocarbon contents of these transplanted clams were monitored for 120 days after transfer. After this period only slight depuration had occurred. A 41.9 microg g wet weight -1 average initial hydrocarbon burden decreased to 29.3 microg g-1, a decrease that became statistically significant (P less than 0.1) only after 120 days. At most, only 30% of the clams' hydrocarbons were lost. These findings indicate that the duration of the exposure period and the chemical nature of the source hydrocarbons are both instumental in determining the persistence of these compounds in filter feeding bivalves. Chronically accumulated petroleum hydrocarbons are strongly retained by the organisms and are only very slowly depurated. (Katz)
W78-04905

INCREASES OF CD AND THE CD:ZN RATIO IN THE HIGH MOLECULAR WEIGHT PROTEIN POOL FROM APPARENTLY NORMAL LIVER OF TUMOR-BEARING FLOUNDERS (PAROPHYRS VETULUS),
British Columbia Univ., Vancouver. Inst. of Oceanography.
D. A. Brown.
Marine Biology, Vol 44, 1977, p 203-209. 3 tab, 2 fig, 53 ref.

Descriptors: *Cadmium, *Zinc, *Metals, *Marine fish, Commercial fish, *Fish diseases, *Animal pathology, Animal physiology, Fish physiology, Toxicity, Public health, Proteins, Water pollution effects, Path of pollutants, *Copper, *Flounders, Parophrys vetulus, Cadmium:Zinc ratio, Liver, Tumors, Tumor-bearing flounders, Heavy metal levels, High molecular weight proteins, Nucleic acid metabolism.

It is evident from previous studies that heavy metal levels are changed in tumor-bearing organisms relative to nontumor-bearing organisms, particularly in apparently normal liver tissue. This study considered the possible role of metallothioneins in binding excess Cd, Cu or Zn in the liver of tumor-bearing flounders (Parophrys vetulus). Cadmium and zinc were not increased significantly on the metallothionein peak, but were increased 3.3- and 2.4-fold, respectively, on the high molecular weight protein peak. In addition, the Cd:Zn ratio was increased by 40% on the high molecular weight protein peak. Results are discussed in terms of competition of Cd and Zn for Zn-requiring enzymes involved in nucleic acid metabolism. Possible reasons for excess Cd occurring on the high molecular weight protein peak rather than on the metallothinein peak are discussed. Copper levels did not change. (Katz)
W78-04906

ZINC AND CADMIUM IN THE PACIFIC HAKE MERLUCCIUS PRODUCTUS OFF THE WESTERN U.S. COAST,
Oregon State Univ., Corvallis. School of Oceanography.
J. R. N. Cutshall, and W. G. Pearcy.
Marine Biology, Vol 44, 1977, p 195-201. 3 tab, 2 fig, 24 ref.

Descriptors: *Zinc, *Cadmium, *Metals, Water pollution effects, Path of pollutants, Heavy metals, Marine fish, *Commercial fish, Commercial fishing, Fish food organisms, Marine animals, Washington, Oregon, California, *Public health, Biochemistry, Fish physiology, *Puget Sound(Wash), Euphausiids, *Pacific hake, Merluccius productus, Muscle tissue concentration.

Concentrations of zinc and cadmium in muscle tissue or whole Pacific hake, Merluccius productus (Ayres), increase with increasing total wet weight, especially for smaller fish. These trends appear to be related to the euphausiid diet of hake. Except for the isolated population in Puget Sound, no relationship between zinc or cadmium concentration and collection site is apparent. (Katz)
W78-04907

VIABILITY OF EMBRYOS OF THE WINTER FLOUNDER PSEUDO-PLEURONECTES AMERICANUS EXPOSED TO COMBINATIONS OF CADMIUM AND SALINITY AT SELECTED TEMPERATURES,
Environmental Research Lab., Narragansett, RI.

R. A. Voyer, C. E. Wentworth, Jr., E. P. Barry, and R. J. Hennekey.
Marine Biology, Vol 44, (1977), p 117-124, 5 tab, 1 fig, 121 ref.

Descriptors: *Cadmium, *Metals, Salinity, Water temperature, *Bioassay, Methodology, *Toxicity, Fish eggs, Aquiculture, Fish physiology, Fish reproduction, Juvenile fish, Water pollution effects, Laboratory tests, Marine fish, *Winter flounder, Flatfish, Pseudopleuronectes americanus, Fifty percent hatches, Fish embryos, Embryo viability.

Developing eggs of the winter flounder were exposed to 9 combinations of cadmium and salinity at 5 and 10C. Overall mean times to 50% hatch ranged from 7.7 days at 10C to 17.9 days at 5C. Mean percentages of total hatches ranged from 50 to 100% for all treatment combinations. Response-surface analyses indicate percentages of viable hatches were generally lowest at 10o/oo S and highest in the 25 to 30o/oo S range. Regression analyses of viable hatch data show that at both temperatures cadmium significantly influenced viable hatch in all experiments. Viable hatch was alsio significantly influenced by the linear and quadratic effect of salinity in both tests at 5C and in 2 of 3 tests at 10C. The interaction between cadmium and salinity also significantly affected viable hatch at 10C. (Katz)
W78-04908

SYNERGISTIC EFFECTS OF LEAD, SALINITY, AND TEMPERATURE ON EMBRYONIC DEVELOPMENT OF THE MUSSEL MYTILUS GALLOPROVINCIALIS,
Institut Rudjer Boskovic Rovinj (Yugoslavia). Center for Marine Research.
M. Hrs-Brenko , C. Claus, and S. Bubic.
Marine Biology, Vol 44, (1977), p 109-115. 3 tab, 8 fig, 17 ref.

Descriptors: Bioassay, *Methodology, *Heavy metals, *Lead, *Salinity, *Mussels, Bivalves, Water temperature, Growth stages, Larvae, Laboratory tests, Water pollution effects, Spawning, *Statistical methods, Mollusks, *Embryonic development, *Adriatic Sea, *Synergistic effects, Mytilus galloprovincialis, *Factorial design.

Combined effects of lead, salinity and temperature on the embryonic development of the mussel Mytilus galloprovincialis Lmk. were studied under laboratory conditions. The basic experimental design used 4 lead concentrations (100, 250, 500, and 1000 ppb Pb2+) and 6 salinity levels (from 25 to 37.5o/oo with 2.5o/oo intervals). These factorial designs were carried out at three constant temperatures (15, 17.5, and 20C). The statistical analysis indicated that salinity changes have more effect on the embryonic development than temperature. Optimal development was observed at 34.8o/oo and 15.6C, which is in accordance with observations in the field. The effect of lead was minimal in optimal salinity and temperature conditions. The deleterious effect of lead on the embryonic development was especially conspicious at 20C. Under experimental conditions, lead caused a delay or inhibition of the embryonic development with the occurrence of a large number of abnormal larvae. (Katz)
W78-04909

DEVELOPMENT OF NORTH SEA COASTAL PLANKTON COMMUNITIES IN SEPARATE PLASTIC BAGS UNDER IDENTICAL CONDITIONS,
Central Lab. TNO., Helder (Netherlands). Dept. of Marine Ecology.
J. Kuiper.
Marine Biology, Vol 44, 1977, p 97-107. 11 fig, 33 ref.

Descriptors: *Methodology, On-site investigation, Laboratory tests, *Plankton, *Phytoplankton, *Zooplankton, Marine algae, Laboratory equipment, Marine biology, Water pollution effects, Populations, Plant populations, *Nutrients, Animal populations, Copepods, Chlorophyll, Nitrates, Nitrites, Phosphates, *North Sea, Marine waters, *Coastal plankton communities, Dominant zooplankton, Den Helder, Netherlands, Dominant phytoplankton.

In two experiments lasting 4 to 6 weeks, communities of North Sea coastal plankton kept in separate plastic bags (of about 1400 l) and exposed to the same environmental conditions showed very similar patterns of growth and decline. This result means that the method is suitable for the evaluation of toxic effects of environmental pollutants at low concentrations on complex plankton systems. The phytoplankton in the bags produced a succession of blooms, which were probably limited by shortage of nutrients. The dominant zooplankton organisms were various species of copepods which can develop in the bags from egg to adult. Strong indications were found that mineralization of organic matter occurs in the bags. (Katz)
W78-04910

ABSENCE OF PIGMENTATION IN CORIXID BUGS (HEMIPTERA) AFTER THE USE OF THE AQUATIC HERBICIDE DICHLOBENIL,
Ministry of Agriculture, Fisheries, and Food, London (England). Salmon and Freshwater Fisheries Lab.
T. E. Tooby, and D. J. Macey.
Freshwater Biology, Vol 7, 1977, p 519-529. 2 tab, 1 fig, 21 ref.

Descriptors: *Herbicides, Insects, Aquatic insects, Aquatic animals, Benthos, Aquiculture, *Fish food organisms, Water pollution effects, Path of pollutants, *Invertebrates, Juvenile growth stage, *Pigments, *Corixid bugs, *Sigara dorsalis, Aquatic herbicides, *Dichlobenil, Nymphs, Adult insects, Tissue residues, *Depuration, Pigmentation.

Unpigmented nymphs and adults of the corixid bugs Sigara dorsalis and Corixa punctata were found in ponds treated with the aquatic herbicide dichlobenil. Tissue residues accumulated rapidly in nymphs exposed to dichlobenil, and pigmentation was inhibited during ecdysis. However, dichlobenil residues were rapidly eliminated from the tissues of unpigmented nymphs placed into clean water, and pigmentation returned during the following ecdysis. (Katz)
W78-04911

APPRAISAL OF A REFERENCE TOXICANT FOR ESTIMATING THE QUALITY OF OYSTER LARVAE,
Washington State Dept. of Fisheries, Brinnon. Shellfish Lab.-Point Whitney.
For primary bibliographic entry see Field 5A.
W78-04912

ACCLIMATION AND REARING OF STRIPED BASS LARVAE IN SEA WATER,
California State Dept. of Fish and Game, San Diego, La Jolla.
K. Lal, R. Lasker, and A. Kuljis.
California Fish and Game, Vol 63, No 4, p. 210-218, 1977. 5 tab, 16 ref.

Descriptors: *Sport fish, *Larval growth stage, *Growth stages, *Growth rates, *Mortality, Fish hatcheries, Fish management, *Fish eggs, *Salt tolerance, Salinity, *Saline water, *Striped bass, Bioassay, Acclimation, *Salinity tolerance.

Results on salinity tolerance of striped bass eggs showed higher survival of larvae in salinities was further enhanced by acclimating 1-day-old larva instead of eggs. Larvae were rapidly acclimated to full sea water within 1 month and reared successfully under laboratory conditions for a period of 15 months. The average and maximum growth compared favorably with that found in natural waters. (Katz)
W78-04913

A SURVEY ON THE MERCURY CONTENT OF THE PERSIAN GULF SHRIMP,
Tehran Univ. (Iran). Dept. of Food Hygiene.
For primary bibliographic entry see Field 5A.
W78-04914

EFFECTS OF SUBLETHAL CONCENTRATIONS OF LIGNOSULPHONATES ON GROWTH, INTESTINAL FLORA AND SOME DIGESTIVE ENZYMES OF RAINBOW TROUT (SALMO GAIRDNERI),
National Veterinary Inst. Oslo (Norway).
S. O. Roald.
Aquaculture, Vol 12, p. 327-335, 1977. 2 fig, 3 tab, 23 ref.

Descriptors: *Rainbow trout, *Growth rates, *Enzymes, *Digestion, *Animal metabolism, Fish physiology, *Pulp wastes, *Lignins, *Toxicity, Bacteria, Industrial wastes, Pulp and paper industry, *Lignosulphonates.

Young rainbow trout were exposed to lignosulphonates at various concentrations. The higher concentrations had the most retarding effect on growth, but a clear general relationship between lignosulphonate concentrations and growth retardation was not observed. There was no significant difference in quantitative or qualitative composition of the intestinal flora of the different groups. A possible connection between the reduced growth rates and depressed activities of the digestive enzymes was also discussed. (Katz)
W78-04915

ORGANOCHLORINE RESIDUES IN FISH AND FISHERY PRODUCTS FROM THE NORTHWEST ATLANTIC,
Fisheries and Marine Service, Halifax (Nova Scotia).
For primary bibliographic entry see Field 5B.
W78-04916

MANAGEMENT OF MAN-MADE EUTROPHICATION: THE SWEDISH CONCEPT,
Association of Swedish Chemical Industries, Stockholm (Sweden).
For primary bibliographic entry see Field 5G.
W78-04917

ORGANIC COMPOUNDS IN AN INDUSTRIAL WASTEWATER: A CASE STUDY OF THEIR ENVIRONMENTAL IMPACT,
Massachusetts Inst. of Tech. Cambridge. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W78-04918

ACCUMULATION OF AROMATIC HYDROCARBONS IN TISSUES OF PETROLEUM-EXPOSED MALLARD DUCKS (ANAS PLATVRHVNCHOS),
New Orleans Univ., LA. Center for Bio-Organic Studies.
G. C. Lawler, W-A. Loong, and J. L. Laseter.
Environmental Science and Technology, Vol 12, No 1, p 51-54, 1978. 3 fig, 1 tab, 20 ref.

Descriptors: *Oil, Spills, *Oil pollution, *Organic compounds, *Aromatic compounds, *Mallard duck, *Absorption, *Water birds, Animal metabolism, Gas chromatography, Mass spectrometry, South Louisiana crude, Aromatic petroleum, Hydrocarbons, Squaleve, Biphenyl.

Mallard drakes were dosed with 5 mL a day of crude oil for 14 days. Petroleum aromatics were found in every experimental tissue analyzed. The skin and underlying adipose tissue had far more accumulated aromatic hydrocarbons than the other tissues, which included: liver, breast muscle, brain, uropygial gland, and blood. Aromatic hydrocarbons did not accumulate in the same relative concentrations as found in the crude oil. The more toxic 2 and 3 condensed ring aromatics were accumulated to a greater extent than the alkylbenzenes. (Katz)
W78-04919

ACCUMULATION OF SATURATED HYDROCARBONS IN TISSUES OF PETROLEUM-EXPOSED MALLARD DUCKS (ANAS PLATVRHVNCHOS),
New Orleans Univ., LA. Center for Bio-Organic Studies.
For primary bibliographic entry see Field 5A.
W78-04920

NITROGEN CYCLING IN A MARINE PLANKTONIC FOOD CHAIN: NITROGEN FLUXES THROUGH THE PRINCIPAL COMPONENTS AND THE EFFECTS OF ADDING COPPER,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
W. G. Harrison, and J. M. Davies.
Marine Biology, Vol. 43, p 299-306, 1977. 3 fig, 4 tab, 26 ref.

Descriptors: *Nitrogen, *Nitrogen cycle, *Copper, *Heavy metals, *Zooplankton, *Food chains, *Nitrates, *Tracers, *Ammonium compounds, *Copepods, Plankton, Seston, Radioactivity techniques, Water pollution effects.

Nitrogen cycling in a natural planktonic food chain was followed before and after perturbation by copper. It was apparent from this analysis that gross features of the cycling of nitrogen through a planktonic food chain, particularly at the herbivore level, can be significantly altered by the introduction of copper (at 10 micrograms/L-1 concentration into the systems. The overall effect depended largely upon the importance of the zooplankton components and their fluxes to the total nitrogen-cycling. (Katz)
W78-04921

EFFECTS OF DDT AND POLYCHLORINATED BIPHENYLS ON CELLULAR METABOLISM AND ULTRASTRUCTURE OF CRITHIDIA FASCICULATA, A FLAGELLATED PROTOZOAN,
Armed Forces Radiobiology Research Inst., Bethesda, MD.
J. E. French, and J. F. Roberts.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 507, Price codes: A02 in paper copy, A01 in microfiche. AFRRI Scientific Report SR76-31, 1976. 26 p, 10 fig, 1 tab, 32 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclors, *DDT, *Pesticide toxicity, *Cytological studies, *Growth rates, *Radiochemical analysis, *Protozoa, Chlorinated hydrocarbon pesticides, Pesticides, Toxicity, Metabolism, Population, Animal physiology, *Mitochondria, *Nucleic acids, Crithidia.

DDT and polychlorinated biphenyls (PCB's) have been shown to be toxic to Crithidia fasciculata by inhibition of cell population growth. These results suggested that further studies were required for understanding the cell population growth inhibition. Energy metabolism, protein and nucleic acid biosynthesis, and ultrastructure were chosen as indices for determining the metabolic sites of the inhibition. Ultrastructural changes induced by these compounds included cellular and mitochondrial swelling, disruption of the mitochondrial genophore, and failure of the mitochondrion to replicate in synchrony with cell division. It is concluded that the initial DDT or PCB inhibition of nucleic biosynthesis and subsequent loss of cell regulatory capacity causes the decrease in cell population growth. (Katz)
W78-04922

LIMNOLOGY OF SHALLOW WATERS, SYMPOSIA BIOLOGICA HUNGARICA, VOL. 15,
Tihany, Hungary, Sept. 3-8, 1973. 303 p, Akademiai Kiado: Budapest, Hungary, 1975. $19.00. Salanki, J., Ponyi, J. E. (Ed.).

Descriptors: Bacteria, Biological communities, Hungary, *Limnology, Phytoplankton, *Primary production, Rotifers, *Shallow waters, Conferences, Yugoslavia, Zooplankton, Lakes, Water pollution, Ecosystems.

Production processes in shallow water ecosystems are examined. The 1st group of papers focuses on primary production. Production was studied in Lake Balaton (Hungary), Lake Tahoe (USA), Lake Warniak (Poland), the Masurian lakes of Poland, Lake Szelid (Hungary) and the lake at Palic (Yugoslavia). The 2nd group of articles study secondary production, including the effect of fluctuating temperatures on palnkton rotifers; zooplankton biomass; characteristics of bacteria and plankton in Lake Castoria (Greece); macrofaunal biomass in Lake Velence (Hungary); and participation of bacteria in organic production in Lake Ohrid (Yugoslavia). Effects of pollution and protection of water ecosystems are considered in many articles.--Copyright 1975, Biological Abstracts, Inc.
W78-04927

THE EFFECTS OF SECONDARILY TREATED SEWAGE EFFLUENT ON THE WILLIMANTIC/SHETUCKET RIVER,
Connecticut Univ., Storrs. Biological Sciences Group.
L. Klotz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 539, Price codes: A05 in paper copy, A01 in microfiche. University of Connecticut Institute of Water Resources, Storrs, Report No 27, November 1977. 85 p, 14 fig, 16 tab, 80 ref. OWRT A-052-CONN(16). 14-31-0001-6007.

Descriptors: *Sewage treatment, *Activated sludge, Effluents, Pollution abatement, Rivers, Algae, Bacteria, Yeasts, Invertebrates, Fish, Aquatic plants, Chemical analysis, *Nutrients, Chlorination, Pesticides, Heavy metals, *Connecticut, Bioassay, Bioindicators, *Sewage effluents, Water pollution effects, Sewage treatment improvement, *Algal assays, *Microbial indicators, *Willimantic/Shetucket River(Conn).

The results of a four-year interdisciplinary study on the effects of a municipal secondary sewage treatment plant upon the biology and chemistry of the Willimantic/Shetucket River in eastern Connecticut are presented. Selected populations of algae, macrophytes, bacteria, fungi, invertebrates and fish were studied for 1 1/2 years before and after an improvement in sewage treatment (primary settling to activated sludge). While zones typical of high organic pollution were not present, inorganic nutrients increased significantly due to the secondary sewage discharge. Downstream of the treatment plant, significant increases in nitrate-nitrogen, total phosphates, orthophosphates, conductivity and algal growth potential were measured. The endemic, rock-attached algae of the river responded to the increased growth potential produced by the effluent with a ten-fold increase in numbers and biomass, as well as a change in composition. The seasonal averages of all bacterial and yeast groups downstream of the treatment plant were always substantially higher than upstream, except during chlorination periods when most groups were equal or reduced from their upstream numbers. The treatment plant did not contribute significantly to the presence of heavy metals and pesticides which were found in the water, plants and sediment of an extended study area. In addition to a detailed examination of the effects of the secondarily treated effluent, recommendations for alleviation of some of the problems associated with the discharge are included (de Lara-Connecticut)
W78-04945

MULTIWAVELENGTH LIDAR FOR REMOTE SENSING OF CHLOROPHYLL-A IN PHYTOPLANKTON,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-04950

SUMMARY OF NASA LANGLEY RESEARCH CENTER REMOTE SENSING ACTIVITIES UNDER THE ENVIRONMENTAL PROTECTION AGENCY INTERAGENCY AGREEMENTS: POTENTIAL FOR REGIONAL APPLICATIONS,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-04951

SURVEY OF BACTERIA, PHYTOPLANKTON, AND TRACE CHEMISTRY OF THE LOWER COLORADO RIVER AND TRIBUTARIES IN THE GRAND CANYON NATIONAL PARK,
Arizona State Univ., Tempe. Dept. of Botany and Microbiology.
For primary bibliographic entry see Field 5A.
W78-04999

AQUATIC INVESTIGATION ON THE COLORADO RIVER FROM SEPARATION CANYON TO THE GRAND CLIFFS, GRAND CANYON NATIONAL PARK,
Nevada Univ., Las Vegas. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W78-05000

SOLUTION, DIFFUSION AND SORPTION IN THE UPPER LAYER OF LAKE SEDIMENTS: V. THE DIFFERENTIATION OF THE PROFUNDAL SEDIMENTS OF AN OLIGOTROPHIC MOUNTAIN LAKE (FELDSEE, HOCHSCHWARZWALD) BY SEDIMENT WATER INTERACTION, (IN GERMAN),
Freiburg Univ. (West Germany). Limnologisches Inst.
For primary bibliographic entry see Field 5B.
W78-05015

THE USE OF MAGNESIUM CARBONATE IN CHLOROPHYLL DETERMINATIONS,
Geological Survey, Atlanta, GA. National Water Quality Lab.
For primary bibliographic entry see Field 5A.
W78-05029

NUTRIENTS AND PRODUCTIVITY AS INDICATIONS OF THERMAL EFFLUENT-UPWELLING INTERACTIONS IN LAKE MICHIGAN,
Argonne National Lab., IL.
E. M. Yaguchi.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 57-64, October 1977. 3 fig, 2 tab, 42 ref.

Descriptors: *Lake Michigan, Nuclear powerplants, *Nutrients, *Aquatic productivity, *Upwelling, Lakes, Surveys, Measurement, Chemical properties, Biological properties,

Phytoplankton, Thermal water, *Thermal pollution, Water pollution, On-site investigations, Limnology, Thermal plumes.

During the summer of 1975, a field study was undertaken to examine separate and combined effects of upwelling and a thermal discharge on nutrients, productivity quotients, and phytoplankton populations in an inshore region of southwestern Lake Michigan. Reactive silicate concentrations were more than doubled during the upwelling (compared to those during stable hydrological conditions); chlorophyll a concentrations, phytoplankton diversity, and cell numbers per milliliter were also significantly greater. Productivity quotients were lower by nearly one-half during upwelling. The Zion Nuclear Plant discharges water warmed an average of 10C to the lake via a submerged high-velocity discharge. Few significant differences in chemical and biological parameters were attributable to the resulting warm water plume. Phytoplankton specific growth rates in the plume were increased over those at control stations only during upwelling. Nutrient limitation is implicated as one of several factors in the response of phytoplankton to locally increased temperature. (Sims-ISWS)
W78-05039

THE INVASION OF SAURIDA UNDOSQUAMIS (RICHARDSON) INTO THE LEVANT BASIN: AN EXAMPLE OF BIOLOGICAL EFFECT OF INTEROCEANIC CANALS,
Fisheries Technology Unit, Haifa (Israel).
M. Ben-Yami, and T. Glaser.
U S Natl Mar Fish Serv Fish Bull. 72(2), p 359-373, 1974.

Descriptors: *Canals, *Hake, *Interoceanic canals, Levant, Saurida-undosquamis, *Red Sea lizard fish, Water pollution effects, *Abiotic conditions, Levant Basin(Red Sea-Mediterranean Sea).

The Red Sea lizardfish, S. undosquamis, invaded the Levant Basin (Red Sea, Mediterranean Sea) and established a population of considerable commercial importance. Its expansion came at the expense of other commercial fishes on which it preys and with which it competes. The rapid reproduction of the Red Sea lizardfish population in the Levant Basin was made possible by a combination of changes in the environmental conditions (abiotic and biotic), one of these being the retreat of, or the recession in, the native hake population. The dynamic coexistence between the lizardfish and the hake, its main competitor, is affected by fluctuations in the abiotic conditions to which the hake seems to be more sensitive than the lizardfish.--Copyright 1974, Biological Abstracts, Inc.
W78-05062

CADMIUM UPTAKE BY THE CRAYFISH, ORCONECTES PROPINQUUS PROPINQUUS (GIRARD),
State Univ. of New York at Buffalo. Dept. of Biochemistry.
R. Gillespie, T. Reisine, and E. J. Massaro.
Environmental Research, Vol. 13, No. 3, June 1977, p 364-368, 2 fig, 9 ref.

Descriptors: Environmental effects, *Water pollution effects, Toxicity, Resistance, *Cadmium, *Crayfish, Public health, *Absorption, Bioaccumulation.

Observations showed that crayfish accumulated a mean of 18.4 ppm Cd over a period of 190.5 hours from water containing 10 ppb Cd, demonstrating an ability to concentrate Cd from water that is considered safe for human consumption and, over a relatively short time span, to accumulate more than the 13-ppm safe limit for food. The mean concentration of Cd in crayfish after 190.5 hours in water containing 1 ppm Cd was 534.4 ppm, indicating a high resistance to Cd toxicity. It was concluded that, even in water containing USPHS acceptable levels of Cd, crayfishes could become a human health hazard. (Chilton-ORNL)
W78-05068

LEAD CONCENTRATIONS IN ALGAE AND PLANTS GROWN OVER LEAD CONTAMINATED SEDIMENTS TAKEN FROM SNOW DUMPS IN OTTAWA, CANADA,
Ottawa Univ. (Ontario). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-05071

RELATIVE SENSITIVITY TO LEAD OF A NAKED GREEN FLAGELLATE DUNALIELLA TERTIOLECTA,
Scripps Institution of Oceanography, La Jolla, CA.
J. Stewart.
Water, Air, and Soil Pollution, Vol 8, No 2, June 1977, p 243-247, 1 fig, 15 ref. NSF No. Ga, NSF No. GA-33230.

Descriptors: Environmental effects, *Water pollution effects, Heavy metals, *Lead, Algae, Toxicity, *Bioassay, *Chlorophyta, *Marine algal assay procedure.

Previous investigation has suggested a role for cell walls in shielding cells of marine algae from potential toxic effects of heavy metals. Dunaliella is a green algae which differs from other plant cells in being devoid of a cell wall. The responses of this algae when grown in a synthetic seawater medium with Pb added were similar to those of other algae, thus disproving the theory. (Chilton-ORNL)
W78-05072

STRUCTURE OF POPULATIONS OF THE DOMINATING BENTHIC ORGANISMS OF LAKE DUSYA: 2. CHIRONOMUS ANTHRACINUS ZETT. IN 1969-1972, (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vilnius Inst. Zoologii i Parazitologii.
For primary bibliographic entry see Field 2H.
W78-05074

EFFECTS OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION AND MORPHOLOGY OF VICTORELLA PAVIDA (ECTOPROCTA) IN LAKE PONTCHARTRAIN, LOUISIANA, AND VICINITY,
New Orleans Univ., LA. Dept. of Biological Sciences.
M. A. Poirrier, and M. M. Mulino.
Chesapeake Science, Vol 18, No 4, December 1977, p 347-352, 2 fig, 1 tab, 25 ref.

Descriptors: Environmental effects, *Water pollution effects, Aquatic plants, Salinity, Sewage, Storm water, Distribution, Plant morphology, *Lake Pontchartrain(La), Louisiana, *Victorella pavida.

The study reported focused upon the effects of salinity, sewage and storm-water discharge upon species distribution, abundance and species associations of Victorella pavida. V. pavida was found at salinities of 12.2 ppt and in Lake Pontchartrain was abundant upon all substrates sampled where salinities ranged from 0.1 to 5.6 ppt. Due to the abundance and uniform distribution of the organism in low salinities and its absence in the limnetic range, it was suggested that it might be used as an indicator species to determine the maximum extent of brackish-water intrusion in estuaries. There appeared to be a relationship between branching and salinity but it was concluded that other factors such as age, growth rate, predation and competition for food and space may also influence branching. V. pavida was found to be the predominant epifaunal species in areas receiving sewage and storm-water discharge. (Chilton-ORNL)
W78-05075

INFLUENCE OF A PULP AND PAPER MILL EFFLUENT ON ASPECTS OF DISTRIBUTION, SURVIVAL AND FEEDING OF NIPIGON BAY, LAKE SUPERIOR, LARVAL FISH,
Fisheries and Marine Service, Ottawa (Ontario). Great Lakes Biolimnology Lab.; and Canada Centre for Inland Waters, Burlington (Ontario).
J. K. Leslie, and J. R. M. Kelso.
Bulletin of Environmental Contamination & Toxicology, Vol 18, No 5, November 1977, p 602-610, 2 fig, 2 tab, 10 ref.

Descriptors: Environmental effects, *Water pollution effects, Pulp and paper industry, *Pulp wastes, Effluents, Larvae, Fish, Distribution, Feeds, *Lake Superior(Nipigon Bay), Great Lakes.

Larval fish were caught in quantity (500-2100/10,000 cubic meters) in surface waters of Nipigon Bay nearshore areas. In areas away from shore, abundance was low (less than 100/10,000 cubic meters). No difference was found in length or in food selection between larvae in influenced and uninfluenced areas. It was concluded that larval fish distribution and habits were either unaffected by the mill effluent or captures in the effluent were transients. (Chilton-ORNL)
W78-05076

EFFECTS OF SALINITY AND ILLUMINATION ON PHOTOSYNTHESIS AND WATER BALANCE OF SPARTINA ALTERNIFLORA LOISEL,
Duke Univ., Durham NC. Dept. of Botany.
D. J. Longstreth, and B. R. Strain.
Oecologia, Vol 31, No 2, 1977, p 191-199, 2 fig, 3 tab, 28 ref. NSF G.B-28950 IA & BMS 7100947 A02.

Descriptors: Environmental effects, *Salinity, *Light, *Photosynthesis, Transpiration, Salt marshes, *Marsh plants, *Water balance, North Carolina, *Spartina alterniflora Loisel.

Leaf photosynthesis, transpiration, total chlorophyll, leaf xylem pressure, and specific leaf weight were measured in Spartina alterniflora Loisel grown at various salinities and at two illuminations (low and high). A 50% reduction in photosynthesis was observed at salinity of 30 ppt and low illumination which was correlated with an increase in gaseous resistance. Results indicated salinity effects on photosynthesis can be ameliorated by development at high illumination. Both high salinity and high illumination were correlated with increases in specific leaf weight which appeared to be the result of increase in leaf thickness. It was concluded that salinity up to ocean water concentrations is not a principle factor limiting the development and distribution of S. alterniflora in areas of high irradiance. (Chilton-ORNL)
W78-05077

AN ECOLOGICAL SURVEY OF THE HEAVY METAL CONTAMINATION OF THE EDIBLE CLAM PAPHIA SP. ON THE IRON-ORE TAILINGS OF TOLO HARBOUR, HONG KONG,
Chinese Univ. of Hong Kong. Dept. of Biology.
M. H. Wong, and M. W. Li.
Hydrologia, Vol 56, No 3, 1977, p 265-272, 5 fig, 6 tab, 16 ref.

Descriptors: Environmental effects, *Water pollution effects, Heavy elements, Metals, *Iron, Mining, *Mine wastes, Public health, *Clams, *Hong Kong, Heavy metals, *Pollutant identification, *Manganese, *Calcium, Tailings, Iron-ore.

Clams sediments and water were collected from sites of the iron-ore tailings of Ma On Shan Iron

Mine and from a control site. Analysis showed that clams collected from the tailings had accumulated higher levels of Mn, Fe, and Ca than had clams from control sites. These clams are collected from the seashores within Tolo Harbour for consumption by villagers. This investigation points out the potential hazard of heavy metal contamination within the harbour. (Chilton-ORNL)
W78-05078

SOME FACTORS INFLUENCING THE DENSITY OF SUBARCTIC POPULATIONS OF BOSMINA LONGIROSTRIS, HOLOPEDIUM GIBBERUM, CODONELLA CRATERA AND CERATIUM HIRUNDINELLA,
Environmental Protection Agency, Yellowknife (Northwest Territories).
J. W. Moore.
Hydrobiologia, Vol 56, No 3, 1977, p 199-207, 3 fig, 2 tab, 24 ref.

Descriptors: Environmental effects, Populations, Plankton, *Temperature, Food, Light, Predation, *Bosmina longirostris, *Holopedium gibberum, *Codonella cratera, *Ceratium hirumdinella.

Results of investigation showed that temperature was the major factor influencing the density of all four species studied. While food availability possibly restricted B. longirostris, other species were not affected by this parameter. Algae were consumed in only small numbers and did not contribute significantly to density changes in the plankton. Light and predation had little influence on all species. (Chilton-ORNL)
W78-05079

ON THE FAUNA AND FLORA IN LAKE KAWAGUCHI IN SUMMER, (IN JAPANESE),
Y. Furuta, M. Suginome, and M. Tanaka.
Bull Freshwater Fish Res Lab (Tokyo). 24(1), p 1-10, 1974.

Descriptors: Aquatic plants, Aquatic animals, *Lake Kawaguchi(Japan), Eutrophication, Mesotrophy, Asplanchna-priodonta, Atteya-zachariarius, Benthos, Bosmina-amemiyai, Bosmina-longirostris, Bosminopsis-deitersi, Fish, Japan, Kellicottia-longispina, Lakes, Melosira-ambigua, Melosira-granulata, Microcystis-aeruginosa, Ploesoma-hudsoni, Ploesoma-truncatum, *Summer, Zooplankton.

A survey was carried out in Aug., 1970. Zooplankton was sampled by vertical hauling of a plankton net. Phytoplankton was sampled together with surface water using a mass cup. Zoobenthos was collected by an Ekmann-Birge bottom sampler. The distribution of fishes in the lake was studied. In the phytoplankton, Atteya zachariarius, Melosira granulata, M. ambigua and Microcystis aeruginosa were dominant; Bosminopsis deitersi, Ploesoma hudsoni, P. truncatum, Asplachna priodonta, Bosmina longirostris and B. amemiyai were dominant in the zooplankton. Lake Kawaguchi (Japan) is a mesotrophic or eutrophic lake. The plankton, zoobenthos and fishes were more abundant in the eastern area than in the western area of the lake. The horizontal distribution of B. longirostris was much denser in the eastern area than in the western area. The reverse was true for B. amemiyai. Kellicottia longispina was seen only in the western area. Lake Kawaguchi may be divided into 2 basins, the eutrophic east-basin and the mesotrophic west-basin.--Copyright 1975, Biological Abstracts, Inc.
W78-05080

COMPARATIVE STUDY OF TOXICITY, UPTAKE AND DISTRIBUTION OF CADMIUM AND MERCURY IN THE SEA WATER ADAPTED EEL ANGUILLA ANGUILLA,
Liege Univ. (Belgium). Lab. d'Oceanologie.
F. Noel-Lambot, and J. M. Bouquegneau.
Bulletin of Environmental Contamination and Toxicology, Vol. 18, No. 4, October 1977, p 418-424, 1 fig, 1 tab, 26 ref.

Descriptors: Environmental effects, *Water pollution effects, Metals, *Cadmium, *Mercury, Absorption, Distribution, *Eels, *Toxicity, Bioaccumulation, Tissue distribution.

Freshwater eels were adapted to seawater for eight days before being exposed to various concentrations of Cd and Hg (as CdC12 and HgC12) added to the water. Temperature was maintained at approximately 18C and fish were not fed during the experiments. Mercury was more toxic than cadmium with 1 ppm of Hg and 50 ppm cadmium being lethal concentrations for the eel. Cadmium was found to principally contained in the viscera and Hg in the muscles. It was suggested that the dissimilar accumulation and distribution of Cd and Hg within the eel body might be explained by the possibility of different membrane permeabilities to both metals and also by the problem of their binding within the cells. (Chilton-ORNL)
W78-05082

LEAD UPTAKE FROM SEA WATER AND FOOD, AND LEAD LOSS IN THE COMMON MUSSEL MYTILUS EDULIS,
Institut fuer Meeresforschung, Bremerhaven (West Germany).
M. Schulz-Baldes.
Mar Biol (Berl). 25(3), p 177-193, 1974.

Descriptors: Dunaliella-marina, *Lead, *Mussels, Water pollution effects, Sea water, *Bioindicators, *Absorption, Pollutant identification.

Common mussles, M. edulis (shell length 19-21 mm, average dry weight 30 mg) were maintained for 6 wk in sea water containing different concentrations of Pb (0.005-5 mg.1 to the -1 power). The Pb concentration in the mussels' whole soft parts was analyzed at different times during the experiment. A constant rate of Pb uptake, linearly dependent on the Pb concentration of the medium, was observed. The temporal change of the concentration factor is also linear (regression coefficient 149.9 daily). Rate of Pb loss, measured after transferring the mussels into natural sea water, is linearly dependent on the original Pb concentration in the soft parts. Rates of uptake and loss in large mussels (shell length 45-55 mm, average dry weight 750 mg) are less than those in small mussels (shell length 19-21 mm, average dry weight 30 mg). Lead uptake by individual organs (kidney, gills, adductor muscle, digestive gland, foot, mantle with gonads) of large M. edulis (shell length 45-55 mm, average dry weight 750 mg) was analyzed in 2 test series. In the test series 'medium,' the mussels were kept in a seawater medium containing 0.01 mg Pb. 1 to the -1 power. In the test series 'food,' the mussels were kept in natural sea water but fed with the green algae Dunaliella marina containing Pb (approximately 600 micro-g. g-1 dry weight). The Pb quantity given per mussel per day was about 2 micro-g in both test series. Within 35 days, the mussels of test series 'medium' took up 29% of the total amount of Pb given, those of test series 'food' took up 23.5%. In all organs, Pb concentration increased, but rates of uptake differed; the kidney displayed by far the highest rate of uptake. With these physiological properties M. edulis is an ideal indicator organism for Pb pollution in the marine environment. A biologic calibration curve, the relationship between Pb concentration in the mussels' whole soft parts at equilibrium and Pb concentration in sea water, is presented.--Copyright 1974, Biological Abstracts, Inc.
W78-05083

POLYCHLORINATED BIPHENYLS IN COTTIDS, MUSSELS, AND SEDIMENT IN SOUTHERN PUGET SOUND, WASHINGTON,
Evergreen State Coll., Olympia, WA.
J. Mowrer, J. Calambokidis, N. Musgrove, B Drager, and M. W. Beug.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No. 5, 1977, p 588-594, 2 fig, 1 tab, 13 ref.

Descriptors: Environmental effects, *Water pollution effects, Absorption, *Polychlorinated biphenyls, Fish, *Mussels, Sediments, Washington, *Puget Sound(Wash), *Cottids.

In Southern Puget Sound, polychlorinated biphenyl levels were found to be highest at or near areas of highest population density, industry, and shipping activity. Levels of PCB found in cottids, mussels, and sediment in this investigation were comparable to those found in similar organisms from other coastal and estuarine systems throughout the world. (Chilton-ORNL)
W78-05084

THE INFLUENCED OF SIZE, SEX AND TEMPERATURE ON THE TOXICITY OF MERCURY TO TWO SPECIES OF CRAYFISHES,
Tulane Univ., New Orleans, LA. Dept. of Biology.
M. Heit, and M. Fingerman.
Bulletin of Environmental Contamination and Toxicology, Vol. 18, No. 5, 1977, p 572-580, 6 fig, 3 ref.

Descriptors: Environmental effects, *Water pollution effects, *Mercury, *Crayfish, *Toxicity, Temperature, Size, Metabolism, Sex.

Two species of crayfishes, Procambarus clarki and Faxonella clypeata, were collected from roadside ditches for this investigation. Female crayfish of both species were better able to withstand the effects of exposure to mercury than males. A trend of increasing ability to withstand exposure to mercury was observed with increasing body size. The most important factor in withstanding exposure to mercury was found to be external temperature with the toxic effects being greater at higher temperatures. It was suggested that these temperature effects might be due to changes in metabolic rate. (Chilton-ORNL)
W78-05085

EFFECT OF TEMPERATURE ON THE GROWTH RATE OF GRIFFITHSIA TENUIS C. AGARDH (RHODOPHYTA: CERAMIALES),
Pennsylvania State Univ., Wilkes-Barre.
W. W. Reynolds, and M. E. Casterlin.
Hydrobiologia, Vol. 56, No. 3, 1977, p 225-227, 1 fig, 13 ref.

Descriptors: Environmental effects, *Thermal pollution, Thermal stress, Temperature, Algae, *Growth rates, Water pollution effects, *Griffithsia tenuis.

Griffithsia tenuis was cultured for 18 days at temperatures of 13, 18, 22 and 25C. The growth rate increased from 13 to 18C and more rapidly increased from 18 to 22C and then declined from 22 to 25C. Optimum temperature for growth under the conditions of this investigation was 22C. (Chilton-ORNL)
W78-05087

THERMAL STABILITY AND PHYTOPLANKTON IN VOLTA LAKE, GHANA,
Nigeria Univ., Nsukka (Nigeria).
S. Biswas.
Hydrobiologia, Vol. 56, No. 3, 1977, p 195-198, 2 fig, 3 tab, 8 ref.

Descriptors: *Environmental effects, Thermal pollution, Thermal stress, Phytoplankton, Lakes, Ghana, *Lake Volta(Ghana), Stability, Nutrients, Consolidated mean, Cyclic average, Transparency.

Data on thermal stability and phytoplankton were collected from various stations representing the main stretch of Volta Lake during 1966-1968. It was shown that under a predominantly low thermal stability, its increase led to increase of phytoplankton. Increase of transparency with the increase of stability was an important factor. Under a predominantly high thermal stability, its decrease led to the increase of phytoplankton. Increase of nutrients in the upper layers of the lake was an important factor. It was concluded that in view of these two conflicting correlations, the data treated as a whole produced no significant results. (Chilton-ORNL)
W78-05088

HUDSON RIVER ECOSYSTEM STUDIES - EFFECTS OF ENTRAINMENT BY THE INDIAN POINT POWER PLANT ON BIOTA IN THE HUDSON RIVER ESTUARY.
New York Univ. Medical Center, NY.
Aggenda to: The 1973 Report submitted to Consolidated Edison Company of New York, Inc. 56 p, 4 fig, 21 tab, 12 ref.

Descriptors: Environmental effects, *Powerplants, Life history studies, *Striped bass, *Intakes, New York, Reviews, Data collections, Indian Point, *Hudson River(NY).

This report presents the final results of studies conducted at Indian Point during 1973 using the full complement of available striped bass ichthyoplankton data, which have been analyzed using samples matched by date, time and depth. The report is presented in two parts. The first part is entitled A Preliminary Analysis of the Abundance of Four Life History Stages of Striped Bass (Morone saxatilis) Collected in the Intakes of Indian Point Unit I and in the Hudson River in Front of Indian Point. The second part is entitled Larval Striped Bass (Morone saxatilis) Length Frequency Analysis. (Chilton-ORNL)
W78-05089

ENERGY FLOW IN BEAR BROOK, NEW HAMPSHIRE: AN INTEGRATIVE APPROACH TO STREAM ECOSYSTEM METABOLISM,
Amherst Coll., MA. Dept. of Biology.
S. G. Fisher, and G. E. Likens.
Ecol Monogr. 43(4), p 421-439, 1973.

Descriptors: Algae, Detritus, *Ecosystems, *Energy budget, Heterotrophy, Leaves, *Metabolism, Moss, *New Hampshire, Photosynthesis, Primary production, Respiration, Streams, Vascular hydrophytes, Northeast US, Bear Brook watershed(NH), *Organic matter.

An annual energy budget is presented for Bear Brook, a small undisturbed 2nd-order stream in northeastern USA. The ecosystem approach, in which all input and output fluxes of potential energy as organic matter are considered, is used to describe the dynamics of energy flow in a 1700 m segment of the stream. The annual input of energy to the system is 6039 Kcal/m2. Over 99% of this is allochthonous, from the surrounding forested watershed or from upstream areas. Autochthonous primary production by mosses accounts for less than 1% of the total energy available to the ecosystem. Algae and vascular hydrophytes are absent from the stream. Meteorologic inputs (litter and throughfall) from the adjacent forest account for 44% of annual energy input. Most of this is in particulate form. The remaining 56% of input enters by geologic vectors (inflowing surface and subsurface waters). Eighty three percent of the geologic input and 47% of the total input of energy occur as dissolved organic matter. Approximately 4730 Kcal/m2 of organic detritus, nearly equally divided between leaves and branches, is stored within the system. The size of this detritus reservoir is stable from year to year. The turnover time of the branch compartment is about 4.2 yr; of the leaf compartment, about 1 yr. Although much of the annual input of energy is in a dissolved state, dissolved organic matter does not tend to accumulate in the system and displays a very rapid rate of turnover. Of the annual energy input 66% is exported to downstream areas in stream water. The remaining 34% is lost as heat through consumer activity. Bear Brook is a strongly heterotrophic steady-state system in which import and export of organic matter play a significant role. A conceptual scheme is presented by which import, export, photosynthesis, and respiration may be used to describe the functional dynamics and developmental processes of ecosystems.—Copyright 1974, Biological Abstracts, Inc.
W78-05092

ECOLOGY OF A NEW ENGLAND SALT MARSH,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
S. W. Nixon, and C. A. Oviatt.
Ecol Monogr. 43(4), p 463-498, 1973.

Descriptors: *Salt marshes, *New England, Northeast US, Estuaries, Metabolism, Marsh grasses, *Dissolved oxygen, Detritus, Birds, *Ecology, Fish, Marshes, Model studies, Sewage effluents, Shrimp, Spartina-alterniflora, Spartina-patens, Temperature.

Measurements of the abundance of major populations, their metabolism, and the seasonal patterns of total system metabolism throughout a year were used to develop energy-flow diagrams for a New England salt-marsh embayment. The annual ecological energy budget for the embayment indicates that consumption exceeds production, so that the system must depend on inputs of organic detritus from marsh grasses. Gross production ranged from almost zero in winter to about 5 g O2 m-2 day-1 in summer. Respiration values were similar, but slightly higher, with the maximum difference observed in fall. Populations of shrimp and fish were largest in fall, with a much smaller peak in spring. Few animals were present in the embayment from May to July, but fall populations of shrimp ranged from 250-800 m-2 and fish averaged over 10 m-2. Birds were most abundant in winter and spring. In spite of high numbers, no evidence was found that the marsh embayment exported large amounts of shrimp or fish to the estuary. Production of above ground emergent grasses on the marsh equaled 840 g m-2 for tall Spartina alterniflora, 432 g m-2 for short S. alterniflora, and 430 g m-2 for S. patens. These values are similar to those for New York marshes, but substantially lower than the southern marsh types. The efficiency of production of marsh grasses in the New England marsh was lower than reported for southern areas. A stimulation model based on the laboratory and field metabolism and biomass measurements of parts of the embayment system was developed to predict diurnal patterns of dissolved O2 in the marsh. The model was verified with field measurements of diurnal O2 curves. The model indicated the importance of the timing of high tides in determining O2 levels and was used to explore simulated additions of sewage biological oxygen demand (BOD) and increases in temperature.—Copyright 1974, Biological Abstracts, Inc.
W78-05093

THE IMPACT OF DEVELOPMENT PROJECTS ON ESTUARINE AND OTHER WETLAND ECOSYSTEMS,
Transport and Environment Studies. London (England).
For primary bibliographic entry see Field 6G.
W78-05095

AN OUTDOOR MODEL SIMULATING A BALTIC SEA LITTORAL ECOSYSTEM,
Swedish Water and Air Pollution Research Lab. Stockholm.
M. Notini, B. Nagell, A. Hagstrom, and O. Grahn.
Oikos, Vol. 28, No. 1, p 2-8, 1977. 5 fig, 4 tab, 18 ref.

Descriptors: *Simulation analysis, Water pollution effects, Wetlands, Aquatic algae, Aquatic life, Dissolved oxygen, Temperature, Hydrogen ion concentration, Bacteria, *Aerobic bacteria, *Littoral ecosystem, *Baltic Sea, Flow-through systems, Aerobic heterotrophic bacteria.

Main components of the flora and fauna of the Baltic littoral zone were introduced into plastic pools equipped with a flow-through system providing 2.5 l/min. During eight weeks the macroscopic epifauna and infauna of the bladder wrack, Fucus vesiculosus L., were found to be qualitatively and quantitatively fairly stable; the number of aerobic heterotrophic bacteria showed little variation. Oxygen concentration, temperature, and pH of the pools showed good agreement with those of the natural littoral ecosystem. This, together with the observed stability and the possibilities for controlling and measuring the conditions in the system, makes the model a valuable tool for assessing toxic effects on the littoral ecosystem. (Stihler-Mass)
W78-05096

MEASUREMENT OF WATER MOVEMENT IN REFERENCE TO BENTHIC ALGAL GROWTH,
Hawaii Univ., Honolulu. Dept. of Botany.
For primary bibliographic entry see Field 7B.
W78-05106

WATER QUALITY EVALUATION OF A LOWER POOL ELEVATION FOR PROPOSED ARCADIA LAKE, OKLAHOMA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5B.
W78-05107

BARATARIA BASIN EUTROPHICATION CASE HISTORY,
Louisiana State Univ., Baton Rouge. Center for Wetlands Resources.
N. J. Craig, and J. W. Day, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 278, Price codes: A03 in paper copy, A01 in microfiche. Report to Louisiana State Planning Office, Baton Rouge, June 1976. 24 p, 5 fig, 3 tab, 46 ref. Ford Foundation 740-0595.

Descriptors: *Barataria Basin(LA), *Eutrophication, *Salinity, *Commercial fishing, *Nursery grounds, *Estuarine environments, *Louisiana, Estuaries, Fisheries, Wetlands, Nutrients, Forecasting, Bays, Crustaceans, Fish, Agricultural runoff, Urban runoff, Sewage, Algae.

Data collected on eutrophication and salinity changes in Barataria Basin in southern Louisiana indicate serious potential effects on the commercial fishery in the basin. Barataria Basin, an interdistributory bay-wetland system bounded by Bayou Lafourche on the west, the Mississippi River on the north and east, and the Gulf of Mexico on the south, is an important estuarine environment for many marine species, including croaker, spot, sand seatrout, sea catfish, menhaden, shrimp, striped mullet, bay whiff, and blue crab. Barataria Basin alone is responsible for some 45% of Louisiana's total commercial fishery harvest ($39.6 million in 1974), including menhaden, trout, croaker, crab, shrimp, oyster, catfish, and crawfish. Both eutrophication in the upper basin and salinity in the lower basin are increasing. Sewage, urban runoff, agricultural drainage, and salinity is due to changes in the flow of the Mississippi, land loss and inlet widening, and projects such as the Mississippi River gulf Outlet, and the Barataria Waterway. Eutrophication under present trends could result in a drastic decline and possible destruction of the nursery zone by the year 2000.

Increasing salinity is pushing the oyster zones and the salinehbrackish and brackish-freshwater marsh boundaries further inland. Data on salinity increases, as well as recommendations, and nutrient loadings are given. (Lynch-Wisconsin)
W78-05108

BIOLOGICAL SURVEY OF WILSON RESERVOIR - SALINE RIVER, KANSAS, AUGUST 1970,
Environmental Protection Agency, Cincinnati, OH. Div. of Field Investigations.
A. M. Lucas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 874, Price codes: A02 in paper copy, A01 in microfiche. Report 1971. 13 p, 3 tab, 5 ref.

Descriptors: *Wilson Reservoir(KS), *Saline River(KS), *Water quality, *Environmental effects, *Kansas, Reservoirs, Biota, Impoundments, Surveys, Primary productivity, Benthic fauna, Phytoplankton, Algae, Light penetration, Water pollution control.

A 1970 study of the biota of Wilson Reservoir and adjacent reaches of the Saline River, Kansas, concludes that the bottom faunal community in the reservoir has improved since 1968, and that water quality in the Saline River downstream continues to be improved by the reservoir. The variety and density of benthic animals in the reservoir increased, with more uniform distribution. Burrowing mayflies, a desirable fish food, were more widely established. The increase in density of benthic fauna from 17/sq ft to 35/sq ft since 1968 was partly caused by a larger food supply in the form of greater algal productivity, which, in the downstream section, rose from 512 to 1480 mg C/sq m/day since 1968. The aquatic environment downstream from the impoundment was improved by better water quality and stabilized river flow, and a greater variety of animals associated with clean water were found. Faunal diversity increased from eight taxa in 1968 to 15 in 1970. The reservoir dilutes the saltier water from streams flowing into the Saline River, and reduces concentrations of dissolved chloride, sulfate, calcium, magnesium and sodium. Total solids and specific conductance of discharged waters were 2700 micromhos/cm and 1660 mg/l, compared with 14,700 micromhos/cm and 5710 mg/l for inflowing water. Benthic fauna in the reservoir were dominated by midge larvae. Sludgeworms were not excessively abundant, although they were dominant in downstream reaches of the reservoir. (Lynch-Wisconsin)
W78-05109

AQUATIC FIELD SURVEYS AT IOWA, RADFORD AND JOLIET ARMY AMMUNITION PLANTS, VOLUME I - IOWA ARMY AMMUNITION PLANT,
Environmental Control Technology Corp., Ann Arbor, MI.
For primary bibliographic entry see Field 5A.
W78-05111

AQUATIC FIELD SURVEYS AT IOWA, RADFORD AND JOLIET ARMY AMMUNITION PLANTS, VOLUME II - RADFORD ARMY AMMUNITION PLANT,
Environmental Control Technology Corp., Ann Arbor, MI.
For primary bibliographic entry see Field 5A.
W78-05112

AN INVESTIGATION OF THE NEARSHORE REGION OF LAKE ONTARIO IFYGL.
State Univ. of New York Coll. at Buffalo.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 268, Price codes: A13 in paper copy, A01 in microfiche. Report No. EPA-600/3-76-115, Environmental Research Laboratory, Environmental Protection Agency, Duluth, Minnesota, December 1976. 269 p, 67 fig, 56 tab, 107 ref, 2 append. 1BA608, 800701.

Descriptors: *International Field Year on the Great Lakes, *Lake Ontario, *Baseline studies, *Cladophora, *Data collections, *Nearshore zones, Shores, New York, Niagara River, Genesee River(NY), Great Lakes, Trophic levels, Oligotrophy, Eutrophication, Sediments, Algae, Zooplankton, Phytoplankton, Nutrients.

Biological, chemical, and physical baseline water quality data were gathered between April 1972 and May 1973 at 81 sampling stations in the nearshore region of southern Lake Ontario and at the mouths of the Niagara and Genesee Rivers. The study area extended from the Welland Canal to Rochester, New York, and from the shoreline eight km into the lake. The project, conducted by the Great Lakes Laboratory, was part of the International Field Year on the Great Lakes (IFYGL). Chemical and biological data generally indicated dimictic oligotrophic to mesotrophic conditions; limited historical limnological information suggested eutrophication effects at the two river mouths. Water quality generally improved with increasing distance from shore. A thermal bar kept nutrient-enriched water on the shoreward side of the bar. Growth of Cladophora appeared to be limited by suitable substrate for attachment and by wave action, rather than by chemical factors. Twelve previously-unreported zooplankton species and one phytoplankton species were collected in the lake. Sediments with higher clay content tended to contain higher concentrations of nutrients, volatile solids, and heavy metals. The zone's major nutrient sources was the Niagara River, with the influence of the Genesee River limited to the limnological spring. Extensive data is presented in appendices. (Lynch-Wisconsin)
W78-05113

EFFECTS OF THERMAL EFFLUENT AND MACROPHYTE HARVESTING ON THE BENTHOS OF AN ALBERTA LAKE,
D. N. Gallup, M. Hickman, and J. Rasmussen.
Verh. Internat. Verein. Limnol., Vol 19, p 552-561, October 1975. 2 fig, 6 tab, 9 ref.

Descriptors: *Lake Wabamun(Alberta Canada), *Thermal pollution, *Water pollution effects, *Benthic fauna, *Aquatic weed control, Alberta(Canada), Canada, Lakes, Effluents, Herbicides, Mollusks, Oligochaetes, Chemcontrol, Mechanical control, Power plants, Standing crops.

Effects of thermal pollution and of a related aquatic weed control program on the benthic fauna of Lake Wabamun, Alberta, Canada, were investigated. Heated effluents from two power stations have changed species composition, distribution, and growth rates of submerged macrophytes in the eastern part of the lake. A management program of mechanical harvesting and herbicides (paraquat-diquat) was initiated to control extensive beds of Elodea canadensis, Myriophyllum exalbescens, Potamogeton pectinatus, P. richardsonii, Certophyllum demersum, and Chara sp. Major factors responsible for changes observed in the benthic fauna include: (1) water temperature; (2) the current produced by the outflow canal (which probably caused the changes in plant species); and (3) sediment type. Causative factors connected with thermal pollution seem to favor a mulluscan community associated with the vegetation, and an oligochaete community in the sediments. In Kapasiwin Bay, near one of the power stations, predominance of aquatic insects (Chironomidae) and crustaceans (Hyalella azteca) distinguishes this area from the open lake, where standing crops of these and total animals are much lower. Cutting and harvesting the aquatic plants produced a significant decrease in Physa gyrina, which occupies the upper portions of macrophyte stems; populations of Chironomidae and Amphipoda were reduced to a lesser degree. (Lynch-Wisconsin)
W78-05115

THE EFFECT OF CADMIUM, COPPER, MERCURY, ZINC AND LEAD ON CELL DIVISION, GROWTH, AND CHLOROPHYLL-A CONTENT OF THE CHLOROPHYTE CHLORELLA VULGARIS,
Herbert H. Lehman Coll., Bronx, NY. Dept. of Biological Sciences.
J. J. Rosko, and J. W. Rachlin.
Bulletin of the Torrey Botanical Club, Vol. 104, No. 3, p 226-233, July-September 1977. 3 fig, 3 tab, 39 ref.

Descriptors: *Chlorella vulgaris, *Algae, *Heavy metals, *Toxicity, *Water pollution effects, Chlorophyll, Plant growth, Cell division, Cell size, Chlorophyta, Cadmium, Copper, Mercury, Zinc, Lead, Pollutants, Toxins, Photosynthesis, Cations.

Increasing concentrations of copper, mercury, and cadmium increased chlorophyll-a content per cell of the chlorophyte Chlorella vulgaris, while lead and zinc concentrations decreased chlorophyll-a content, in a study conducted to quantify tolerance limits of the alga of the five heavy metals. A commonly-observed phenomenon of low concentrations of very toxic metals enhancing cell division was likewise observed in this study; when cells were exposed to 0.0056 mg/l copper, 0.56 mg/l zinc, and 1.0 mg/l lead, cell numbers after 33 days (minus initial inoculum) were 19,780, 20,240, and 19,270 respectively, compared with 18,190 in the control. Cell division with low concentrations of mercury and cadmium were identical to controls. Higher concentrations of copper (0.32 mg/l), cadmium (0.32 mg/l), mercury (2.4 mg/l), and zinc (7.5 mg/l) resulted in cell counts of 6,830, 3,290, 7,110, and 7,970; a lead concentration of 32.0 mg/l resulted in 18,050 cells after 33 days. Cells exposed to higher concentrations of cadmium and to copper were significantly larger than control cells after 33 days, while cells grown in 2.4 mg/l mercury were significantly smaller than controls after 16 days. (Lynch-Wisconsin)
W78-05116

LIMITING NUTRIENTS AND MAXIMUM GROWTH RATES FOR DIATOMS IN NARRAGANSETT BAY,
Trondheim Univ. (Norway). Biological Station.
E. Sakshaug.
Journal of Experimental Marine Biology and Ecology, Vol. 28, No. 2, p 109-123, 1977. 5 fig, 5 tab, 24 ref. NSF 31319X.

Descriptors: *Narragansett Bay(RI), *Diatoms, *Limiting factors, *Nutrient requirements, *Algae, *Rhode Island, Growth rates, Plant growth, Nutrients, Nitrogen, Skeletonema costatum, Asterionella japonica, Dialysis, Carbon, Phytoplankton, Water temperature, Light intensity.

Nitrogen deficiency was clearly shown in dialysis cultures of the diatoms Skeletonema costatum and Asterionella japonica grown in tanks with running seawater at 50% of surface light intensity and a temperature range of 2-17C. Dialysis, which permits field analysis of phytoplankton chemical composition (measured by chlorophyll-a, ATP, nitrogen, and carbon) to determine the growth-limiting nutrient, also enables determination of maximum growth rate for the species under given environmental conditions. The experiments were carried out during March-June 1973 at the University of Rhode Island's Narragansett Bay Campus pier in 130-m dialysis bags in a 125-liter Plexiglas tank. Seawater from six m depth was pumped through the tank at a flow rate of 30 l/min, and light intensity was reduced to 50% by covering with a grey nylon net. The exponential growth rate was exponentially related to temperature at vary-

ing surface light intensities of 350-500 ly/day, with a maximum of 2.0 div./day for Skeletonema and 1.9 div./day for Asterionella at 17C. Surface light intensities below 200 ly/day resulted in a decrease in the growth rate. The chlorophyll-a/ATP ratio showed a four-fold temperature-dependent increase from March to June for both starved and exponentially-growing cells of both species. This was due to increased chlorophyll content in Skeletonema, but in Asterionella it was due to a decrease in ATP accompanied by a decrease in carbon per cell. (Lynch-Wisconsin)
W78-05117

DETERMINATION OF PRIMARY PRODUCTIVITY AND COMMUNITY METABOLISM IN STREAMS AND LAKES USING DIEL OXYGEN MEASUREMENTS,
Geological Survey, Bay Saint Louis, MS. Water Resources, Div.; and National Aeronautics and Space Administration, Bay Saint Louis, MS. National Space Technology Labs.
D. W. Stephens, and M. E. Jennings.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 645, Price codes: A05 in paper copy, A01 in microfiche. Report No. USGS/WRD/SRI-76/055, August 1976. 88 p, 1 fig, 2 tab, 35 ref, 5 append.

Descriptors: *Primary productivity, *Metabolism, *Computer programs, *Diel oxygen measurements, *Respiration, *Biological communities, *Photosynthetic oxygen, Methodology, Community metabolism, Streams, Lakes, Measurement, Dissolved oxygen, Water temperature, Salinity, Photosynthesis, Model studies, Oxygen sag.

Methods for computerized calculation of daytime net production, night respiration, and total community metabolism are described, using a diel series of dissolved oxygen, temperature, and salinity measurements. The computer program uses an Odum approach to solve the oxygen balance equation (X=P-R+or-D+0) at a single station in a stream or as a difference between upstream and downstream stations. Net oxygen production and community metabolism are calculated assuming a one-dimensional model and using a finite-difference equation. The results are useful for quantifying biological activities of aquatic communities as they influence the oxygen cycle in streams, estuaries, lakes, and reservoirs; results can also be used as input to water quality models for dissolved oxygen analysis. Program details (flow chart, deck schematic and deck setup) are given in an appendix, along with examples of program output in various uses. Limiting assumptions of this approach to solution of the oxygen balance equation include: (1) reaeration is constant; (2) advective transport is absent, or oxygen transport is known; (3) water accrual or loss is known; (4) turbulence is low enough to permit observation of a nighttime decline in dissolved oxygen; and (5) plant biomass is sufficient to provide daytime increase in photosynthetic oxygen; in standing waters, the lower limit for measurable oxygen production occurs when phytoplankton densities fal below 1 mg chlorophyll a per cu m. (Lynch-Wisconsin)
W78-05119

CHEMICAL DEGRADATION OF MILITARY STANDARD FORMULATIONS OF ORGANOPHOSPHATE AND CARBAMATE PESTICIDES I. CHEMICAL HYDROLYSIS OF DIAZINON,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, MD.
For primary bibliographic entry see Field 5B.
W78-05120

PERSISTENCE OF AZINPHOSMETHYL IN SOIL,
Environmental Protection Agency, Wenatchee, WA. Field Studies Section.
For primary bibliographic entry see Field 5B.
W78-05121

MOSQUITO PRODUCTION AND CONTROL IN ANIMAL WASTE LAGOONS,
North Carolina State Univ. at Raleigh. Dept. of Entomology.
R. C. Axtell, D. A. Rutz, M. R. Overcash, and F. J. Humenik.
In: Managing Livestock Wastes, ASAE Publication PROC-275, Proceedings of the 3rd International Symposium on Livestock Wastes held at the University of Illinois, Urbana-Champaign, April 21-24, 1975. p 15-18, 21, 4 fig, 3 tab, 10 ref.

Descriptors: *Mosquitoes, *Sewage lagoons, *Farm wastes, *Insecticides, *Waste disposal, *Manure, Culex pipiens quinquefasciatus, Brachydeutera argentata, Lagoons, Sewage disposal, Insects, Hogs, Poultry, Farm management, Pesticides, North Carolina, Agriculture, Livestock, Solid wastes, Simulation analysis.

Simulated farm animal waste lagoons were used to determine the relationship between hog and poultry manure loading rates and mosquito production, and the effectiveness of two insect growth regulators and five insecticides. Samples from five lagoons in Johnston County, North Carolina were analyzed June-October 1974. The optimal pollution level for production of the southern house mosquito (Culex pipiens quinquefasciatus) in 625 cu ft tanks was at a loading rate of 480 cu ft of lagoon volume per 100 lb hog (supernatant COD=600 mg/l, TOC=200 mg/l), and in 7.4 cu ft drums at a loading rate of 320 cu ft of lagoon volume per 100 lb hog (supernatant COD=593 mg/l, TOC=228 mg/l). At a loading rate of 80 cu ft or less of lagoon volume per 100 lb hog there was very little mosquito production. In poultry manure in the 7.4 cu ft drums, optimal mosquito production was a a loading rate of 5.1 cu ft of lagoon volume per 4 lb bird (supernatant COD=669 mg/l, TOC=243 mg/l). Mosquito abundance was also influenced by vegetation and floating debris in the lagoons. With the growth regulators Altosid and Dimilin, and insecticides, malathion, chlorpyrifos, Abate, and Flit MLO, mosquito control was obtained from a few days to over a month; chlorpyrifos was the longest-acting. (Lynch-Wisconsin)
W78-05123

LIMNOLOGICAL AND FISHERIES SURVEY OF THE UPPER SKUNK RIVER, IOWA,
Iowa State Univ., Ames. Dept. of Zoology and Entomology.
For primary bibliographic entry see Field 5B.
W78-05124

PERIDININ-CHLOROPHYLL A PROTEINS OF DINOFLAGELLATE ALGAE,
Brookhaven National Lab., Upton, NY. Dept. of Biology.
H. W. Siegelman, J. H. Kycia, and F. T. Haxo.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL-21729, Price codes: A02 in paper copy, A01 in microfiche. Energy Research and Development Administration, Report BNL-21729. 17 p, 5 fig, 2 tab, 15 ref. (1976). OT E(30-1)-16.

Descriptors: *Peridinin-chlorophyll a proteins, *Proteins, *Dinoflagellates, *Pigments, *Photosynthesis, Amphidinium carterae, Glenodinium, Chlorophyll, Algae, Phytoplankton, Marine algae, Oceans, Carotenoids, Peridinin.

Studies of the properties of peridinin-chlorophyll-a proteins in several dinoflagellates confirm that these proteins are important light-harvesting pigments for photosynthesis in oceans and some lakes, and indicate that their distinctive patterns may provide biochemical markers for particular species. The proteins contribute significantly to cellular absorption and may account for about 50% of total peridinin content. Their absorption coincides with the portion of the visible spectrum having maximum penetration in the water column. The dinoflagellate Amphidinium carterae cultured in artificial seawater was the primary alga studied, but other dinoflagellates--Gonyaulux polyedra, G. tamarensis, Cachonina niei, Glenodinium sp., Peridinium cincrum, and Dissodinium lunula--were also examined. Carotenoid pigments, including peridinin, may be more important that chlorophylls for photosynthetic energy capture by phytoplankton in the oceans. Most phytoplankton groups have a specific carotenoid accounting for a major portion of total carotenoid centent; in Dinophyceae (dinoflagellates) the predominant carotenoid is peridinin. The amino acid composition of purified peridinin-chlorophyll-a proteins from A. carterae and Glenodinium sp. is given, as well as the molecular weight of the proteins for A. carterae, G. polyedra, G. tamarensis, C. niei, and Glenodinium sp. (Lynch-Wisconsin)
W78-05125

PRELIMINARY REPORT TO INTERNATIONAL DECADE OF OCEAN EXPLORATION (IDOE) ON THE POSSIBLE EFFECTS OF THE CERATIUM TRIPOS BLOOM IN THE NEW YORK BIGHT, MARCH-JULY 1976,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
P. G. Falkowski, and S. O. Howe.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL-21944, Price codes: A02 in paper copy, A01 in microfiche. Energy Research and Development Administration, Report BNL-21944. 7 p, 2 fig, 4 ref. (1976). EY-76-C-02-0016.

Descriptors: *New York Bight, *Ceratium tripos, *Eutrophication, *Model studies, *Simulation analysis, New York, New Jersey, Algae, Dinoflagellates, Chlorophyll, Carbon, Stratification, Bays, Anaerobic conditions, Biochemical oxygen demand, Hypolimnion, Oxygen depletion.

A computer simulation model explores combined effects of benthic respiration and respiration of the dinoflagellate Ceratium tripos on the oxygen depletion rate below the thermocline in the New York bight. C. tripos was largely responsible for a subsurface algal bloom March-July 1976 in the New York Bight extending from eastern Long Island to southern New Jersey. The subsurface chlorophyll-a maximum occurred at a depth of about 30 m, below the 0.3% light depth and coincident with the base of the thermocline. While cells in the overlying mixed layer probably were autotrophic, the majority of the population below the compensation depth and thermocline were probably capable of phagotrophy. The simulation indicated that within two months the oxygen concentration in the botton 5-m layer reached a steady concentration which was 45% of the initial concentration of 0.6 mg at 02 per liter. The simulated oxygen depletion rate below the thermocline is extremely sensitive to changes in eddy diffusivity, with small decreases producing simulated anoxia. The integrated Ceratium respiration rate exceeded the benthic oxygen consumption rate of 1.0 mg as 02/sq m/hr by a factor of 19.5. Ceratium biomass also is a potentially significant source of biological oxygen demand. Assuming specified carbon and oxygen molar ratios, oxidation of Ceratium (3255 mg at C/sq m) within 20 m of the bottom would require 8463 mg at 02/sq m or 71% of the initial total oxygen in the same volume. (Lynch-Wisconsin)
W78-05126

APONIN, A CYTOLYTIC FACTOR TOWARD THE RED TIDE ORGANISM, GYMNODINIUM BREVE. BIOLOGICAL ASSAY AND PRELIMINARY CHARACTERIZATION,
University of South Florida, Tampa. Dept. of Chemistry.
D. F. Martin, and B. B. Martin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 286, Price codes: A02 in paper copy, A01 in microfiche.

Journal Environmental Science Health, Vol. A11, No. 10 and 11, p 613-622, 1976. 2 fig, 9 ref. SG-04-6-158-4405 and 04-5-158-44.

Descriptors: *Aponin, *Red tide, *Fishkill, *Algal control, Cytolysis, Bioassay, Biocontrol, Cyanophyta, *Gymnodinium breve, Gomphosphaeria aponina, *Dinoflagellates, Phytoplankton, Florida, Toxicity, Sea water, Eutrophication.

An improved method is described for isolating aponin, a cytolytic agent against the dinoflagellate Gymnodinium breve, a cause of fish mortalities associated with Florida red tides. Aponin is extracted from Gomphosphaeria aponina, a cyanophyte known to inhibit growth of G breve. The improved isolation procedure consists of subjecting G. aponina cultures to continuous cell centrifuging, acidification with concentrated hydrochloric acid to pH 6, extraction with CHC13, and concentration in a rotary evaporator under reduced pressure at 35C. Preliminary purification was attained using silica gel chromatography, followed by permeation gel chromatography. Temperature, pH, and temporal stability studies were conducted with aponin and G. breve in artificial seawater. Cytolytic activity provided a practical means of evaluating physical and chemical effects on aponin. Thermal inactivation of cytolytic activity did not occur following incubation for one hour at temperatures ranging from 30-110C, indicating that aponin is much more thermally stable than G. breve, which lost most ichthyotoxic properties within one hour at temperature above 75-80C. Aponin was stable with incubation of 48 hours at 30C at pH 1-5, but at pH 6 activity began to decrease. Kinetic studies showed an increase in cytolytic activyt during the first day of incubation, a constant level for 10-11 days, and a decrease after 14 days. (Lynch-Wisconsin)
W78-05128

REMOTE SENSING ANALYSIS OF LAKE LIVINGSTON AQUATIC PLANTS, 1975 FINAL REPORT,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 5A.
W78-05134

NEOPLASTIC SKIN LESIONS IN SALAMANDERS FROM A SEWAGE LAGOON CONTAINING PERYLENE,
Massachusetts Inst. of Tech., Cambridge. Dept. of Chemical Engineering.
J. G. Windsor, Jr., R. E. LaFlamme, R. A. Hites, and F. L. Rose.
Science, Vol. 198, p 1280-1281, 1977. 8 ref.

Descriptors: *Insecticides, *Pesticides, *Pesticide residues, *Pesticide toxicity, *Toxicity, *Sewage lagoons, *Waste storage, *Insect control, *Salamanders, Mosquitoes, *Water pollution sources, Water pollution effects, *Perylene, *Neoplasms.

The etiology of neoplastic skin lesions in a population of salamanders was debated by two research groups. The method by which the presumed pathogenic chemical, perylene, entered the lagoon was probably as a mosquitocide. (Katz)
W78-05136

EFFECTS OF CHROMATE AND CADMIUM ON MOST PROBABLE NUMBER ESTIMATES OF NITRIFYING BACTERIA IN ACTIVATED SLUDGE,
California State Univ., Los Angeles. Dept. of Microbiology and Public Health.
L. L. Fargo, and R. W. Fleming.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 3, p 350-354, 1977. 4 tab, 5 ref.

Descriptors: *Heavy metals, *Cadmium, *Nitrification, *Activated sludge, *Growth rates, *Animal growth, *Biological membranes, Water pollution effects, Bacteria, Industrial wastes, *Chromate, *Nitrosomonas, *Nitrobacter.

This study was an effort to determine the effects of chromate and cadmium on the number of nitrifying bacteria obtained from activated sludge samples. The results indicated that chromate severely inhibits growth of Nitrosomonas and that cadmium in concentrations below 100.0 had little effect on either Nitrosomonas or nitrobacter. The lack of an effect on Nitrobacter may be due to differences in intracytoplasmic membranes in the cell envelope. (Katz)
W78-05137

BIOACCUMULATION IN FISH OF CHLORINATED PHENOLS FROM KRAFT PULP MILL BLEACHERY EFFLUENTS,
Swedish Water and Air Pollution Research Lab. Stockholm.
L. Landner, K. Lindstrom, M. Karlsson, J. Nordin, and S. Sorensen.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 6, p 663-673, 1977. 2 fig, 2 tab, 8 ref.

Descriptors: *Rainbow trout, Pulp and paper industry, *Pulp wastes, *Lignins, *Bleaching wastes, *Phenols, *Chlorine, *Chlorination, *Toxicity, *Fish physiology, *Animal metabolism, Gas chromatography, Path of pollutants, *Bioaccumulation, Tissue analysis, Chlorinated phenols.

The present work examined low-molecular weight chlorinated compounds, identified to be present in the effluents from Swedish Kraft pulp bleacheries, to determine if the toxic compounds showed tendencies to accumulate in fish. Controlled exposure to several types of effluent demonstrated a significant uptake of at least three different chlorinated phenols into rainbow trout body parts (i.e. liver and muscle). (Katz)
W78-05138

THE TOXICITY OF KELTHANE TO THE GRASS SHRIMP (CRANGON FRANCISCORUM),
California Univ., Davis. Dept. of Land, Air and Water Resources.
S. Khorram, and A. W. Knight.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 6, p 674-682, 1977. 3 fig, 4 tab, 19 ref.

Descriptors: *Toxicity, *Mortality, *Bioassay, Animal metabolism, *Commercial shellfish, Animal behavior, *Miticides, *Chlorinated hydrocarbon pesticides, *Insecticides, *Shrimp, Water pollution effects, *Bioaccumulation, *Kelthane, Sub-lethal effects.

The acute toxicity of Kelthane, an organochlorine insecticide, on grass shrimp was determine by using static bioassay tests. The 24-and 48-hour LC50's were 777 to 2138 and 437 to 832 ppb, respectively. Kelthane was also found to have sublethal effects on feeding, molting and motor control. (Katz)
W78-05139

EFFECTS AND FATE OF A SURFACTANT IN CULTURES OF THE RED TIME ORGANISMS, GVMNODINIUM BREVE,
University of South Florida, Tampa. Dept. of Chemistry.
W. S. Hitchcock, and D. F. Martin.
Bulletin of Environmental Contamination and Toxicology, Vol. 18, No. 3, p 291-296, 1977. 2 fig, 1 tab, 11 ref.

Descriptors: *Plankton, *Red tide, *Dinoflagellates, *Gymnodinium, *Biodegradation, *Surfactants, *Toxicity, *Mortality, *Alkylbenzene sulfonates, Water pollution sources, Phosphates, Degradation, Biological membranes, Fishkill, Methodology, Water pollution control.

Results of the present study indicate the useful mode of introducing a proper surfactant in the water column to manage a red tide bloom, and they indicated the rate of movement of surfactant in non-turbulent water. Further, the results indicate the basis of studying naturally occurring surfactant that could be environmentally acceptable and that could manage a red tide. Finally, the results with sub-lethal concentrations indicate the possibility of inactivating G. breve cell, presumably without releasing toxin into the water column. Reactivation of the cells is due to degradation of surfactant, or conversion of surfactant micelles, or, possibly, adaptation of the cells. (Katz)
W78-05140

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. I. MANIPULATION OF EXPERIMENTAL ENCLOSURES,
Tsukuba Univ., Ibaraki (Japan). Inst. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W78-05141

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. II. MARINE BACTERIOPLANKTON,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5A.
W78-05142

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. III. PHYTOPLANKTON POPULATION CYNAMICS AND PRODUCTION,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5A.
W78-05143

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. IV. ZOOPLANKTON POPULATION DYNAMICS AND PRODUCTION,
California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 5A.
W78-05144

CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT: EFFECT OF MERCURY ON ENCLOSED WATER COLUMNS. V. GROWTH OF JUVENILE CHUM SALMON (ONCORHYNCHUS KETA),
British Columbia Univ. Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5A.
W78-05145

EVALUATION OF A CELL CULTURE ASSAY FOR DETERMINATION OF WATER QUALITY OF OIL-REFINERY EFFLUENTS,
Oklahoma State Univ., Stillwater. Dept. of Biochemistry; Oklahoma State Univ., Stillwater. Dept. of Statistics; and Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-05146

CHLORINATED HYDROCARBON RESIDUES IN THE DIET AND EGGS OF THE FLORIDA BROWN PELICAN,
Florida Univ., Gainesville. Pesticide Research Lab.
N. P. Thompson, P. W. Rankin, P. E. Cowan, L. E. Williams, Jr., and S. A. Nesbitt.
Bulletin of Environmental Contamination and Toxicology, Vol 18, No 3, p 331-339, 1977. 1 fig, 5 tab, 19 ref.

Descriptors: *Dieldrin, *DDT, *DDE, *DDD, *Chlorinated hydrocarbon pesticides, *Pesticide residues, *Polychlorinated biphenyls, Water pollution effects, Gas chromatography, Calcium, Metabolism, Monitoring, Water pollution effects, *Diets, *Brown pelican, Endangered population, Pelican eggs.

The potential instability of a population of Brown Pelicans was investigated by monitoring chlorinated hydrocarbon residues in their diet and eggs. Decreases in DDT and metabolite concentration were noted compared to previous investigations. The authors postulate that, with the usage of DDT severely restricted, this chemical will not endanger the viability of the species. (Katz)
W78-05147

ACUTE TOXICITY OF INORGANIC CHLORAMINES TO EARLY LIFE STAGES OF BROOK TROUT (SALVELINUS FONTINALIS),
Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.
G. L. Larson, F. E. Hutchins, and D. A. Schlesinger.
Journal of Fish Biology, Vol 11, p 595-598, 1977. 1 fig, 1 tab, 8 ref.

Descriptors: *Toxicity, *Salmonids, *Trout, *Brook trout, Fish physiology, Mortality, Lethal limit, Chlorine, Inorganic compounds, Growth stages, Resistance, Bioassay, Fry, Juvenile growth stage, Analytical techniques, *Chloramines, Salvelinus fontinalis, Alevins.

The acute toxicity of inorganic chloramines to brook trout alevin, fry, and juvenile life stages was determined in 96-h tests. Toxicity was not constant between the life stages. Alevins were more tolerant than the fry group tested. Alevins showed a decreased tolerance with an increase of body weight. Two groups of juveniles were similar in tolerance to the heaviest alevin group. A relationship between life stage-body weight of brook trout and 96-h median tolerance limits was presented. (Klein)
W78-05149

ENZYME ACTIVITIES IN THE SERUM OF RAINBOW TROUT, SALMO GAIRDNERI RICHARDSON; AND THE EFFECTS OF WATER TEMPERATURE,
Stuttgart Univ. (West Germany). Inst. fuer Siedlungswasserbau und Wassergueteswirtschaft.
D. M. Sauer, and G. Haider.
Journal of Fish Biology, Vol 11, p 605-612, 1977. 8 fig, 1 tab, 18 ref.

Descriptors: *Salmonids, *Trout, *Rainbow trout, *Water temperature, *Enzymes, *Biochemistry, *Chemical reactions, Proteins, Analytical techniques, Catalysts, Laboratory tests, Heated water, Fish physiology, Tissue analysis, Lactate dehydrogenase, Hydroxy butyric dehydrogenase, Glutamic oxalacetic transaminase, Glutamic pyruvic transaminase, Glutamate dehydrogenase, Creatinine kinase, Alkaline phosphatase, Leucine amino peptidase.

Activities of lactate dehydrogenase, hydroxy butyric dehydrogenase, glutamic oxalacetic transaminase, glutamic pyruvic transaminase, glutamate dehydrogenase, creatinine kinase, alkaline phosphatase, and leucine amino peptidase were determined in the area of rainbow trout. The animals had previously been adapted to temperatures of 3.5, 6, 8, 10, 12.5, 15, 17, 19, 21.5, and 23C. Most of the enzyme activity increased with the rise in temperature. The activity of alkaline phosphatase decreased in the range 6-19C, while the changes in the glutamate dehydrogenase activity took a complex course. (Klein)
W78-05150

RESIDUAL TOXICITY OF SEVERAL DISINFECTANTS IN DOMESTIC WASTEWATER,
Grand Valley State Coll., Allendale, MI.
R. W. Ward, and G. M. DeGraeve.
Journal Water Pollution Control Federation, Vol 50, No 1, p 46-60, 1978. 13 tab, 18 ref.

Descriptors: Freshwater fish, *Toxicity, *Growth rates, *Disinfection, *Mortality, *Waste water(Pollution), Bromine, Chlorine, Chlorides, Effluents, Ozone, Fish reproduction, Sulfur compounds, Resistance, Chlorination, Bioassay, *Fathead minnows, Pimephales promelas, Sulfur dioxide, Bromine chloride.

A life cycle study with fathead minnows (Pimephales promelas) was designed to simultaneously test in parallel the toxicity of a non-disinfected effluent stream and the residual toxicity of identical effluent streams disinfected with chlorine, bromine chloride, or ozone, as well as a chlorinated stream dechlorinated with sulfur dioxide. The following conclusions were supported by the study: Mean total residual C1 concentrations as low as 0.045 mg/l in secondary effluent negatively affected the survival of fathead minnows; levels to 0.033 mg/l retarded their growth. The adverse effects of residual C1 on the survival and growth of P. promelas were eliminated by dechlorination with sulfur dioxide with no undesirable side effects. Mean residual bromine chloride levels as low as 0.034 mg/l were found to inhibit minnow growth. Long-term exposure to oxonated effluent with mean residual ozone levels of 0.016 mg/l or less did not affect the survival, growth or reproduction of fathead minnows. (Klein)
W78-05151

THE COMPARISON OF ACTIVATED AND DIGESTED SLUDGE EXTRACTS IN CULTIVATING CHLORELLA PYRENOIDOSA AND C. SALINA,
Chinese Univ. of Hong Kong. Dept. of Biology.
M. H. Wong.
Environmental Pollution, Vol. 14, p 207-211, 1977. 2 fig, 1 tab, 11 ref.

Descriptors: *Chlorella, *Productivity, *Growth rates, *Sludge, Organic wastes, Activated sludge, Aquatic life, Algae, Effluents, Sewage lagoons, Laboratory tests, Chemical analysis, Metals, Elements, Calcium, Copper, Nitrogen compounds, Phosphorus compounds, Potassium, Cadmium, Magnesium, Iron, Zinc, *Chlorella pyrenoidosa, Chlorella salina, Digested sludge.

Extracts of activated and digested sludge were used for cultivating Chlorella pyrenoidosa and C. salina in the laboratory. It was discovered that the growth rate of the freshwater and marine Chlorella species cultivated in the extracts were higher than in the conventional media, Kuhl medium, and the MAV enrichment medium. The contents of the two types of extracts were similar. The digested sludge extract possessed higher contents of total nitrogen, water-soluble phosphorus, Ca, and Cu, and lower contents of NH3-N, K, Cd, Mg, Fe, and Zn. (Klein)
W78-05153

SOIL-PLANT-WATER ASPECTS OF OZONE PHYTOTOXICITY IN TOMATO PLANTS,
Guelph Univ. (Ontario). Dept. of Horticultural Science.
H. Khatamian, N. O. Adedipe, and D. P. Ormrod.
Plant Soil. 38(3), p 531-541, 1973.

Descriptors: Growth rates, *Tomatoes, Lycopersicon-Esculentum, *Ozone phytotoxicity, Soils, Stomata, *Toxicity, Water pollution effects, Plant growth, Soil-water-plant relationships.

Tomato (Lycopersicon esculentum Mill.) plants were grown in controlled environments and subjected to different soil water regimes. At 3-, 5-, and 7-leaf growth stages, plants were fumigated with ozone at 50 or 100 pphm for 1 h. Plants at 5- or 7-leaf stage were not sensitive to ozone as were the young plants fumigated at 3-leaf stage. At the 7-leaf stage, leaf injury at near-optimum water condition was very minimal, even at ozone concentration of 100 pphm. Ozone treatment decreased total dry matter of optimally watered plants fumigated at the 3-leaf stage. Plants subjected to water stress resulting in low leaf relative turbidity prior to ozone fumigation, were considerable protected from ozone phytotoxicity. Open stomata were an important factor in ozone phytotoxicity. Post-fumigation water regimes had no effect on eventual leaf injury.--Copyright 1974, Biological Abstracts, Inc.
W78-05154

COMBINED IN VITRO ACTIVITY OF TRIMETHOPRIM AND SULPHONAMIDES ON FISH - PATHOGENIC BACTERIA,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
D. H. McCarthy, J. P. Stevenson, and A. W. Salsbury.
Aquaculture, 3(1), p 87-91, 1974.

Descriptors: Aeromonas-punctata, Aeromonas-salmonicida, *Bacteria, Fish diseases, Haemophilus-piscium, *Pathogenic bacteria, Phenazole, Pseudomonas-sp, Pyridazine, Sulfadiazine, Sulfadimidine, Sulfamerazine, Sulfamethoxy, Sulfamethyl, Sulfanilamide, Sulfathizole, *Sulfonamides, *Trimethoprim, Vibrio-anguillarium, Water pollution effects.

The relative in vitro activity of 7 sulfonamides, sulfadiazine, sulfanilamide, sulfadimide, sulfamerazine, Sulfathiazole, Sulfamethoxypyridazine and sulfamethylphenazole, each linked in turn to trimethoprim, was assessed for representatives of the following fish-pathogenic bacteria: Aeromonas punctata, A. salmonicida, Vibrio anguillarum, Pseudomonas sp., Haemophilus piscium.--Copyright 1975, Biological Abstracts, Inc.
W78-05155

YIELD OF CHANNEL CATFISH AND COMPOSITION OF EFFLUENTS FROM SHALLOW-WATER RACEWAYS,
Fish Farming Experimental Station, Stuttgart, AR.
D. L. Tackett.
Prog Fish-Cult. 36(1), p 46-48, 1974.

Descriptors: *Channel catfish, *Chemical wastes, Effluents, Equations, Raceways(Shallow water), Water pollution effects.

A yield of 120 kg/m3 (7.5 lb/ft3) of marketable channel catfish was produced in an experimental raceway system having 0.34 m3 (12 ft3) of water volume, a water depth of 23 cm (9 in.) and an inflow of 23 l/min (6 gal/min). Stocking size and density determined the average weight of the fish at harvest. The prediction equation was: $Y = 1.053x1 - 2.724x2 + 520.284$ where Y equals average weight in grams, x1 is stocking size in grams and x2 is number of fish stocked/raceway. The concentration of chemical constituents in the influent and effluent differed significantly only in suspended solids and biological O2 demand.--Copyright 1975, Biological Abstracts, Inc.
W78-05156

INTERACTIONS OF DIETARY ALPHA-TOCOPHEROL, OXIDIZED MENHADEN OIL

AND ETHOXYQUIN ON CHANNEL CATFISH (ICTALURUS PUNCTATUS),
Georgia Agricultural Experiment Station, Savannah.
T. Murai, and J. W. Andrews.
J Nutr. 104(1), p 1416-1431, 1974.

Descriptors: *Channel catfish, *Fish diets, *Ethoxyquin, *Menhaden oil, *Tocopherol, Fish mortality, Fish pathology, Water pollution effects.

A 3 x 3 x 2 factorial feeding study with channel catfish (I. punctatus) included the following dietary treatments: 0, 25 and 100 mg/kg dl-alpha-tocopherol; 0, 10 and 100 g/kg oxidized menhaden oil; and 0 and 125 mg/kg ethoxyquin. Fish fed diets containing oxidized menhaden oil without supplemental alpha-tocopherol or ethoxyquin exhibited poor growth, food conversion and survival rates; high incidenc of 3 distinct gross syndromes-exudative diathesis, muscular dystrophy and depigmentation; fatty livers; anemia; and pronounced histological changes in muscle fibers, kidney and pancreatic tissue. Although these conditions were improved by the addition of either alpha-tocopherol or ethoxyquin, analysis of variance of data revealed differentiation in effects. Tocopherol had a very strong main effect on all variables; ethoxyquin did not have a significant effect ($P > 0.05$) on hematocrit levels and incidences of muscular dystrophy. Growth reduction, hematological changes and the occurrence of muscular dystrophy and fatty livers were not observed in fish fed diets without diathesis, depigmentation, and mortality were present in this dietary treatment. Data from this study suggest that 25 mg/kg alpha-tochopherol and 125 mg/kg ethoxyquin, or 100 mg/kg alpha-tocopherol should provide adequate protection in most practical catfish diets.--Copyright 1975, Biological Abstracts, Inc.
W78-05157

THE ISLAND MASS EFFECT ON THE PHYTOPLANKTON AND PRIMARY PRODUCTION OF THE HAWAIIAN ISLANDS,
Australian Inst. of Marine Sciences, Townsville.
M. Gilmartin, and N. Revelante.
Exp Mar Biol Ecol. 16(2), p 181-204, 1974.

Descriptors: Distribution, Water pollution effects, Diatoms, Hawaiian Islands, *Island mass, Mixing, Nutrients, *Phytoplankton, *Standing crops, *Primary productivty, *Chlorophyll.

A 170 station oceanographic reconnaissance in the nearshore waters of the Hawaiian Islands emphasizes the 'island mass' effect in increasing primary production and chlorophyll a standing crop as well as in altering community assimilation ratios. The distribution of oceanographic parameters and micronutrients indicate that one of the enriching mechanisms is turbulence and vertical mixing in island channels. The species composition of the net phytoplankton communities characteristic of inshore, offshore and oceanic station is given and the relative importance of the nannoplankton component discussed. The nannoplankton dominated in all regions, with a tendency for the net/nannoplankton ratio to increase toward the base of the euphotic zone. The net phytoplankton consisted chiefly of open ocean diatom species with neritic species restricted to a narrow inshore environment.--Copyright 1975, Biological Abstracts, Inc.
W78-05158

PRELIMINARY BIOCHEMICAL OBSERVATIONS OF FISHES INHABITING AN ACIDIFIED LAKE IN ONTARIO, CANADA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5A.
W78-05159

DEMONSTRATION OF THE ACTIVITY OF MUREINE HYDROLASE DURING THE BREAKDOWN OF A BLOOM OF ANABAENA SOLITARIA KLEB, (IN GERMAN),
Tuebingen Univ. (West Germany). Inst. fuer Chemische Pflanzenphysiologie.
H. E. A. Schenk, and F. Juettner.
Arch Hydrobiol. 74(1), p 1-7, 1974.

Descriptors: *Cyanophyta, *Eutrophication, Lakes, Anabaena-planctonica, Anabaena-solitaria, Lysozyme, *Murein hydrolases, *West Germany(Wahnbachtalsperre).

Several factors effecting lysis of blooms of Cyanophyta are discussed. A new test for mureine hydrolases is described. Activity of mureine hydrolases was demonstrated in sterile filtrates of lake water (Wahnbachtalsperre, near Bonn, W. Germany) with blooming A. planctonica. The activity of mureine hydrolases found does not appear to come from lysozyme.--Copyright 1975, Biological Abstracts, Inc.
W78-05160

STUDIES ON MANGROVE COMMUNITIES IN PUERTO RICO,
Puerto Rico Univ., Mayaguez. Dept. of Marine Sciences.
P. R. Burkholder, and L. R. Almodovar.
Fla Sci. 36(1), p 66-74, 1973.

Descriptors: Primary productivity, Marine algae, Acanthophora-spicifera, Anadyomene-stellata, Batophora-oerstedii, Carbon-14 method, Caulerpa-racemosa, Caulerpa-verticillata, Chlorophyll, Dictyota-dichotoma, Halimeda-incrassata, Lagoons, *Mangrove, *Puerto Rico, Rhizophora-mangle, Tropical regions, Valonia-ventricosa, Wrangelia-bicuspidata.

Quantitative data were presented for the occurrence and primary productivity of marine algae growing on the roots of red mangrove (Rhizophora mangle) in southern Puerto Rico. The wet weight of algae per root (of 9 roots) averaged 274 g. The average number of algal species per root (of 10 roots) was 5.1 and the greatest number per root was ten. A list of species which were dominant on individual roots includes: Acanthophora spicifera, Anadyomene stellata, Batophora oerstedii, Caulerpa racemosa, C. verticillata, Dictyota, dichotoma, Halimeda incrassata, Valonia ventricosa, Wrangelia bicuspidata and occasionally others. In a set of typical physiological observations on 14 kinds of algae chlorophyll a content averaged 2.11 mg g-1. C fixed in mg per g dry wt per day averaged 34.1 with the O2 method and 14.7 with the 14C technique. The flora of an average root was calculated to produce in gross photosynthesis 1.47 g C per day, and in 'net' assimilation with the 14C method about 0.64 g C per day. The flora of a mangrove root appears to produce about as much organic matter per day as was observed in a m2 column of phytoplankton in moderately rich tropical lagoons.--Copyright 1975, Biological Abstracts, Inc.
W78-05161

THE ANALYSIS AND CONTROL OF VOLATILE HYDROCARBON CONCENTRATIONS (E.G. BENZENE) DURING OIL BIOASSAYS,
Skidway Inst. of Oceanography, Savannah, GA.
For primary bibliographic entry see Field 5A.
W78-05162

RESPONSE OF SELENASTRUM CAPRICORNUTUM TO ZINC SULFIDES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.
A. C. Hendricks.
Journal Water Pollution Control Federation, Vol. 50, No. 1, p 163-168, 1978. 7 fig, 2 tab, 13 ref.

Descriptors: *Toxicity, *Oxygen, *Zinc, *Dissolved oxygen, *Photosynthetic oxygen, *Algae, *Sulfides, *Nutrients, *Photosynthesis, Bioassay, Chemical analysis, Metals, Sulfur compounds, Selenastrum, Oxygen production, Zinc sulfide, Antagonism.

Oxygen production by Selenastrum capricornutum was measured after exposure to zinc, sulfide, and zinc plus sulfide. Oxygen production was decreased by 50% at 1.0 mg/l and 2.5 mg/l of zinc and sulfide, respectively. When zinc and sulfide were added together at a 2.0 ratio the oxygen production was at or near the oxygen production of the control even with zinc and sulfide concentrations of 5 and 2.5 mg/l, respectively. The two ions demonstrated an antagonism that reduced their toxic effects. (Deal)
W78-05163

SEA-WATER CHLORINATION AND THE SURVIVAL AND GROWTH OF THE EARLY DEVELOPMENTAL STAGES OF PLAICE, PLEURONECTES PLATESSA L., AND DOVER SOLE, SOLEA SOLEA (L.),
Ministry of Agriculture, Fisheries and Food, Port Erin (England). Fisheries Lab.
R. Alderson.
Aquaculture. 4(1), p 41-53, 1974.

Descriptors: Embryonic growth stage, Fish, Sea water chlorination, *Chlorination, *Dover sole, Growth rates, *Plaice, Pleuronectes-platessa, *Sole, Solea-solea, Sublethal limit, Water pollution effects.

The response of the developmental stages tested was examined under constant flow conditions using direct electrolysis of sea water as a source of chlorine. From LC50 determinations, the eggs of plaice were found to be more tolerant than the newly-hatched larvae, and for both plaice and Dover sole the tolerance of the larvae increased as their development proceeded up to metamorphosis. Less change in tolerance was evident with increasing size of fish after metamorphosis. Determinations of time to kill 50% of a test population showed that at chlorine concentrations only slightly higher than LC50 level the time for survival was considerably reduced. Growth of the metamorphosed fish of both species at sub-lethal levels only showed a very marked depression at concentrations very close to the LC50 level. There was some evidence of acclimation to chlorine during long exposure. The growth of fish in power station effluents should not be affected by the use of low level chlorination as an anti-fouling measure, since the chlorine is normally rapidly absorbed by reactions taking place in the sea water. Large fluctuations in the chlorine dose could however present a hazard.--Copyright 1975, Biological Abstracts, Inc.
W78-05164

THE PRE-SKELETAL PHASE OF CHRONIC FLUORIDE INTOXICATION.
Fluoride. 7(3), p 118-122, 1974.

Descriptors: *Toxicity, Lethal limit, Trace elements, *Human diseases, Public health, *Fluoridated water, *Fluorides, Reviews, Stomatitis, Water pollution effects.

Few investigators have paid attention to the systemic effects of flouride in chronic poisoning. In contrast to acute fluoride intoxication from large (drug) doses of fluoride, trace amounts as in fluoridated water can have a sustained effect on the gastrointestinal tract in persons who are susceptible to poisoning by it. Symptoms such as nausea, vomiting, bowel disturbances and frequent ulcers of the mouth (stomatitis) appear to be the most common feature. With the expanding role of fluoride in industry, its special significance as an air pollutant and its increasing occurrence in food in drinks, an awakening to the clinical aspect

of chronic fluoride poisoning will occur.--Copyright 1975, Biological Abstracts, Inc.
W78-05165

REPOPULATION AFTER A FISH KILL IN MUD CREEK, WASHINGTON COUNTY, ARKANSAS FOLLOWING PESTICIDE POLLUTION,
Duke Power Co., Huntersville, NC. Environment Lab.
For primary bibliographic entry see Field 5G.
W78-05166

DECHLORINATION OF WATER FOR FISH CULTURE: COMPARISON OF THE ACTIVATED CARBON, SULFITE REDUCTION, AND PHOTOCHEMICAL METHODS,
Wisconsin Univ.-Milwaukee. Center for Great Lakes Studies.
For primary bibliographic entry see Field 5G.
W78-05167

DISTRIBUTION OF PURPLE PHOTOSYNTHETIC BACTERIA IN WETLAND AND WOODLAND HABITATS OF CENTRAL AND NORTHERN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Botany.
M. E. Burke, E. Gorham, and D. C. Pratt.
J Bacteriol. 117(2), p 826-833, 1974.

Descriptors: *Bacteria, *Distribution, Habitats, *Minnesota, *Photosynthetic bacteria, Rhodopseudomonas-viridis, Wetlands, Woodlands, *Sulfur bacteria, Soil analysis.

Enrichment cultures for purple nonsulfur and sulfur photosynthetic bacteria were prepared for soil samples collected in central and northern Minnesota. The purple nonsulfur bacteria were found in most wetland soils sampled but were uncommon in woodland and grassland soils. The pH range of the soils in which these bacteria occurred was 3.8-7.8 and the oxidation-reduction potential (Eh) ranges was +510 to -65 mV. Soils with a pH below 5.0 or an Eh above +370 mV had a few purple nonsulfur bacteria (< 10/g of soil). Rhodopseudomonas viridis, a photosynthetic bacterium containing bacteriochlorphyll b, and the purple sulfur bacteria were common only in low-acidity wetland soils that were usually being reduced.--Copyright 1974, Biological Abstracts, Inc.
W78-05168

AQUACULTURE IN THERMAL EFFLUENTS FROM POWER PLANTS,
Public Service Electric and Gas Co., Newark, NJ.
C. R. Guerra, B. L. Godfriaux, A. F. Eble, and N. E. Stolpe.
10th European Symposium on Marine Biology, Ostend, Belgium. Vol. 1, p. 189-205, 1975. 4 fig, 4 tab, 19 ref.

Descriptors: *Shrimp, *Commercial shellfish, *Shellfish farming, *Rainbow trout, *Aquiculture, *Powerplants, *Cooling water, *Thermal pollution, *Thermal powerplants, *Animal metabolism, *Animal growth, Water temperature.

This paper reviews certain factors which determine the usefulness, potential and limitations of thermally assisted artificial culture of aquatic organisms: thermal aquaculture. It describes the highlights of thermal aquaculture experiments being carried out at a power generating station and presents conceptual designs of thermal aquaculture systems which would be integrated with power station condenser cooling systems. (Katz)
W78-05169

THE EFFECTS OF ZINC ON THE CARDIAC AND VENTILATORY RHYTHMS OF RAINBOW TROUT (SALMO GAIRDNERI, RICHARDSON) AND THEIR RESPONSES TO ENVIRONMENTAL HYPOXIA,
Bristol Univ. (England). Research Unit for Comparative Animal Respiration.
G. M. Hughes, and R. J. Adeney.
Water Research, Vol. 11, p 1069-1077, 1977. 8 fig, 1 tab, 24 ref.

Descriptors: *Zinc, *Heavy metals, *Fish physiology, *Toxicity, *Respiration, *Oxygen requirements, *Rainbow trout, *Biological membranes, *Membrane processes, Water pollution effects, Bioassay, *Heart rate.

Recordings were made of the cardiac and ventilatory rhythms of rainbow trout subjected to solutions of 40 to 10 ppm zinc in an experimental circulation. The higher concentration produced clearly-defined increases in ventilatory and coughing frequency and a decrease in heart rate. It was concluded that zinc interferes with some of the mechanisms involved in the uptake of oxygen at the gills and consequently can significantly affect the ability of the fish to respond to the additional stress of oxygen lack in its environment. (Katz)
W78-05170

COMPARATIVE SHORT-TERM TOLERANCE OF ZEBRAFISH, FLAGFISH, AND RAINBOW TROUT TO FIVE POISONS INCLUDING POTENTIAL REFERENCE TOXICANTS,
Guelph Univ. (Ontario). Dept. of Zoology.
A. Fogels, and J. B. Sprague.
Water Research, Vol. 11, p. 811-817, 1977. 1 tab, 51 ref.

Descriptors: *Poisons, *Toxicity, *Bioassay, *Lethal limit, Resistance, *Rainbow trout, *Phenols, Fish physiology, Animal metabolism, *Sodium compounds, *Copper sulfate, Water pollution effects, Organic compounds, Methodology, *Picloram, *DSS, *Zebrafish, *Flagfish, Reference toxicant, Sodium pentachloro phenate, Dodecyl sodium sulfate.

Zebrafish (Brachydanio rerio) and flagfish (Jordanella floridae) were evaluated as potential standard species for aquatic bioassays in Canada by comparing their short-term tolerance to that of rainbow trout (Salmo gairdneri). When threshold or 10-day LC50's for rainbow trout were assigned a value of 1.0, corresponding values for zebrafish and flagfish were respectively: copper sulfate, 1.6, 7.2; sodium pentachloropenate, 4.7, 7.6; phenol, 2.5, 3.1; picloram, 1.6, 0.55; and dodecyl sodium sulfate, 2.8, 2.4. On the average, zebrafish were 2.6 times as tolerant at trout, and flagfish 4.2 times. As a reference toxicant, sodium pentachlorophenate presented difficulties with analysis and availability. Dodecyl sodium sulfate showed no threshold of acute lethality for trout and 5-yr-old DSS had about one-third the toxicity of 1-year old DSS. Phenol met all criteria for a reference toxicant. (Katz)
W78-05173

THE EFFECTS OF DEPRESSED PH ON OOGENESIS IN FLAGFISH JORDANELLA FLORIDAE,
Concordia Univ., Montreal (Quebec). Dept. of Biological Sciences.
S. M. Ruby, J. Aczel, and G. R. Craig.
Water Research, Vol. 11, p. 757-762, 1977. 10 fig, 3 tab, 15 ref.

Descriptors: *Hydrogen ion concentration, *Fish eggs, *Fish physiology, *Reproduction, *Growth rates, *Growth stages, *Cytological studies, *Industrial wastes, *Acidic water, Water pollution effects, Bioassay, Laboratory tests, *Oocytes, *Flagfish.

Mature female flagfish were continuously exposed to pH levels of 6.7, 6.0, 5.5, 5.0 and 4.5 during a 20-d period. Quantitative histological analysis of oocyte numbers in six arbitrarily assigned stages of development indicates that the ability of oocytes to form mature eggs is reduced at all pH values tested to 20.7, 15.8, 2.1 and 8.2%, respectively, when compared with control. This reduction is primarily produced by the loss of ability of oocytes to deposit secondary yolk within the cytoplasm. (Katz)
W78-05174

POLYCHLOROBORNANE COMPONENTS OF TOXAPHENE: STRUCTURE-TOXICITY RELATIONS AND METABOLIC REDUCTIVE DECHLORINATION,
California Univ., Berkeley. Dept. of Entomological Sciences, Pesticide Chemistry and Toxicology.
M. A. Saleh, W. V. Turner, and J. E. Casida.
Science, Vol. 198, p. 1256-1258, 1977. 1 fig, 1 tab, 24 ref.

Descriptors: *Toxicity, *Chlorination, *Animal metabolism, *Fish physiology, *Animal physiology, *Chlorine, *Insecticides, *Biodegradation, *Chlorinated hydrocarbon pesticides, Gas chromatography, *Toxaphene, *Polychlorobornane, *Biotransformation, *Photolysis.

2,2,5-endo,6-exo,8,9,10-Heptachlorobornane and four derivatives of the heptachlorobornane, with an additional chlorine atom at position 3-exo,8,9, or 10, account for a major portion of the acute toxicity of toxaphene and for up to 23 percent of toxaphene composition as analyzed by open tubular column gas-liquid chromatography with an electron capture detector. Both in several organisms and model environmental systems and on photolysis, this heptachlorobornane undergoes facile reductive dechlorination at the geminal-dichloro group and sometimes dehydrochlorination. (Katz)
W78-05175

BIOTRANSFORMATION AND ELIMINATION OF THE HERBICIDE DINITRAMINE IN CARP,
Fish and Wildlife Service, La Crosse, WS. Fish Pesticide Research Div.
L. E. Olson, J. L. Allen, and J. W. Hogan.
Agricultural and Food Chemistry, Vol. 25, No. 3, p. 554-556, 1977. 1 fig, 2 tab, 7 ref.

Descriptors: *Biodegradation, *Carp, *Herbicides, *Pesticides, *Animal metabolism, *Fish physiology, *Nitrogen compounds, Gas chromatography, Biochemistry, Bioassay, Laboratory tests, Water pollution effects, Path of pollutants, Biotransformation, Tissue analysis, *Bile, *Dinitramine, *Liver.

Carp exposed to 1 mg/l dinitramine for 12-h accumulated the herbicide. After the fish were held in fresh water for 7 days, samples of plasma, muscle and gall bladder bile contained 6, 25, and 7%, respectively, of the concentration found immediately after exposure. Metabolites were not found in plasma or muscle, but deethylated dinitramine was present in the gall bladder. Biotransformation by dealkylation thus occurred in the liver. (Katz)
W78-05176

AQUATIC TOXICOLOGY: A NEW ELEMENT IN THE SAFETY TESTING OF SURFACTANTS,
Water Pollution Research Lab., Stevenage (England).
J. S. Alabaster.
The Journal of the American Oil Chemists' Society, Vol. 55, p. 181-184, 1978. 2 fig, 27 ref.

Descriptors: *Surfactants, *Toxicity, *Safety, *Biodegradation, Animal metabolism, Fish physiology, Methodology, *Testing procedures, *Alkylbenzene sulfonate, *Sewage treatment, Aquatic environment, Rainbow trout, Toxicity, Methodology, Bioassays, Environmental effects, Aquatic toxicology, Preliminary screening test procedures, Biological treatment process, LAS, Linear alkyl sulfonates.

Aquatic toxicology is becoming increasingly important in assessing the risks from environmental contamination by surfactants. Recent work by the Water Research Centre and others is discussed to show that: (a) there is a need for flexibility in approach even for preliminary screening test procedures and for toxicity tests to be relevant to field situations; (b) where linear chain surfactants pass through a normal biological treatment process these are readily biodegraded and reduced in toxicity, and in these circumstances toxicity tests should be made using biodegraded materials; (c) methods of analysis currently used overestimate the acute toxicity of surfactants to fish. (Katz)
W78-05177

EFFECT OF EXPOSURE TIME AND COPPER CONCENTRATION ON REPRODUCTION OF THE FATHEAD MINNOW (PIMEPHALES PROMELAS),
Environmental Research Lab.-Duluth, Cincinnati, OH. Newtown Fish Toxicology Station.
Q. Pickering, W. Brungs, and M. Gast.
Water Research, Vol 11, pp 1079-1083, 1977. 4 tab, 15 ref.

Descriptors: *Copper, *Fish eggs, *Fish reproduction, Fish physiology, *Minnows, *Spawning, *Fertility, *Toxicity, Reproduction, Growth rates, Bioassay, Fecundity, Metals, Path of pollutants, Water pollution effects, Prespawning exposure, Fathead minnow, Pimephales promelas.

Three concurrent studies were conducted to determine the chronic effect of prespawning exposure to various concentrations of copper on fathead minnow reproduction. Copper was introduced into the three exposure systems to give 6-, 3-, and 0-months exposure prior to spawning. Prespawning exposure time had not significant effect on reproduction. Number of eggs produced per female decreased, however, with increase in copper concentrations. (Katz)
W78-05178

FACTORS AFFECTING THE SEASONAL ABUNDANCE, COMPOSITION AND DIVERSITY OF FISHES IN A SOUTHEASTERN NEW ENGLAND ESTUARY,
Southeastern Massachusetts Univ., North Dartmouth.
For primary bibliographic entry see Field 2L.
W78-05179

SIGNIFICANCE OF HYPOCHLOROUS ACID IN FREE RESIDUAL CHLORINE TO THE AVOIDANCE RESPONSE OF SPOTTED BASS (MICROPTERUS PUNCTULATUS) AND ROSYFACE SHINER (NOTROPIS RUBELLUS),
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
D. S. Cherry, S. R. Larrick, K. L. Dickson, R. C. Hoehn, and J. Cairns, Jr.
Journal of the Fisheries Research Board of Canada, Vol 34, p 1365-1372, 1977. 3 fig, 2 tab, 20 ref.

Descriptors: *Chlorine, *Acids, *Water temperature, *Fish behavior, *Bass, *Shiners, *Sunfishes, Water quality, Water properties, Chemistry, Water chemistry, Laboratory tests, Water pollution effects, *Avoidance response(Fish), *Hypochlorous acid, Free Residual chlorine, Micropterus punctulatus, Notropis rubellus, Rosyface shiner, Spotted bass.

The spotted bass and rosyface shiner when exposed to successively doubling doses of total residual chlorine (TRC) from 0.025 to 0.80 mg/l, generally avoided higher concentrations when acclimated and tested at five temperatures from 6 to 30C. Both species avoided 0.05 mg/l TRC when acclimated and tested at 6C and avoided 0.20 mg/l TRC at 24 and 30C. Variations in avoidance of the free resedual chlorine (FRC) ranged from 0.017 to 0.091 mg/l (0.05 to 0.20 mg/l TRC) between 6 and 30C. After the initial avoidance response, the rosyface shiner continued to avoid the remaining higher residual levels, while spotted bass showed less avoidance or none at all. The same behavioral responses occurred when each species was exposed to a single concentration (0.05 or 0.10 mg/l TRC) for three successive 10-min observations. The avoidance response was most closely associated with the calculated hypochlorous acid (HOCl) fraction of the TRC, which declined (relative to the percent of TRC) as the pH and acclimation temperature increased. Avoidance to HOCl occurred between 0.012 mg/l (6C) and 0.031 mg/l (30C) when TRC was between 0.05 and 0.20 mg/l, respectively. Avoidances did not occur at the 12 and 18C acclimation temperatures until the HOCl threshold level (0.012-0.014 mg/l) calculated for 0.05 mg/l TRC at 6C. The HOCl content may be the most important constituent within the TRC to influence the avoidance response of fish in unpolluted aquatic systems. (Klein)
W78-05200

5D. Waste Treatment Processes

DECISION STRUCTURE FOR ASSESSMENT OF THE ECONOMIC IMPACT OF WATER QUALITY STRATEGIES IN AN INDUSTRIAL WATERSHED,
Wisconsin Univ.-Madison Dept. of Real Estate and Urban Land Economics.
For primary bibliographic entry see Field 5G.
W78-04701

LAND APPLICATION OF SEWAGE SLUDGE: V. CARBON DIOXIDE PRODUCTION AS INFLUENCED BY SEWAGE SLUDGE AND WOOD WASTE MIXTURES,
Nigeria Univ., Nsukka. Dept. of Soil Microbiology.
For primary bibliographic entry see Field 5E.
W78-04717

PHOSPHORUS REMOVAL AND WATER QUALITY IMPROVEMENTS IN GRAVENHURST BAY, ONTARIO,
M. F. P. Michalski, K. H. Nicholls, and M. G. Johnson.
Verh. Internat. Verein. Limnol., Vol. 19, p 644-659, October 1975. 10 fig, 3 tab, 34 ref.

Descriptors: *Gravenhurst Bay(Ont. Canada), *Phosphorus, *Nutrient removal, *Stratification, *Phytoplankton, Ontario(Canada), Canada, Nutrients, Chlorophyll, Algae, Water management(Applied), Eutrophication, Waste treatment, Waste disposal, Muskoka Lake(Ont Canada), Cyanophyta, Thermocline, Euphotic zone, Water pollution control.

Effects of 90% phosphorus removal from waste treatment plant effluent on phytoplankton growth were studied before and after removal was initiated in August 1971 on effluent into Gravenhurst Bay of Muskoka Lake, Ontario, Canada. It is concluded that significant improvements in water quality resulted from the program. Ice-free mean Secchi disk visibilities improved from an average of 2.5 m (1969-71) to 3.2 m (1972-73), reflecting a diminution of suspended material. In 1969 the euphotic zone was situated above the metalimnion; by 1973 this zone extended to the lower metalimnion and into the upper hypolimnion, an indication of the effects of improved light penetration following reductions in phosphorus loading to the bay. Downward movement of the metalimnion in late summer and fall characterized the thermal regime of the bay each year. Excessive algal growths have not developed during summer months of the post-phosphorus removal period, whereas previously recreational activity and water treatment supply operations were impaired. Chlorophyll-a levels reached 82 micrograms/l on 15 July 1971, but consistent patterns were not observed from 1969-73. Phytoplankton standing stocks did not show definite patterns from 1969-71, but the mean areal standard unit value dropped from 2,717 in 1969-71 to 1,406 in 1972-73. (Lynch-Wisconsin)
W78-04772

BIOLOGICAL DENITRIFICATION OF NITRATE WASTE SOLUTIONS,
Union Carbide Corp., Oak Ridge, TN. Nuclear Div.
F. E. Clark, H. C. Francke, and J. W. Strohecker.
Available from the National Technical Information Service, Springfield, Va 22161 as Y-DA-6106, Price codes: A03 in paper copy, A01 in microfiche. Report Y-DA-6106, Reprint from 30th Annual Purdue Industrial Waste Conference, Purdue University, West Lafayette, Indiana, May 6-8, 1975. 34 p, 12 fig, 3 tab, 10 ref. W.7405 eng 26.

Descriptors: *Denitrification, *Biological treatment, *Waste water treatment, *Nitrates, *Uranium purification, Nitric acid, Water pollution control, Streams, Groundwater, Bacteria, Union Carbide Corporation, Oak Ridge Y-12 Plant(TN), NPDES, Recycling.

Evaluation of alternative methods for disposal of high-nitrate wastes from uranium purification at Union Carbide Corporation's Oak Ridge, Tennessee Y-12 Plant (operated for the U.S. Energy Research and Development Administration) led to adoption of a system for recycling usable chemicals and biodenitrification of the rest. For the last 20 years liquid waste has been pumped into four one-acre ponds for evaporation and percolation into the soil. Nitrogen concentrations in a nearby creek were kept below 20 mg/cu dm, but recent changes in water pollution laws and creation of the National Pollutant Discharge Elimination System (NPDES) required that use of the ponds be discontinued to improve wate quality in the creek and eliminate the danger of nitrate pollution of groundwater. Disposal methods investigated were: (1) neutralization with lime and calcination; (2) neutralization with lime lime and conversion to liquid or solid fertilizer; (3) neutralization with lime followed by biodenitrification; and (5) recovery and recycling usable chemicals and biodenitrification of the remainder. Methods 1-3 were rejected because of expense, pollution dangers, or troublesome side products, and because of the quantity of nitrate ion involved method 5 was selected over method 4. Under the new process, nitric acid will be recovered by distillation, and aluminum nitrate nanohydrate by crystallization, with only the mother liquor denitrified biologically by bacteria. (Lynch-Wisconsin)
W78-04783

THE EDGE OF THE ARROWHEAD,
Minnesota Marine Advisory Service, Duluth. Office of Sea Grant.
For primary bibliographic entry see Field 2H.
W78-04784

EVALUATION OF MEMBRANES FOR WATER POLLUTION CONTROL,
Massachusetts Univ., Amherst. Dept. of Chemical Engineering.
W. L. Short, and E. E. Lindsey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 353, Price codes: A04 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, Publication No. 79, June 1976, 53 p, 6 fig, 8 tab, 27 ref. OWRT A-057-MASS(1), 14-31-0001-3821.

Descriptors: *Membrane processes, Filtration, Water pollution control, Water quality control, Water treatment, *Recycling, Coagulation, *Waste water treatment, Membranes, Sludge treatment, Separation techniques, *Aluminum sulfate.

An ultra-filtrative alum (aluminum sulfate) recovery and recycling process using synthetic polymeric membranes at low pressure differentials is economical and effective. The quality of the treated water produced by coagulation with the recycled alum as measured by turbidity and color does not suffer when using the optimum dose established by tests with fresh alum. The alum may be recycled four times if the membrane is periodically cleansed with an alkali (sodium hydroxide). An additional advantage is that the volume of sludge is greatly reduced and the remaining sludge is dewaterable. Efforts to attach a cleaning enzyme to the membrane and to use polyethylene and polystyrene as separation membranes were unsuccessful. (Lefferts-Mass)
W78-04813

MANAGEMENT OF MAN-MADE EUTROPHICATION: THE SWEDISH CONCEPT,
Association of Swedish Chemical Industries, Stockholm (Sweden).
For primary bibliographic entry see Field 5G.
W78-04917

MANUAL: RESEARCH AND DEMONSTRATION OF IMPROVED SURFACE MINING TECHNIQUES FOR THE EASTERN KENTUCKY COAL FIELDS.
Kimball (L. Robert) Consulting Engineer, Lexington, KY.
For primary bibliographic entry see Field 5G.
W78-05013

LABORATORY MEASUREMENTS OF RADIANCE AND REFLECTANCE SPECTRA OF DILUTE SECONDARY-TREATED SEWAGE SLUDGE,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-05016

5E. Ultimate Disposal Of Wastes

WELL INJECTION INTO A TWO-PHASE FLOW FIELD: A HELE-SHAW MODEL INVESTIGATION,
Hawaii Univ., Honolulu. Water Resources Research Center.
J. A. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 197, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. 108, May 1977. 37 p, 17 fig, 3 tab, 12 ref. OWRT B-043-HI(2), 14-34-0001-6012.

Descriptors: *Injection wells, *Waste water disposal, *Saline water-freshwater interfaces, *Two-phase flow, *Mathematical models, Hawaii, Simulation analysis, Interfaces, Water pollution sources, Path of pollutants, Model studies, *Hele-Shaw model, Hubbert's force potential, Waimanalo, Oahu(Hawaii).

A Hele-Shaw model was employed in conducting preliminary studies of waste water injection into a fresh-saine water system. Three different field conditions were simulated: injection under static conditions, injection into an ambient flow field without a fresh-saline water interface, and injection into an ambient flow field with a fresh-saline water interface. Both single and double-well injections were studied for the latter case of injection in the presence of an interface. The density of the saline water was 1.026 g/cm2 for the majority of the tests while that of the injected fluid was 1.0005 g/cm3. The test results indicate that when injection is below the fresh-saline water interface, the injected fluid, under the action of the bouyant forces, rises through a relatively narrow, vertical channel to the interface and then spreads laterally along that surface. The distance increases with the distance below the interface at which injection takes place. Consequently, injection at or above the interface appears to be preferable to injection below the interface from an economic as well as a pollution standpoint. The general behavior of the injected-ambient flow field as observed in the two-dimensional Hele-Shaw model is consistent with that observed in a three-dimensional, sand-filled, hydraulic model.
W78-04709

LAND APPLICATION OF SEWAGE SLUDGE: V. CARBON DIOXIDE PRODUCTION AS INFLUENCED BY SEWAGE SLUDGE AND WOOD WASTE MIXTURES,
Nigeria Univ., Nsukka. Dept. of Soil Microbiology.
N. N. Agbim, B. R. Sabey, and D. C. Markstrom.
Journal of Environmental Quality, Vol 6, No 4, p 446-451, October-December, 1977. 6 fig, 4 tab, 20 ref.

Descriptors: *Sewage sludge, *Sludge disposal, *Wood wastes, *Land use, *Carbon dioxide, Microbial degradation, Decomposing organic matter, Nitrogen cycle, Organic wastes, Waste disposal, Recycling, Waste water treatment.

Studies were conducted to examine the effect of different proportions and rates of application of wood residues and sludge on the rate of CO2 production. Wood, bark, and a wood-bark mixture from Engelmann spruce were added to anaerobically digested sludge in varying proportions. Each mixture was applied to a clay loam at a rate of 22.4-224 metric tons/ha. The carbon oxidation rate was assessed using carbon dioxide production over a period of 367 days. Generally, carbon dioxide production increased as application rate increased, but the increase was not additive for most of the time intervals. At higher application rates, carbon dioxide accumulation increased as the percentage of wood and bark materials increased up to 75% bark or wood material, then dropped 100% wood material. Laboratory incubation and greenhouse studies attempted to correlate carbon dioxide production with N mineralization. Microbial respiration was considered a suitable index of plant-available nitrogen in soil, except in cases where nutrients were deficient because of microbial immobilization or where toxic substances limited microbial activity. (See also W77-07079 and W76-10841) (Snyder-FIRL)
W78-04717

EFFECTS OF LAND TREATMENT ON THE AQUATIC ENVIRONMENT,
Illinois Univ. at Urbana-Champaign. Dept. of Ecology, Ethology, and Evolution.
For primary bibliographic entry see Field 5G.
W78-04732

WATER QUALITY DATA DURING SEPTEMBER 16-19, 1974 AT SILVER BAY, SAWMILL COVE, AND EASTERN CHANNEL, SITKA, ALASKA.
Environmental Protection Agency, Seattle, WA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W78-04756

BIOLOGICAL DENITRIFICATION OF NITRATE WASTE SOLUTIONS,
Union Carbide Corp., Oak Ridge, TN. Nuclear Div.
For primary bibliographic entry see Field 5D.
W78-04783

THE EDGE OF THE ARROWHEAD,
Minnesota Marine Advisory Service, Duluth. Office of Sea Grant.
For primary bibliographic entry see Field 2H.
W78-04784

NUTRIENTS AND THEIR INFLUENCE ON THE ALGAE IN THE STOCKHOLM ARCHIPELAGO DURING 1970. NO. 6, EFFECTS OF SEWAGE WATER ON BENTHIC VEGETATION,
Uppsala Univ. (Sweden). Inst. of Plant Ecology.
For primary bibliographic entry see Field 5C.
W78-04793

EFFECT OF SPRAY IRRIGATION OF MUNICIPAL WASTEWATER ON SOIL INVERTEBRATE POPULATIONS AND THE POTENTIAL INFLUENCE ON PHYSICAL FACTORS OF SOIL,
State Univ. of New York Coll. of Environmental Science and Forestry. Dept. of Environmental and Forestry Biology.
For primary bibliographic entry see Field 5C.
W78-04818

DEVELOPMENT OF MODELS FOR PREDICTION OF SHORT-TERM FATE OF DREDGED MATERIAL DISCHARGED IN THE ESTUARINE ENVIRONMENT,
Tetra Tech, Inc., Pasadena, CA.
For primary bibliographic entry see Field 5B.
W78-04854

TRACE METALS IN SCALLOPS FROM WITHIN AND AROUND TWO OCEAN DISPOSAL SITES,
Environmental Protection Agency, Narragansett, RI.
For primary bibliographic entry see Field 5C.
W78-04887

ANALYSIS OF BRINE DISPOSAL IN THE GULF OF MEXICO. 1. BRYAN MOUND,
National Oceanic and Atmospheric Administration, Washington, DC. Environmental Data Service.
For primary bibliographic entry see Field 5G.
W78-04963

ANALYSIS OF BRINE DISPOSAL IN THE GULF OF MEXICO. 2. WEST HACKBERRY,
National Oceanic and Atmospheric Administration, Washington, DC. Environmental Data Service.
For primary bibliographic entry see Field 5G.
W78-04964

ANALYSIS OF BRINE DISPOSAL IN THE GULF OF MEXICO. 4. BIG HILL.
National Oceanic and Atmospheric Administration, Washington, DC. Environmental Data Service.
For primary bibliographic entry see Field 5G.
W78-04965

TRACE METALS IN ORGANISMS FROM OCEAN DISPOSAL SITES OF THE MIDDLE EASTERN UNITED STATES,
National Marine Fisheries Service, Milford, CT. Milford Lab.
For primary bibliographic entry see Field 5A.
W78-05059

HEAVY METALS FROM WASTE DISPOSAL IN CENTRAL PUGET SOUND,
Washington Univ., Seattle. Lab. of Radiation Ecology.
For primary bibliographic entry see Field 5B.
W78-05073

GRANULATION OF COMPLEX FERTILIZERS CONTAINING AMMONIUM SULFATE BY MELT TECHNOLOGY,
Ferguson Industries, Dallas, TX.
For primary bibliographic entry see Field 5G.
W78-05118

CHEMICAL DEGRADATION OF MILITARY STANDARD FORMULATIONS OF ORGANOPHOSPHATE AND CARBAMATE PESTICIDES I. CHEMICAL HYDROLYSIS OF DIAZINON,
Army Medical Bioengineering Research and Development Lab., Fort Detrick, MD.
For primary bibliographic entry see Field 5B.
W78-05120

5F. Water Treatment and Quality Alteration

EVALUATION OF MEMBRANES FOR WATER POLLUTION CONTROL,
Massachusetts Univ., Amherst. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W78-04813

THE PRE-SKELETAL PHASE OF CHRONIC FLUORIDE INTOXICATION.
For primary bibliographic entry see Field 5C.
W78-05165

5G. Water Quality Control

DECISION STRUCTURE FOR ASSESSMENT OF THE ECONOMIC IMPACT OF WATER QUALITY STRATEGIES IN AN INDUSTRIAL WATERSHED,
Wisconsin Univ.-Madison Dept. of Real Estate and Urban Land Economics.
C. E. Stanley, and R. A. Erickson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 156, Price codes: A09 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, WIS WRC 77-07, 1977. 167 p, 10 fig, 7 tab, 58 ref, 6 append. OWRT B-095-WIS(1), 14-34-0001-6133.

Descriptors: *Alternative costs, *Cost analysis, *Econometrics, *Economic impact, Management, *Estimating, *Forecasting, Statistical methods, *Statistical models, Water quality control, Wisconsin, *Decision making, Watershed management, Industrial water, Cities, Milwaukee Area Regional Economy(Wisc).

The objective was to develop a decision structure that would trace the impact of water quality decisions through to the economic effect on an industrial watershed and its contained metropolitan economic system. The basic design and some of the results of initial testing of the model are described. Residuals management models for environmental analysis are reviewed with particular attention given to industrial residuals generation and the impacts of pollution abatement strategies. The Milwaukee metropolitan study region is described, water quality monitoring efforts discussed and major polluting industries are identified. Treatment costs for plants and industries are derived based on present municipal treatment costs and prospective marginal cost municipal treatment. A linear prgramming model is then applied to the beer-producing industry to determine the likely response to abatement costs incurred at current operating levels if effluent restrictions are met. At the macroeconomic level, a 96-equation econometric model of the Milwaukee area (MEM), providing forecasts of key variables through 1985, was designed, constructed and tested. The linkages between the reactions of firms in response to abatement costs and the aggregate effects on the regional economy are discussed and tested. Legislation effects and directions for future research are discussed.
W78-04701

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER: PART I. SOIL-WATER QUALITY AND VEGETATIVE RESPONSES,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
E. J. Ciolkosz, L. T. Kardos, R. C. Cronce, and E. R. Stein.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 161, Price codes: A11 in paper copy, A01 in microfiche. Institute for Research on Land and Water Resources, University Park, Completion Report, January, 1978. 227 p, 69 tab, 27 fig, 74 ref, 4 append. OWRT B-086-PA(1) (Part I), 14-34-0001-6114.

Descriptors: *Acid mine water, Water, Soils, Irrigation, Fescues, Flood plains, Hydrogen ion concentration, Total acidity, Conductivity, *Mine drainage, *Water pollution control, *Vegetation regrowth, Liming, *Feasibility studies, *Revegetation, Soil water, *Soil water quality, Vegetative responses, Renovation, Ryegrass.

This study determined the feasibility of using soil as a medium for the renovation of acid mine drainage water. The effects of liming and three levels of irrigation with acid water were studied. Acid water from a stream was applied weekly at three levels to an unlimed and a limed floodplain soil. Soil water samples were collected weekly. The soil water samples and the acid water applied were analyzed for pH, total acidity, conductivity, Al, Fe, Mn, SO4, Ca, Mg, K, and Na. Perennial ryegrass and tall fescue were planted in separate halves of each expermental unit. During the study, the grasses were measured for yield, height, stand density and percent cover. Both the unlimed and limed areas initially had considerable capacity for renovating the applied acid water. Liming and the weekly levels of acid water irrigation significantly affected the growth of perennial ryegrass and tall fescue. When the soil was limed, both species grew well and provided adequate cover. Without liming, both grass species were shorter, yielded less and provided less cover. In the unlimed areas, the tall fescue appeared more tolerant to the higher weekly levels of acid water irrigation than the perennial ryegrass. (See also W78-04705) (Sink-Penn State)
W78-04704

SOIL AS A MEDIUM FOR THE RENOVATION OF ACID MINE DRAINAGE WATER: PART II, SOIL PHYSICAL AND CHEMICAL CHANGES,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
E. J. Ciolkosz, L. T. Kardos, R. C. Cronce, and E. R. Stein.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 162, Price codes: A08 in paper copy, A01 in microfiche. Institute for Research on Land and Water Resources, University Park, Completion Report, January, 1978. 147 p, 62 tab, 13 fig, 68 ref, 2 append. OWRT B-086-PA(1)(PartII), 14-34-0001-6114.

Descriptors: Soils, Acidic water, Soil environment, Cation exchange, Acidity, Hydrogen ion exchange, Irrigation, Soil moisture, Soil temperature, Vegetation regrowth, *Mine drainage, *Water pollution control, Loam, Soil profiles, *Soil physical properties, *Soil chemical properties, Acid mine water, Revegation, Soil parameters, Soil depth, Limed area, Renovation, Sandy loam.

Acid coal mine water was supplied to a Linden sandy loam soil at various levels. The soil data indicated that the main reactions between the applied water and the soil occurred in the upper part of the soil profile. The cation exchange capacity of the soil appeared to be the most important soil property affecting the renovation of the acid water. Th basic cations were removed from the soil in the upper part of the profile and exchanged for H and Al in the water, thus causing the acidity of the soil to increase and the pH of the water to increase. Amounts of Ca and Na in the soil decreased, while the amount of the exchange acidity, K, and Al increased from acid mine water application. The Ca:Mg ratio of the soil decreased as a result of the treatment. The soil in the irrigated areas was unsaturated; soil moisture content increased with increasing soil depth. Soil temperatures were lower in the irrigated areas than in the unirrigated areas. Apparently the better stand of vegetation in the irrigated area shaded the soil more and thus lowered its temperature. (See also W78-04704) (Sink-Penn State)
W78-04705

EFFECTS OF PHYTOPLANKTON ON DISSOLVED OXYGEN CONCENTRATION IN CATFISH PONDS,
Auburn Univ., AL. Water Resources Research Inst.
For primary bibliographic entry see Field 5C.
W78-04710

NON-POINT SOURCE POLLUTION SEMINAR, SECTION 108(A) DEMONSTRATION PROJECTS PROGRESS REPORTS, HELD AT CHICAGO, NOVEMBER 20, 1975. POLLUTION CONTROL IN GREAT LAKES.
Environmental Protection Agency, Chicago, IL. Office of the Great Lakes Coordinator.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-250 970, Price codes: A12 in paper copy, A01 in microfiche. Report EPA-905/9-75-007, (1975). 260 p, 66 fig, 59 tab, 67 ref. EPA G005103, G005139, G005140.

Descriptors: *Erosion control, *Sediment control, *Water quality control, *Demonstration projects, *Nonpoint pollution, Land treatment, Indiana, Wisconsin, Minnesota, Washington County Project(WI), Red Clay Project(WI, MN), Black Creek Sediment Control Project(IN), Great Lakes, Farm management, Agriculture, Grants, Water pollution control, Land use, Monitoring, Watersheds(Basins), Runoff, Planning.

Seventeen papers were presented at a one-day 'Non-Point Source Pollution Seminar,' held 20 November 1975 in Chicago, Illinois under EPA sponsorship. The seminar concentrated on three erosion and sediment control demonstration projects funded by EPA grants under section 108(a) of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500). The majority of the papers concerned the Black Creek Sediment Control Project in Allen County, Indiana; the Black Creek watershed contributes sediment and nutrients to the Maumee River, a tributary of Lake Erie. Two papers provide very preliminary planning synopses of the Red Clay Project in Wisconsin and Minnesota on the southern shore of Lake Superior, and the Washington County Project of southeastern Wisconsin. Three additional papers present judicial interpretations of PL92-500 discharge permit regulations, EPA research and development goals, and management procedures for EPA demonstration grants. The twelve Black Creek Project papers deal with the project's first two years and cover planning techniques, farmer attitudes, minimum tillage experiments, pesticide and fertilizer use in the watershed, sediment and nutrient contributions to the Maumee River, streambank stabilization experiments, sediment traps, grassed waterways, effects of land treatment on fish, computerized monitoring systems, cost analysis, and a progress report. (See W78-04720 thru W78-04736) (Lynch-Wisconsin)
W78-04719

THE CHALLENGE TO AMERICAN AGRICULTURE OF P.L. 92-500 FROM A NATIONAL VIEWPOINT - FOCUS ON 'POLITICAL

RULINGS AS THEY AFFECT NPS PROGRAMS',
Environmental Protection Agency, Washington, DC. Water Planning Div.
J. R. Churchill.
In: Non-Point Source Pollution Seminar, Section 108(a) Demonstration Projects Progress Reports, Held at Chicago, November 20, 1975. Report EPA-905/9-75-007, (1975). p 8-11. EPA G005103, G005139, G005140.

Descriptors: *Federal Water Pollution Control Act Amendments(1972), *Agriculture, *Nonpoint pollution, *Permits, *Water pollution control, Legal aspects, Feed lots, PL 92-500, Legislation, Judicial decisions, Regulation, Point pollution, NPDES, Agricultural runoff.

Under section 402 of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) discharge permits are regulated by the National Pollutant Discharge Elimination System (NPDES). Although some EPA officials feel that certain agricultural activities should be excluded form permit regulations of the NPDES, the recent Flanery decision by the Federal District Court for the District of Columbia ruled that the EPA must promulgate regulations to extend NPDES permits to include all sources in the concentrated animal feeding operation, separate storm sewer, agricultural, and silvicultural categories. Regulations for concentrated feeding oprations, published 20 November 1975 in the Federal Register, specify that a feedlot operator needs a permit if more than a certain number of animals (specified in his paper) are confined, and if measurable waste are discharged into navigable waters. EPA has said that such activities as those mentioned in the Flanery decision are best dealt with at the state and local level as part of an overall, integrated approach based on best management practices, rather than through use of permits. PL 92-500 marks the first time federal water pollution control efforts have been directed at nonpoint sources of pollution. (See also W78-04719) (Lynch-Wisconsin)
W78-04720

OVERVIEW OF RESEARCH AND DEVELOPMENT AS IT RELATES TO NONPOINT SOURCE POLLUTION,
Environmental Protection Agency, Washington, DC. Nonpoint Source Management Div.
P. R. Heitzenrater.
In: Non-Point Source Pollution Seminar, Section 108 (a) Demonstration Projects Progress Reports, Held at Chicago, November 20, 1975. Report EPA-905/9-75-007, (1975). p 12-16. EPA G005103, G005139, G005140.

Descriptors: *Nonpoint pollution, *Research and development, *Agriculture, *Environmental Protection Agency, EPA, Planning, Decision-making, Pollutants, Agricultural runoff, Nutrients, Costs, Benefits.

EPA's long-term agricultural goals are to increase food and fiber production with minimal environmental degradation and minimal conflict with other national goals. Major focal areas of EPA agricultural research, covering all aspects from production through harvesting, are: (1) management of waste from animal production; (2) irrigated and nonirrigated crop production; (3) alternate pest management techniques; and (4) silvicultural practices. Research objectives include: (1) mathematical simulation models to predict impact on water quality of various agricultural and silvicultural practices, as well as the effects of alternate management methods; (2) best management practice (BMP) alternatives for runoff and emission control; (3) assessment of renewable resource production trends and impact; and (4) development of integrated pest management controls to reduce the effects of agricultural pesticides. Several fundamental issues must be dealt with by planners and decision-makers in relation to nonpoint agricultural pollution: (1) measurement of source loads; (2) measurement of pollutant delivery and damage; (3) cost effectiveness of nonpoint pollution source controls; and (4) feasibility of controls implementation. Current progress in each of these areas is discussed. Whether benefits from control are worth the cost is essentially a political question. (See also W78-04719) (Lynch-Wisconsin)
W78-04721

USEPA INVOLVEMENT IN MANAGING SECTION 108(A) PROJECTS,
Environmental Protection Agency, Chicago, IL. Non-Point Source Coordinator.
C. D. Wilson, Jr.
In: Non-Point Source Pollution Seminar, Section 108 (a) Demonstration Projects Progress Reports, Held at Chicago. November 20, 1975. Report EPA-905/9-75-007, (1975). p 17-18. EPA G005103, G005139, G005140.

Descriptors: *Environmental Protection Agency, *Demonstration projects, *Nonpoint pollution, *Research and development, *Grants, EPA, Procedures, Federal Water Pollution Control Act Amendments(1972), PL 92-500, Planning.

Demonstration projects for point and nonpoint pollution sources are provided for by section 108(a) of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) under research and development provisions. All three current nonpoint pollution source projects are managed in essentially the same way through the EPA project officer. Several steps are involved: (1) the project grantee or governing board hires a local project director, who is responsible for all technical direction, guidance of the work plan, operations manual, construction plans and specifications, analytical work, plans evaluation, reports, voucher preparation, and time schedules; (2) the project officer meets with the grantee and outlines accounting procedures, preparation of plans and specifications, reports, purchases, assurances, and reimbursement; (3) all construction plans and farm plans are reviewed by the EPA project officer for approval; (4) after approval, the grantee may advertise for bids; (5) the EPA project officer, after reviewing bid tabulations and proof of advertising, approves or disapproves the awarding of construction or equipment contracts; (6) the project officer performs inspections and program reviews and provides technical assistance; (7) following completion of the project an audit is required; (8) a final report is submitted by the project director. (See also W78-04719) (Lynch-Wisconsin)
W78-04722

CONSERVATION FARM PLANNING,
Soil Conservation Service, Fort Wayne, IN.
For primary bibliographic entry see Field 4D.
W78-04723

IMPACT OF SOCIAL ATTITUDES ON MANAGING THE ENVIRONMENT,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Economics.
R. M. Brooks, and D. L. Taylor.
In: Non-Point Source Pollution Seminar, Section 108(a) Demonstration Projects Progress Reports, Held at Chicago, November 20, 1975. Report EPA-905/9-75-007, (1975). p 26-41, 1 fig, 8 tab. EPA G005103, G005139, G005140.

Descriptors: *Social aspects, *Attitudes, *Black Creek Sediment Control Project(IN), *Amish, *Sediment control, *Surveys, Environmental control, Decision-making, Planning, Demonstration projects, Indiana, Farm management, Soil conservation, Farms, Agriculture, Nonpoint pollution, Costs, Leadership.

Opinions of 89 farmers in connection with the Black Creek Sedimentation Control Project in northeastern Allen County, Indiana, were surveyed to determine attitudes toward introduction of soil conservation practices in the area. A large Amish population, constituting about one-third (32) of the farmers, was an important factor in the study. Identification of leaders among the farmers was a major goal of the survey; eight respected, successful farmers were named as sources of agricultural advice and example by non-Amish. It was hoped that these leaders would cooperate in introducing the new sediment control methods involved in the project. Among the Amish no information on leaders was found. But it was learned that the district Bishop was very influential, and that the project could not be successful without his cooperation. A majority of the Amish felt that soil conservation was a major problem in the area, while a majority of the non-Amish felt it was not a major problem. Both groups agreed that soil erosion practices should not be borne entirely by the farmers affected, and that the federal government should play an important role in soil conservation programs. They also felt that they would benefit from the project. The non-Amish agreed that major decisions in the demonstration project should be made by technicians. (See also W78-04719) (Lynch-Wisconsin)
W78-04724

TILLAGE AND SIMULATED RAINFALL STUDIES,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
J. V. Mannering, D. R. Griffith, and C. B. Johnson.
In: Non-Point Source Pollution Seminar, Section 108(a) Demonstration Projects Progress Reports, Held at Chicago, November 20, 1975. Report EPA-905/9-75-007, (1975). p 42-56, 12 tab, 6 ref. EPA G005103, G005139, G005140.

Descriptors: *Black Creek Sediment Control Project(IN), *Crop production, *Rainfall simulation, *Corn(Field), *Cultivation, Indiana, Demonstration projects, Soil erosion, Erosion control, Farm management, Agriculture, Sedimentation, Turn plowing, Chiseling, Disking, Sediment control.

Five methods for cultivating corn were tested on demonstration plots in 1973-74 to determine the best techniques for erosion control. Results showed that fall chiseling reduced soil losses 50-75% over conventional fall turn plowing, while producing equivalent or better yields on two of three lake plain soils. The experiments were conducted as part of the Black Creek Sedimentation Control Project in northeastern Allen County, Indiana. Three main soil groups were tested: (1) rolling upland silty with clay subsoils (Morley), Blount, Pewamo); (2) nearly-level lake plain sandy, loamy, and silty soils with clay loam subsoils, or clays under deep loams (Oshtemo, Whitaker, Rensselaer, Haskins); and (3) nearly-level lake plain soils with silt loam, clay loam, or clay surfaces and clay subsoils (St. Clair, Nappanee, and Hoytville). Cultivation systems tested were: (1) fall turn plowing and spring disking; (2) spring turn plowing with spring disking; (3) fall chiseling and spring secondary seedbed preparation; (4) light disking; and (5) no cultivation, with planting in a narrow slit. Simulated rainfall tests were conducted to ascertain sediment contributions of the soil units, and to determine effects of cultivation techniques, residue management, and crop species. Both shallow fall disking and no cultivation resulted in 25% reduction in soil losses over fall turn plowing. Shallow disking produced yields generally equivalent to chiseling or plowing, while no cultivation produced variable yields. (See also W78-04719) (Lynch-Wisconsin)
W78-04725

USES OF PESTICIDES AND FERTILIZERS IN THE BLACK CREEK WATERSHED,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
H. M. Galloway.

In: Non-Point Source Pollution Seminar, Section 108(a) Demonstration Projects Progress Reports, Held at Chicago, November 20, 1975. Report EDA-905/9-75-007, (1975). p 57-70, 12 tab. EPA G005103, G005139, G005140.

Descriptors: *Black Creek Sediment Control Project(IN), *Fertilizers, *Pesticides, *Surveys, *Amish, *Social aspects, *Farm management, Indiana, Agriculture, Farms, Water pollution control, Nonpoint pollution, Herbicides, Insecticides, Crop production.

Pesticide and fertilizer use was surveyed among 89 farmers, representing all but four farms of ten acres or more included in the Black Creek Sediment Control Project in northeastern Allen County, Indiana. Amish constituted 32 of the 89 landowners. High crop (especially) corn) and hay acreage and low pasture and woodland acreage characterize the area. Of 57 non-Amish, 47 reported moderate pesticide use, mainly herbicides; 9 of 16 Amish used pesticides. Use of insecticides is uncommon. Tables give types and application rates of herbicides used on corn and soybeans. For corn, oats, and wheat, 92-100% of all farmers use manure or fertilizer, while for soybeans (not grown by Amish) 66% of non-Amish farmers use manure or fertilizer. For hay the percentage ranges from 37% (non-Amish) to 53% (Amish), and for pasture 0% (non-Amish) to 75% (Amish). Seventeen of 28 Amish farmers with pastureland depend entirely on manure for pastures. Both Amish and non -Amish use mixed grades of fertilizer on wheat and oats; non-Amish use two or three fertilizers on corn and low amounts on more phosphorus and potassium than Amish. Analyses of total nitrogen, phosphorus, and potassium in sub-watersheds shows no striking differences between the two groups. Non-Amish tend to use two or three fertilizers as plowdown and in the row, while Amish tend to use one mixed-grade fertilizer at planting. (See also W78-04719) (Lynch-Wisconsin)
W78-04726

SEDIMENT CONTRIBUTIONS TO THE MAUMEE RIVER,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W78-04727

STREAM STABILIZATION,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W78-04728

SEDIMENT TRAP MEASURING BED LOAD MOVEMENT IN BLACK CREEK,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W78-04729

GRASSED WATERWAY DESIGN,
Soil Conservation Service, Kendallville, IN. Area II.
For primary bibliographic entry see Field 4D.
W78-04730

NUTRIENT CONTRIBUTIONS TO THE MAUMEE RIVER,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-04731

EFFECTS OF LAND TREATMENT ON THE AQUATIC ENVIRONMENT,
Illinois Univ. at Urbana-Champaign. Dept. of Ecology, Ethology, and Evolution.
J. R. Karr, and O. T. Gorman.

In: Non-Point Source Pollution Seminar, Section 108(a) Demonstration Projects Progress Reports, Held at Chicago, November 20, 1975. Report EPA-905/9-75-007, (1975). p 120-150, 13 fig, 6 tab, 31 ref. EPA G005103, G005139, G005140.

Descriptors: *Environmental effects, *Black Creek Sediment Control Project(IN), *Ecosystems, *Fish, *Sedimentation, Demonstration projects, Ecology, Water quality, Sediment, Erosion control, Suspended solids, Streams, Forest watersheds, Forests, Universal Soil Loss Equation, Channel improvement, Watersheds(Basins), Indiana.

Biological studies carried out as part of the Black Creek Sediment Control Project in Allen County, Indiana, demonstrated that even small-scale changes in land use may have profound effects on sediment and nutrient dynamics, and on the nature of stream biota. Land treatments incorporated into the project, initiated in 1972, included such measures as agricultural modifications, stream bank reconstruction, erosion control structures, and sedimentation traps. The biological studies ranged from effects of streamside vegetation on suspended solids to fish community dynamics. Stream sampling was conducted throughout the Black Creek watershed, and Wertz Woods on Wertz Drain was selected for intensive study of intra-watershed variation caused by vegetation in fish and other factors. The various land treatments caused significant alterations in fish populations due to reductions in spawning and nursery areas. A general decline in fish numbers--particularly large fish--was noted, as well as lower maximum ages and lower growth rates. The Wertz Woods study area comprised 1800 m of stream channel, 550 m of which meanders through the mixed forest. Average suspended solids load in Wertz Drain drops from 90-95 mg/l upstream of the forest to 74 mg/l at the downstream end of the woods; as the stream flows through the forest it acts as a natural sediment basin. Increased water quality was reflected in the biota. (See also W78-04219) (Lynch-Wisconsin)
W78-04732

COMPUTER MONITORING OF ENVIRONMENTAL CONDITIONS IN A WATERSHED,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W78-04733

PROJECT MANAGEMENT AND LAND TREATMENT COSTS,
Allen County Soil and Water Conservation District, IN.
J. E. Lake.
In: Non-Point Source Pollution Seminar, Section 108(a) Demonstration Projects Progress Reports, Held at Chicago, November 20, 1975. Report EPA-905/9-75-007, (1975). p 162-216, 38 fig, 3 tab, append. EPA G005103, G005139, G005140.

Descriptors: *Black Creek Sediment Control Project(Ind), *Erosion control, *Costs, *Management, *Sediment control, *Farm management, Land use, Indiana, Data collections, Environmental effects, Soil conservation, Water quality, Maumee River, Agriculture, Lake Erie, Sediments, Agricultural runoff, Monitoring, Pollutants, Channel improvement, Grants, Nonpoint pollution.

Cost considerations are related project benefits for the five-year Black Creek Sediment Control Project (Allen County, Indiana), begun in 1972, which was designed to evaluate the impact of agricultural pollutants and land use modifications on water quality. Application of soil conservation and erosion control practices on private farmland, together with monitoring of their effects, is the major activity of the project. Funding of $2.5 million from the Environmental Protection Agency and local sources was obtained, of which $750,000 was budgeted for cost-sharing incentives to farmers for adoption of conservation practices. Thirty four such measures were identified, and goals were set for each. After two years, goals meeting with the greatest success have been grade stabilization structures, stream channel stabilization, conservation cropping, critical area planting, field borders, and grassed waterways. Discouraging results have been associated with contour farming; farmstead, feedlot, and field windbreaks; land smoothing; minimum tillage; pasture and hayland planting; a sediment control basin; strip cropping; tree planting; and woodland practices. Even high cost-sharing incentives have not induced farmers to adopt several of the techniques, including minimum tillage, a conservation measure holding great potential. Management aspects and costs are discussed at length in this paper, accompanied by extensive cost data. The project was initiated after nonpoint pollution (especially sediment) was identified as the major polluter of the Maumee River, of which Black Creek is a tributary. (See also W78-04719) (Lynch-Wisconsin)
W78-04734

SYNOPSIS OF THE RED CLAY PROJECT,
Western Lake Superior Basin Erosion and Sediment Control Program, Superior, WI.
For primary bibliographic entry see Field 4D.
W78-04735

BACKGROUND, DEVELOPMENT, AND OBJECTIVES OF THE WASHINGTON COUNTY PROJECT,
Wisconsin Univ.-Madison. Dept. of Soil Sciences.
For primary bibliographic entry see Field 4D.
W78-04736

WATER QUALITY EFFECTS OF POTENTIAL URBAN BEST MANAGEMENT PRACTICES: A LITERATURE REVIEW,
Wisconsin Dept. of Natural Resources, Madison. Bureau of Water Quality.
G. L. Oberts.
Technical Bulletin No 97, 1977. 24 p, 16 tab, 121 ref. 2 append.

Descriptors: *Bibliographies, *Reviews, *Water management(Applied), *Urban runoff, *Water quality effects, Erosion control, Costs, Sewers, Storm runoff, Nonpoint pollution, California, Virginia, Urban drainage.

The literature of management approaches to control of urban is reviewed, with emphasis on analysis of water quality effects. Three basic alternative approaches to runoff control from sources as construction, streets, litter, and sewer overflow are discussed: (1) on-site source control, (2) collection and transport of runoff to a different location; and (3) treatment of runoff. Rainfall, which occurs on a predominatly impervious area, as runoff picks up sediments, nutrients, and metals and other toxicants and transports them into the stormwater receiving system. The largest concentration, on the rising side of the runoff hydrograph, is termed the 'first flush.' Source control techniques include increased infiltration, retention of runoff/reduction of erosion, reduction of contaminant deposition, and removal of contaminants. Source control is the least expensive approach, and is suitable for small, upstream basins. Collection system problems involve reduction of in-channel erosion, increase of runoff water infiltration, storage of runoff, and removal of contaminants. These systems cost more than source control, but are needed for many larger-scale problems. Treatment of discharge, including physical, chemical, biological, or mixed methods, is the most costly approach, but is often the only alternative for highly developed urban areas; the physical chemical technique is the most cost-effective. (Lynch-Wisconsin)
W78-04744

MODELING OF ACID MINE DRAINAGE AND OTHER POLLUTANTS IN THE MONOGAHELA RIVER BASIN UNDER LOW FLOW CONDITIONS,
West Virginia Univ., Morgantown. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-04746

WATER POLLUTION INVESTIGATION: CUYAHOGA RIVER AND CLEVELAND AREA,
ECO-LABS, Inc., Cleveland, OH.
For primary bibliographic entry see Field 5B.
W78-04748

WATER QUALITY ASSESSMENT FOR THE PROPOSED RDX-HMX FACILITY, MCALESTER NAVAL AMMUNITION DEPOT, VOLUME I AND II.
Water and Air Research, Inc., Gainesville, FL.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 394 and AD-A026 395, Price codes: A08 in paper copy, A01 in microfiche and A07 in paper copy, A01 in microfiche. Final Report to Army Research and Development Command, Washington, D. C. February 1976. 265 p, 35 fig, 29 tab, 115 ref, 5 append. DAMD-17-75-C-5049.

Descriptors: *McAlester Naval Ammunition Depot(OK), *RDX-HMX, *Ammunition plants, *Effluents, *Water pollution sources, *Water pollution effects, Oklahoma, Fish, Streams, Eufaula Reservoir(OK), Peaceable Creek(OK), Eutrophication, Waste water disposal, Industrial wastes, Dissolved oxygen, Nuisance algae, Low flow, Reservoirs.

A survey of chemical and biological characteristics of receiving waters of the proposed RDX-HMX facility at McAlester Naval Ammunirions Depot, Pittsburgh County, Oklahoma showed that the effluents could alter the existing biotic community. Industrial wastewater from the facility would go to Eufaula Reservoir via Chun, Peaceable, Brushy, and Gaines Creeks. The effluents would consist of (1) treated process waste water, and (2) untreated cooling water blowdown, condensate blowdown, and ion exchange regeneration water. Streamflow in receiving waters is highly variable, and during periods of sparse rainfall in late summer and early fall creeks may become dry except for intermittent pools. At those times streamflow would be composed of waste discharge from the facility. Low flows and drought are expected in Peaceable-Brushy Creek system about 5-0% of the year. In the event of treatment plant failure, raw wastewater discharged to the streams under no-flow or medium-flow conditions would cause severe dissolved oxygen (DO) deficits ot the point of anoxia, with the elimination of some species of game fish. Even with normal plant operation, critically low dissolved oxygen conditions could develop, depending on reaeration characteristics. Plant operation would result in nitrogen loading to streams and reservoir, and nuisance algal growth could occur. (Lynch-Wisconsin)
W78-04755

CHEMICALS USED TO CONTROL FISH AND AQUATIC PLANTS IN ILLINOIS, I. AN EVALUATION OF FISH TOXICANTS.
Illinois Natural History Survey, Urbana. Aquatic Biology Section.
In: Illinois Institute for Environmental Quality Document No. 75-13, June 1975. p 1-26, 4 tab, 17 ref, 2 append. 20.054.

Descriptors: *Piscicides, *Rotenone, *Antimycin, Illinois, Toxins, Environmental effects, Toxicity, Invertebrates, Water quality control, Fish control toxicants, Fish control agents, Chemcontrol.

Only two fish control toxicants, rotenone and antimycin, have been found satisfactory for general use in the United States, and along with two selective toxicants are the only piscicides registered by the Environmental Protection Agency. Piscicides are the most efficient and practical means of eliminating undesirable fish, such as bottom-rooting fish or those competing with game species for space and food. An ideal agent should be selectively toxic only for target species, efficient over a wide range of water quality, detoxified rapidly by natural or chemical means, effective after short exposure time, nonrepellant to target species, irreversible, easy to apply, nonhazardous, and economical. Of selected fish species, rotenone is most toxic to minnows, trout, and yellow perch, and least toxic to bullheads, carp, catfish, and goldfish. Antimycin is most toxic to gizzard shad, trout, walleyes, and yellow perch, and least toxic to bullheads, bowfins, catfish, goldfish, and shortnose gar. Sixteen other fish have intermediate resistance to one or both agents. At levels lethal to fish, rotenone is toxic to several invertebrates, while antimycin is toxic to Daphnia and bullfrog tadpoles. Extensive toxicity data for other organisms is presented in tabular form. The presence of aquatic plants, springs, seepages, and silt affect piscicide efficiency, and many toxicants will not penetrate the thermocline; both rotenone and antimycin are degraded by sunlight, high temperature and high pH. (Lynch-Wisconsin)
W78-04779

CHEMICALS USED TO CONTROL FISH AND AQUATIC PLANTS IN ILLINOIS, A REVIEW OF THE AQUATIC HERBICIDES USED IN ILLINOIS,
Illinois Natural History Survey, Urbana. Aquatic Biology Section.
R. C. Hiltibran.
Illinois Institute for Environmental Quality Document No. 75-13, June 1975. p 27-82, 4 fig, 16 tab, 34 ref, 1 append. 20.054.

Descriptors: *Herbicides, *Algicide, *Illinois, *Aquatic weed control, *Algal control, Eutrophication, Copper compounds, Chemcontrol, Water quality control, Environmental effects, Toxicity, Diquat, Biochemical oxygen demand.

Characteristics and uses of aquatic herbicides and algicides currently registered by the Environmental Protection Agency are summarized; some experimental compounds are also included. Algicides include five copper and five non-copper formulations; three pre-emergent and 19 post-emergent herbicides are discussed. Tables and figures give toxicity data for fish and other aquatic organisms, diuration of diquat in natural waters, uptake of copper and diquat by bluegills, and diquat absorption by six hydrosoils. Although minimal study has been focused on changes in water quality parameters from application of herbicides, effects would probably be minimal compared with changes resulting from removal of the aquatic plants and associated biota. Plant decay would increase biological oxygen demand and could caused fish loss. Nutrient levels could also be affected, with the development of algal blooms. Interaction of aquatic herbicides and the aquatic environment, based on experiments in the field and in the laboratory with several herbicides, is also discussed. These herbicides include copper, dequat, fenac, 2,4-D, endothall, simazine, amitrole, dalapon, dichlobenil, diuron, and silvex. (Lynch-Wisconsin)
W78-04780

TAX PLANNING FOR POLLUTION CONTROL EQUIPMENT UNDER THE TAX REFORM ACT OF 1976,
Texas Tech. Univ., Lubbock. Dept. of Accounting.
R. W. Ingram.
Taxes - The Tax Magazine, Vol. 55, No. 8, p 511-515, August 1977. 1 tab.

The Federal Tax Reform Act of 1976 (P.L. 93-625) reflects a change in tax policy relative to pollution control equipment. Two provisions will stimulate enviromental protection: (1) reinstatement of the incentive of rapid amortization for equipment in plants in operation before 1976, and (2) permitting use of the investment credit along with rapid amortization, making the incentive more attractive. Most companies will find rapid amortization the more advantageous alternative; only where short-term facilities are involved will depreciation be desirable. Effects of the new policy will be limited by the increase in the minimum tax rate on preference items. Under earlier law, taxpayers could either amortize the amortizable basis of the equipment over a 60-month period, or depreciated the equipment over its useful life than take the investment credit. In many cases, the second option was preferable. The new law amends Section 169 of the old law to include plants in operation prior to January 1, 1976, and extends tax incentives to cover equipment for 'preventing the creation or emission of pollutants.' An additional criterion for rapid amortization qualification specifies that the property shall not significantly 'increase the output or capacity, extend the useful life, or reduce the total operating costs of such plant' not 'alter the nature of the manufacturing...process or facility.' (Lynch-Wisconsin)
W78-04797

PROBLEMS RELATED TO WATER QUALITY AND ALGAL CONTROL IN LOPEZ RESERVOIR, SAN LUIS OBISPO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA.
R. H. Fuller, R. C. Averett, and W. G. Hines.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 466, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigation 47-74, February 1975. 46 p, 18 fig, 6 tab, 34 ref. USGS/WRI-47-74.

Descriptors: *Lopez Reservoir(CA), *Eutrophication, *Algal control, *Stratification, *Copper sulfate, Reservoirs, Multiple-purpose reservoirs, California, Water quality control, Dissolved oxygen, Anaerobic conditions, Nutrients, Flood control, Anabaena unispora, Sediments, Organic matter.

A study to determine the present enrichment status of Liopez Reservoir in San Luis Obispo county, California, and to evaluate copper sulfate algal treatment found that stratification in the reservoir regulates nutrient release and that algal control has been ineffective. Nuisance algal blooms, particularly from March to June, have been a problem in the warm multipurpose reservoir since it was initially filled following intense storms in 1968-69. The cyanophyte Anabaena unispora has been dominant; cospecies are the diatoms Stephanodiscus astraea and Cyclotella operculata, and the chlorophytes Pediastrum deplex and Sphaerocystis schroeteri. During an A. unispora bloom in May 1972 the total lake surface cell count was nearly 100,000 cells/ml. Thermal stratification from late spring through autumn results in oxygen deficiency in the hypolimnion and metalimnion caused by bacterial oxidation of organic detritus. The anaerobic conditions favor chemical reduction of organic matter, which constitute 10-14% of the sediment. As algae die, sink to the bottom, and decompose, nutrients are released to the hypolimnion, and with the autumn overturn are spread to the epilimnion. Algal blooms not only hamper recreation, but through depletion of dissolved oxygen in the epilimnion may have caused periodic fishkills. Copper sulfate mixed with sodium citrate and applied at 1.10-1.73 lbs/acre has not significantly reduced algal growth; a method for determining correct dosage is presented. (Lynch-Wisconsin)
W78-04802

WATER SUPPLY AND WATER QUALITY CONTROL STUDY, STONEWALL JACKSON RESERVOIR, WEST FORK RIVER BASIN, WEST VIRGINIA.
Department of Health, Education, and Welfare, Wheeling, WV.; Army Engineer District, Pittsburgh, PA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 064, Price codes: A05 in paper copy, A01 in microfiche. February 1965. 84 p, 22 tab, 3 fig, 17 ref.

Descriptors: *Stonewall Jackson Reservoir(WV), *West Fork River Basin(WV), *Water supply, *Water quality control, Reservoirs, Streamflow, Water storage, Multiple purpose projects, River basins, Discharge(Water), Acid mine water, Pennsylvania, Pittsburgh(PA), Baseline studies, West Virginia, Monongahela River.

Present and future municipal and industrial water supply needs in the West Fork River Basin of northern West Virginia are analyzed, as well as the degree to which the proposed Stonewall Jackson Reservoir at Brownsville would meet those and other needs. The basin of West Fork River, a tributary of the Monongahela River, covers 881 sq mi. At Brownsville, average annual discharge from 1946-62 was 171 cu ft/sec (cfs). The population of the basin economic study area is about 231,900, expected to reach 336,000 by 2010. Municipal water use by 15 principal communities in the basin is about 15 million gallons/day (mgd). Water quality of the upper reaches of the river generally is good, but downstream of Clarksburg acidic tributaries draining coal-mining areas degrade the quality of the main stem. Regulation of the streamflow by the Stonewall Jackson Reservoir could provide increased assured flows in the West Fork, Monongahela, and Ohio Rivers, and also improve oxygen concentrations, reduce hardness and acidity, and improve other water quality parameters. The Pittsburgh reach of the Monongahela receives the greatest waste load of the entire system, and summer flows as high as 4,000 cfs may be needed by 2010 to assimilate organic waste loads. As the proposed reservoir could provide only 4-17% of this requirement, other projects would be necessary. Storage needs and provision by the reservoir for various cities are discussed. (Lynch-Wisconsin)
W78-04807

WATER SUPPLY AND WATER QUALITY CONTROL STUDY, BUCK CREEK RESERVOIR, MIAMI RIVER BASIN, OHIO,
Public Health Service, Charlottesville, VA. Region III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 065, Price codes: A04 in paper copy, A01 in microfiche. June 1965. 61 p, 1 fig, 28 tab, 11 ref, 1 append.

Descriptors: *Buck Creek Reservoir(OH), *Water quality control, *Water supply, *Flood control, *Water demand, Reservoirs, Ohio, Baseline studies, Streamflow, Multiple-purpose reservoirs, Recreation, River basins, Miami River(OH), Mad River(OH), Buck Creek(OH), Projections, Planning.

A study was made to furnish data for evaluating the need for the proposed Buck Creek Reservoir in Clark County, east of Springfield, Ohio. While no present or future need (to the year 2020) is seen for municipal or industrial water supply storage, a progressively greater annual need is projected for storage for water quality control purposes. The project is planned by the U.S. Army Corps of Engineers for flood control and associated purposes on Buck Creek, a tributary of the Mad River, which is a major tributary of the Miami River. The study area, with a population of about 1,044,000 in 1960, will have an estimated population of 2,222,000 in 2020, with over 90% urban. By 2020 a summer flow of 1400 cfs will be needed in the Miami River at Dayton to assimilate an estimated residual organic waste load of 269,000 P.E., and streamflow regulation will be necessary. An annual draft-on-storage of 203,000 acre-feet will be needed by 2020 for water quality control below the Dayton sewage treatment plant outfall; about 20,000-40,000 acre-feet could be provided by the Buck Creek Reservoir. The minimum annual value of the benefits for providing the entire draft-on storage would be $1,750,000 of which $172,000-$345,000 would be attributable to the Buck Creek Reservoir, based on a 50-yr project life and a 3-1/8% interest rate. Data from the study are presented in tables. (Lynch-Wisconsin)
W78-04808

A MODELING APPROACH FOR PREDICTING NUTRIENT INFLUENCES ON LAKES AND THEIR WATERSHEDS,
Massachusetts Univ., Amherst. Dept. of Forestry and Wildlife Management.
For primary bibliographic entry see Field 5C.
W78-04814

COMMENT: WATER LAW - CESSATION OF RETURN FLOW AS A MEANS OF COMPLYING WITH POLLUTION CONTROL LAWS,
Wyoming Univ., Laramie. Coll. of Law.
For primary bibliographic entry see Field 6E.
W78-04815

ORGANIC CARBON AND DEOXYGENATION IN THE PAMLICO RIVER ESTUARY,
East Carolina Univ., Greenville, SC. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-04816

AN ECONOMIC ANALYSIS OF OPTIMAL INVESTMENT SCHEDULING FOR SALINITY CONTROL IN THE COLORADO RIVER,
California Univ., Berkeley. Dept. of Civil Engineering: California Univ., Berkeley. Graduate School of Management.
D. Erlenkotter, and C. R. Scherer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 328, Price codes: A13 in paper copy, A01 in microfiche. Completion Report, December 1977. (California Water Resources Center Project UCAL-WRC-W-474) 267 p, 92 ref, 2 append. OWRT B-170-CAL(5).

Descriptors: *Salinity, *Colorado River, *Economics, Planning, Mathematical models, *Evaluation, Investment, *Optimal investment scheduling, *Salinity control, *Comprehensive planning, *Model studies, Standards, Water demand, Computer models, Water quality standards, Dynamic programming, Cost analysis.

This study demonstrates the development of a comprehensive investment planning model for salinity control on the Colorado River for evaluation of alternate salinity control plans and determination of those plans that minimize total economic costs and damages. Sources of salinity, early modeling efforts, selected legal-institutional factors and recent salinity control plans are reviewed. The planning model developed includes the relevant detail of deterministic simulation models for the Colorado and incorporates estimates of economic damages and project costs that may be drawn from other mathematical programming models for agricultural areas and salinity control sites. The model serves best as an information system for exploring the effects of cost-minimizing plans of different assumptions and data variations. Instead of relying on arbitrarily established salinity standards, the model determines future salinity levels--or 'standards'--endogenously by balancing costs and benefits of incremental additions to the salinity control plan. Relevance to policy decision-making involves a dynamic programming model that coordinates selection of scale for individual projects and the sequence in which projects are undertaken under assumptions of a linearly increasing demand projection and constant per-unit penalty cost for not satisfying demand. The model also pinpoints the difficulties involved in developing a solution approach under more general assumptions and shows why approximate solution methods may be needed for complex water resources development problems. (Snyder-Calif Davis)
W78-04817

THE DEHELMINTHIZATION OF LIQUIDS BY THE ELECTROHYDRAULIC EFFECT, (IN RUSSIAN),
Vsesoyuznyi Inst. Eksperimentalnoi Veterinaryi, Belgorod (USSR). Belgorod Div.
A. E. Dol'nikov, and K. V. Mel'nikova.
Gig Sanit 10, p 115-116, 1976.

Descriptors: Activated sludge, *Electrohydraulic effect(Ascarid eggs), *Dehelminthzation.

The ovicidal effectiveness of the electrohydraulic effect (EHE) was studied on ascarid eggs in water. The eggs were extracted from females found in pig intestines. The ovicidal effectiveness of the EHE was 90% at 20 discharges, 96% at 40, 99% at 60 and 100% at 70. The addition of even an insignificant amount of activated sludge to the water caused an appreciable reduction in ovicidal effectiveness.--Copyright 1978, Biological Abstracts, Inc.
W78-04825

A REVIEW OF MULCHES TO CONTROL WIND EROSION,
Agricultural Research Service, Manhattan, KS. North Central Region.
For primary bibliographic entry see Field 4D.
W78-04839

CHARACTERIZATION AND TREATMENT OF WASTE DISCHARGED FROM HIGH-DENSITY CATFISH CULTURES,
Tennessee Valley Authority, Chattanooga. Div. of Environmental Planning.
For primary bibliographic entry see Field 5B.
W78-04898

MANAGEMENT OF MAN-MADE EUTROPHICATION: THE SWEDISH CONCEPT,
Association of Swedish Chemical Industries, Stockholm (Sweden).
H. O. Bouveng.
The Journal of the American Oil Chemists' Society, Vol 55, p. 178-180, 1978. 3 fig.

Descriptors: *Eutrophication, *Nutrients, *Nutrient removal, *Biochemical oxygen demand, *Chemical oxygen demand, *Phosphorus compounds, *Plankton, *Sewage treatment, *Waste water(Pollution), Effluents, Economic impact, Economic feasibility, *Sweden, Eutrophication management.

The Swedish approach for the control of man-made eutrophication is described as simple, pragmatic and effective. It was founded on a combination of an agreed definition of the problem, appropriate management instruments, adequate technology, available funds, and participation by concerned parties. (Katz)
W78-04917

THE EFFECT OF PUBLIC LAW 92-500 ON ARIZONA'S WATER FUTURE,
Southwest Forest Industries, Phoenix, AZ.
R. A. Miller.
In: Proceedings of the 20th Annual Arizona Watershed Symposium, Arizona Water Commission, Report No 8, September 15, 1976, p 43-50.

Descriptors: *Water pollution control, *Water pollution, *Water quality, *Arizona, Legislation, Federal Water Pollution Control Act, Forests, Environmental effects, Legal aspects, Federal-state water rights conflicts, Environmental Protection Agency.

Report of a panel discussion concerned with the forest products industry's involvement in the implementation of Public Law 92-500, the Federal Water Pollution Control of Amendments of 1972. The industry will be affected by the legislation due to the potential impact on road building and logging activities. Environmental Protection Agency requirements and their effect on the forest products industry are discussed. Anomalies in Federal Water Pollution control are pointed out. Arizona's surface and groundwater are governed by separate systems of laws concerning the rights to those waters. The role of the state Health Department in the determination of water quality is described. Section 208 of the Act which deals with water quality management, is evaluated. (See also W78-04934) (Jamail-Arizona)
W78-04939

PROCEEDINGS OF CONFERENCE ON ENVIRONMENTAL QUALITY SENSORS (SECOND) HELD AT NATIONAL ENVIRONMENTAL RESEARCH CENTER, LAS VEGAS, NEVADA ON OCTOBER 10-11, 1973.
National Environmental Research Center, Las Vegas, NV.
For primary bibliographic entry see Field 5A.
W78-04947

ANALYSIS OF SOME AQUATIC ENVIRONMENTS OF THE VALLEY OF KATHMANDU DURING THE MONSOON PERIOD: AUGUST-SEPTEMBER, 1971, (IN FRENCH),
Centre Univ. de Savoie, Chambery (France). Lab. de Biologie Vegetale.
A. Maire.
Trav Lab Hydrobiol Piscicult Univ Grenoble 64/65, p99-108, 1974.

Descriptors: *Algae, Aquatic environment, *Coleoptera, *India(Kathmandu Valley), Monsoons, *Odonata, Rice, Potable water, Water quality standards, *Water analysis, Sampling, Pollutant identification.

The physical-chemical analyses conducted on water samples taken from various aquatic environments in the Valley of Kathmandu (India) illustrate the characteristics of the tropical biotpoes during the August-September monsoon period. The muddy rainy season did not permit taking faunistic samples. Only the adults of Odonata and some Coleoptera were captured. The Drinking Water Supply Office, in collaboration with the Organization of United Nations is undertaking the sampling of running waters upstream of the principal basins of the valley, used for supplying drinking water to Kathmandu and Patan, the 2 largest population centers in the valley. The river water is low in mineral salts. NO3, NO2, PO4, SO4 are presumed to be rapidly absorbed by rice paddies and associated plants, especially algae. The biotope of the rice fields is a temporary aquatic environment; the water is stagnant for a time, but moves during the rainy period.--Copyright 1976, Biological Abstracts, Inc.
W78-04962

ANALYSIS OF BRINE DISPOSAL IN THE GULF OF MEXICO. 1. BRYAN MOUND,
National Oceanic and Atmospheric Administration, Washington, DC. Environmental Data Service.
J. M. Bishop.
Report to Federal Energy Administration Strategic Petroleum Reserve Program, Salt Dome Storage, February 1977. 177 p, 90 fig, 8 tab, 25 ref, 5 append.

Descriptors: *Waste disposal, *Brines, *Environmental effects, *Water quality control, *Gulf of Mexico, Texas, Dispersion, Meteorological data, Oceanographic data, Ecology, Bathymetry, *Brine disposal, *Salt dome storage, *Petroleum reserves, Environmental factors, Storage caverns.

In implementing the Strategic Petroleum Reserve (SPR), the Federal Energy Administration (FEA) proposes to use storage caverns leached-out of the Bryan Mound salt dome on the coast of Texas near Freeport. Discharge into the Gulf of Mexico is an alternative under consideration for disposal of the saturated brine now in existing caverns and brine to be produced as additional caverns are solution-mined. This report was prepared to assist FEA in a full examination of potential environmental impacts of this brine disposal alternative as that agency presses to meet the legislative mandate of the SPR Program. An extensive summary of meteorological, oceanographic, and bathymetric conditions in the Bryan Mound study area is provided based upon existing data and information, and an overview of ecological conditions in the study area has been prepared. (NOAA)
W78-04963

ANALYSIS OF BRINE DISPOSAL IN THE GULF OF MEXICO. 2. WEST HACKBERRY,
National Oceanic and Atmospheric Administration, Washington, DC. Environmental Data Service.
J. M. Bishop.
Report to Federal Energy Administration Strategic Petroleum Reserve Program, Salt Dome Storage, March 1977. 120 p, 62 fig, 12 tab, 37 ref, 4 append.

Descriptors: *Waste disposal, *Brines, *Environmental effects, *Water quality control, Gulf of Mexico, Louisiana, Dispersion, Meteorological data, Oceanographic data, Ecology, Bathymetry, *Brine disposal, *Salt dome storage, *Petroleum reserves, Environmental factors, Storage caverns.

In implementing the Strategic Petroleum Reserve (SPR), the Federal Energy Administration (FEA) proposes to use storage caverns leached-out of the West Hackberry salt dome on the coast of Louisiana near Lake Calcasieu. Discharge into the Gulf of Mexico is an alternative under consideration for disposal of the saturated brine now in existing caverns and brine to be produced as additional caverns are solution-mined. This report was prepared to assist FEA in a full examination of potential environmental impacts of this brine disposal alternative as that agency presses to meet the legislative mandate of the SPR Program. An extensive summary of meteorological, oceanograhic, and bathymetric conditions in the West Hackberry study area is provided based upon existing data and information. An overview of ecological conditions in the study area has also been prepared. (NOAA)
W78-04964

ANALYSIS OF BRINE DISPOSAL IN THE GULF OF MEXICO. 4. BIG HILL.
National Oceanic and Atmospheric Administration, Washington, DC. Environmental Data Service.
Report to Federal Energy Administration Strategic Petroleum Reserve Program, Salt Dome Storage, July 1977. 156 p, 63 fig, 25 tab, 103 ref, 3 append.
Gloria D. Thompson (Ed.).

Descriptors: *Waste disposal, *Brines, *Environmental effects, *Water quality control, Gulf of Mexico, Texas, Dispersion, Meteorological data, Oceanographic data, Ecology, Bathymetry, *Brine disposal, *Salt dome storage, *Petroleum reserves, Environmental factors, Storage caverns.

To implement the Strategic Petroleum Reserve (SPR) Program, the Federal Energy Administration (FEA) proposes to use storage caverns leached out of a salt dome known as Big Hill on the coast of Texas 15 miles west of Sabine Pass. Discharge into the Gulf of Mexico is being considered for disposal of the saturated brine to be produced as a result of creating these solution-mined caverns. This report will assist FEA in fully examining the potential environmental impact of this brine disposal option. It includes: an extensive summary of physiographic, meteorological, oceanographic, and water quality conditions along the Texas coast adjacent to the Big Hill site; a comprehensive review of ecological conditions in the area; analysis of the dispersion of salt brine to be discharged at the two locations offshore, under various environmental conditions; general considerations for a brine diffuser at the Big Hill site; and the potential impact of brine due to osmotic stress. (NOAA)
W78-04965

PROJECT DEVELOPMENT AND TECHNICAL DEVELOPMENT PLAN. NEW YORK BIGHT PROJECT.
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
NOAA, ERL, Marine EcoSystems Analysis Program Office Report, July 1977. 228 p, 6 fig, 7 tab, 124 ref, append. SAI Contract-NOAA-03-7-022-35105.

Descriptors: *Resources development, *Baseline studies, *Environmental effects, *Water pollution sources, *Water pollution effects, New York, Land use, Coasts, Ecosystems, Waste disposal, Oil spills, Sewage, *Outer Continental Shelf, *New York Bight, Coastal Zone management, Ocean dumping.

The Marine EcoSystems Analysis (MESA) Project Development Plan has been jointly prepared by the MESA Program Office and the New York Bight Project Staff and represents the overall plan for project implementation. The plan describes a systematic approach to achieving specifically identified goals and objectives that have been delegated to the Department of Commerce for protection of the marine environment. The overall goals of the Project are to develop a comprehensive understanding of the processes and interrelationships of the ecosystem and to determine the fate and effects of pollutants and other man-related stresses on the New York Bight. More specific goals include planning for future actions such as monitoring of the Bight, oil and gas development, offshore nuclear power generation, and the development of alternatives to existing waste disposal strategies. (NOAA)
W78-04969

INSTITUTIONAL DESIGN FOR IMPROVED ENVIRONMENTAL QUALITY: LEGAL AND ECONOMIC ASPECTS IN WISCONSIN,
Wisconsin Univ.-Madison. Dept. of Agricultural Economics.
D. W. Bromley, M. McMillan, M. Robertson, and A. Schroeder.
Sea Grant College Program Technical Report No 232, October 1977. 256 p, 11 tab, 12 maps.

Descriptors: *Water quality, *Legal aspects, *Jurisdiction, *Water pollution, Wisconsin, Economics, *Environmental assessment, Fox River Basin(WI), Regional environmental quality authority.

This report is concerned with the nature of a regional environmental quality authority (REQA) that might effectively deal with environmental (primarily water) quality problems in the Fox River Basin of northeastern Wisconsin. Several disciplinary points of view are integrated to attempt a thorough assessment of the problems and the prospects. Attention is given to the concepts of

public choice theory with respect to voting rules and jurisdictions, and pluralism and models of representation are discussed. The most carful scrutiny is reserved for the possible legal constraints and opportunities for the establishment of an REQA. An analysis of federal statutes and the Wisconsin Constitution is given with respect to the possible establishment of an REQA in the Lower Fox Basin. Possible jurisdictional boundaries, possible criteria for electing commissioners for the REQA and general issues pertaining to the policy setting and administration of such an authority are suggested. Avenues for implementing an REQA with a maximum of citizen input at the local level are suggested. The emphasis is on ways to minimize the possible conflicts that might arise when inter-jurisdictional action is undertaken to deal with environmental quality matters. (NOAA)
W78-04971

REPORT TO THE CONGRESS ON OCEAN POLLUTION, OVERFISHING, AND OFFSHORE DEVELOPMENT.
National Oceanic and Atmospheric Administration, Washington, DC.
For sale by the Superintendent of Documents, U. S. Gov't Print. Off. Washington, DC 20402. NOAA Report for the period July 1975 through September 1976 (Pulic Law 92-532 Title II, Section 202c), November 1977. 58 p, 2 append.

Descriptors: *Pollution, *Oil pollution, *Coasts, *Estuaries, Resources development, *Overfishing, Ocean mining, Biological effects, Environmental assessment, Ocean dumping, Outer Continental Shelf, Oil leases.

The programs summarized in this report are representative of those conducted by the National Oceanic and Atmospheric Administration Administration, in cooperation with other agencies and organizations, in response to the provisions of the Marine Protection, Research and Sancturaries Act of 1972, Title II, Section 202. This report focuses on six major areas of research: studies of the New York Bight, investigations of the relationships of heavy metals and selected marine organisms, experiments on the effects of petroleum on marine animals, research on the status and effects of overfishing, work on the environmental questions raised by deep-ocean mining, and asessment of the environments of potential offshore oil lease areas. (NOAA)
W78-04972

FRESHWATER AND THE FLORIDA COAST: SOUTHWEST FLORIDA,
State Univ. System of Florida Sea Grant Program, Gainesville; and Southwest Florida Water Management District, Brooksville.
For primary bibliographic entry see Field 2L.
W78-04973

LIMNOLOGIC STUDIES ON THE COLORADO RIVER FROM LEE'S FERRY TO DIAMOND CREEK,
Arizona State Univ., Tempe. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-05003

QUALITY ASSURANCE RESEARCH PLAN FY 1978-82.
Environmental Protection Agency, Washington, DC. Office of Research and Development.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 421, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/8-77-008, July 1977. 53 p, 1 fig, 12 tab. 1HD621.

Descriptors: *Water pollution, *Air pollution, *Sanitary engineering, Water supply, Water quality, Environmental effects, Environmental engineering, Civil engineering, Quality control, Project planning, Monitoring, Sampling, Quality assurance, Environmental data, Environmental measurements.

The quality assurance research plan for fiscal years 1978 through 1982 identifies and justifies the resources required by EPA's Office of Water Research and Development (ORD), to develop the quality assurance tools, techniques, and services needed by other program offices, the EPA regions, and the States to generate valid data. The program is described in terms of goals, objectives, and functional elements; the current status of ORD's ongoing quality assurance efforts is summarized; Agency and program needs are discussed and the resources and approaches required to develop and carry out a dynamic program which will ensure scientifically valid environmental measurements are delineated: Common quality assurance program needs identified by EPA regional offices were also discussed; they include comprehensive long-term quality assurance plans for the regions, standardization protocols for measurement methods with an approval mechanisms for methods suggested, a system to quantify data quality and to reject data out of control, and quality control and references samples for routine use. (Wares-IPA)
W78-05007

MANUAL: RESEARCH AND DEMONSTRATION OF IMPROVED SURFACE MINING TECHNIQUES FOR THE EASTERN KENTUCKY COAL FIELDS.
Kimball (L. Robert) Consulting Engineer, Lexington, KY.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 578, Price codes: A03 in paper copy, A01 in microfiche. Report No. ARC-71-66-T5, March, 1974. 30 p, 18 fig, 2 tab, 5 append. Prepared for Appalachian Regional Commission, Washington, DC. ARC 71-66.

Descriptors: *Pollutant identification, *Coal mine wastes, *Acid mine water, Evaluation, *Pollution abatement, *Kentucky, *Analytical techniques, Sampling, Water analysis, Water pollution sources, Coal mines, Mine drainage, Pyrite, Water pollution, Mine water, Inspection, *Strata sampling, *Acid pollution potential, Eastern Kentucky.

Since acid production potential varies with coal seam stratum, strata of high pollution potential (as indicated in a recently completed Water Quality Study for the Eastern Kentucky Coal Field) were sampled and analyzed, with the intention of determining plans to minimize this acid production after defining the potential. Indictors and procedures are presented to assist the reclamation inspector in identifying such potential in the particular area in Eastern Kentucky which was proposed for surface mining. Ongoing data analysis geared at pinpointing new areas of high pollution potential and eliminating from testing those coal seams with low pollution potential serve to (1) update and refine evaluation techniques; (2) further the overall goal of determining those mining plans which best minimize acid production; and (3) introduce improved surface mining techniques. The manual provides the inspector with guidelines for controlling acid pollution from permit application through bond release. Appendices A-F include data and figures on coal seam groupings, water quality summary, mineral recognition, laboratory strata testing procedures, selective burial and acid neutralization. (Seip-IPA)
W78-05013

ORDER CLASSIFICATION OF URBAN CATCHMENTS,
North Carolina Univ. at Raleigh. Water Resources Research Center.
For primary bibliographic entry see Field 2E.
W78-05022

ESTIMATING RUNOFF FROM FURROW IRRIGATION,
Kansas State Univ., Garden City. Garden City Experiment Station.
For primary bibliographic entry see Field 3F.
W78-05034

RAPID CITY COMBATS THE EFFECTS OF URBAN RUNOFF ON SURFACE WATER,
Environmental Protection Agency, Pierre, SD.
For primary bibliographic entry see Field 5B.
W78-05044

STUDIES ON THE ROLE OF SOLAR ULTRAVIOLET RADIATION IN 'NATURAL' WATER PURIFICATION BY AQUATIC ECOSYSTEMS,
Kentucky Water Resources Research Inst., Lexington.
J. Calkins, J. A. Barcelo, P. Grigsby, and S. Martin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 666, Price codes: A06 in paper copy, A01 in microfiche. Research Report No. 108, January 1978. 91 p, 26 fig, 7 tab, 29 ref. OWRT A-064-KY(2), 14-34-0001-6018 (FY-76), 14-34-0001-7037 (FY-76T), 14-34-0001-7038 (FY-77).

Descriptors: Ozone, *Ultraviolet radiation, Ecosystems, Attenuation, Microorganisms, *Solar radiation, Algae water purification, Model studies, Photosynthesis, Light intensity, Sensitivity(Organisms to solar UV).

The possibility that pollution might deplete the stratospheric ozone layer and intensify solar UV at the earth's surface focuses attention on the role of solar UV in the various ecosystems at the earth's surface. Previous studies suggested that solar UV might contribute to bacterial die off in wastewater and the studies reported here were directed toward elucidating the action of solar UV in 'natura' waters. It has been assumed that solar UV action on aquatic ecosystems can be evaluated (using proper models) on the basis of the following four independently measurable quantities: (1) the intensity of solar UV at the water surface, (2) the attenuation of the UV in the water column, (3) the position of the critical organism in the water, and (4) the sensitivity of the individual organisms to solar UV exposure. These four factors have been investigated on a continuing basis and the results of measurements have been utilized along with special field and laboratory experiments to assess UV-B actions. Field work has focused on the sucession of organisms, their locations in the water column, and under controlled conditions, the killing of E. coli by natural sunlight. Laboratory work has included studies of UV-B lethality, its ability to stimulate positioning responses, and its depression of the photosynthetic activity of algae. Laboratory and field observations have been interpreted through models and results are consistent with the hypothesis that solar UV is a significant agent for the aquatic microorganisms we have tested. (Huffsey-Kentucky)
W78-05051

NON-POINT WATER QUALITY MODELING IN WILDLAND MANAGEMENT: A STATE-OF-THE-ART ASSESSMENT VOL. II: APPENDIXES.
Forest Service (USDA), Washington, DC.
For primary bibliographic entry see Field 5B.
W78-05055

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA. SUBPROJECT NO. 2. A STUDY OF THE IMPACT OF SELECTED BANK STABILIZATION STRUCTURES ON GAME FISH AND ASSOCIATED ORGANISMS,
Iowa Cooperative Fishery Research Unit, Ames.

For primary bibliographic entry see Field 6G.
W78-05097

NUTRIENT REMOVAL BY WATER HYACINTHS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
D. A. Cornwell, J. Zoltek, Jr., C. D. Patrinely, T. deS. Furman, and J. I. Kim.
Journal of Water Pollution Control Federation, Vol 49, No 1, p 57-65, January, 1977. 5 fig, 4 tab, 15 ref.

Descriptors: *Nutrient removal, *Biological treatment, *Water hyacinth, Aquatic plants, Nitrogen, Phosphorus, Sewage treatment, Growth rates, Water pollution control, *Water pollution treatment, Pollution abatement, Nutrient sloughing.

Nutrient removal capacity of water hyacinths was directly related to pond surface area. Pond depth and detention time in the pond must be set so as to provide a given amount of surface area per unit flow through the system. To remove 80% of the nitrogen, 2.1 ha of water hyacinths were needed per 3800 cu m water/da. Corresponding phosphorus removal was approximately 44%. Nutrients sloughed during the death phase phosphorus removal was approximately 44%. Nutrients sloughed during the death phase remained in the ponds as bottom sediment, reducing the necessity for harvesting. When harvested, the most profitable use of water hyacinths would be as compost. (Stihler-Mass)
W78-05104

FEASIBILITY OF UTILIZATION OF WETLAND ECOSYSTEMS FOR NUTRIENT REMOVAL FROM SECONDARY MUNICIPAL WASTEWATER TREATMENT PLANT EFFLUENT,
Michigan Univ., Ann Arbor.
R. H. Kadlec, D. L. Tilton, and J. A. Kadlec.
Semi-annual report No 5, 1977. 364 p.

Descriptors: *Biological treatment, *Tertiary treatment, *Nutrient uptake, *Aquatic plants, Wetland, *Michigan, Waste water treatment, Nitrogen, Phosphorus, Cattails, Element budgets, Sedges, *Houghton Lake(Mich), Peatland.

The feasibility of wetland tertiary treatment of sewage plant effluent has been established via field experimentation on a peatland location at Houghton Lake, Michigan. Many 36 sq m test plots and one 40,000 sq m test plot were used. Water movement is sheet flow at a very slow velocity. Algal nutrient uptake is potentially significant. Bioassay algal growth rates increased from 85 mg dry wt/sq m day (-1) at the control site to 2656 mg dry wt/sq m day (-1) at the site of effluent addition. Phosphorus concentrations were significantly higher in algae grown at the discharge site. Cattail dimensions ant the chlorophyll a content of Carex sp. leaves were highest near the discharge site. Biomass components showed increased P and K concentrations in sedge shoots and roots as well as in letter. N concentrations showed no significant difference among locations. Soils showed an increase in P near the discharge site. Waste water scheduling into the marsh is determined from simulation and optimization. Because nutrient uptake is quite efficient, water depth is the active constraint. (Stihler-Mass)
W78-05105

GRANULATION OF COMPLEX FERTILIZERS CONTAINING AMMONIUM SULFATE BY MELT TECHNOLOGY,
Ferguson Industries, Dallas, TX.
J. Lanier, and R. MacDonald.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 480, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-295, Environmental Protection Agency, Athens, Georgia Environmental Research Laboratory, December 1976. 94 p, 14 fig, 24 tab, 33 ref, 1 append. 13020 HMV, 68-01-0754.

Descriptors: *Fertilizers, *Granulation, *Melt technology, *Ammonium sulfate, *Pollution abatement, Waste disposal, Industrial wastes, Ammonium compounds, Water pollution sources, Recycling, Water pollution control, Aquifers, Air pollution, Costs.

A modification of the melt granulation process was developed for production of high-nutrient N-P-K-S fertilizer utilizing by-product ammonium sulfate generated by steel and plastic industries and projected power plant ammonia scrubbers. Waste ammonium compounds and sulfur dioxide are common pollutants of aquifers and the atmosphere. A commercial outlet was needed for ammonium sulfate to enable power companies to recover the cost of ammonia used in sulfur dioxide removal from stack gases through scrubbing. In the new process, phosphoric acid and anhydrous ammonia are reacted to form the liquid bonding agent. Solid ammonium sulfate, potassium chloride, and recycled fines are added to the melt in a pug mill. Pollutant emissions are less than from conventional plants and are readily contained. Developed and tested on a laboratory scale and in a small pilot plant, the process was verified in a 454 kg/hr demonstration unit. Operating costs reflect the assumed value of waste ammonium sulfate; cost savings of 10-20% over similar products can be realized. Most conventional fertilizer granulation plants were closed in the 1960s with the advent of granular disammonium phosphate, granular potash, bulk blending marketing stations, and polyphosphate liquids. As a result, the price of by-product ammonium sulfate dropped drastically. (Lynch-Wisconsin)
W78-05118

MOSQUITO PRODUCTION AND CONTROL IN ANIMAL WASTE LAGOONS,
North Carolina State Univ. at Raleigh. Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W78-05123

ECONOMIC AND ENVIRONMENTAL ASPECTS OF DAILY AND ANNUAL MANURE SPREADING SYSTEMS IN SMALL WATERSHED,
Pennsylvania Cooperative Extension Service, Leesport. Agricultural Center.
H. W. Schaffer, G. L. Casler, and J. J. Jacobs.
In: Managing Livestock Wastes, ASAE Publication PROC-275, Proceedings of the 3rd International Symposium on Livestock Wastes held at the University of Illinois, Urbana-Champaign, April 21-24, 1975. p 53-56, 6 tab, 3 ref.

Descriptors: *Manure spreading, *Dairy industry, *Crop production, *Environmental effects, *Nutrients, *Agricultural runoff, *Economic feasibility, Watersheds(Basins), Nonpoint pollution, Fertilization, Agriculture, Farm management, Water pollution control, Nitrogen, Phosphorus, Soil erosion, Model studies, Economics, New York, Canadarago Lake Watershed(NY).

An economic model which simulates nitrogen, phosphorus, and soil losses from two manure spreading Systems shows that changing from a daily to an annual system with immediate soil incorporation reduces phosphorus and soil losses, while also decreasing farm income, but increases nitrogen losses. Requiring farmers to invest in large manure storage facilities therfore appears questionable. Reduced phosphorus loss appears particularly difficult and costly to achieve. Stronger restrictions on nitrogen and phosphorus losses decrease farm income, crop acreage, and livestock populations. Restrictions on either phosphorus or nitrogen are accompanied by reduced losses of the other and by reduced soil losses, indicating interdependencies. The model was constructed from published laboratory and field data; the economic and environmental analysis was made on the 6900-acre Mink Creek basin of the Canadarago Lake watershed in east-central New York. Tables present nutrient and soil losses on various soils for corn silage, potatoes, corn grain, oats, and alfalfa; effects of nitrogen and phosphorus loss restrictions on farm organization and income; and environmental impact scores for odor, flies, appearance, noise, nutrient loss, and risk to water quality, along with cost per cow per year. While the overall environmental impact score for annual spreading with direct soil incorporation (145) is lower than daily spreading (179), several notable tradeoffs occur. (Lynch-Wisconsin)
W78-05129

ECONOMICS OF ALTERNATIVE BEEF WASTE MANAGEMENT SYSTEMS,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W78-05130

SYMPOSIUM ON WATER RESOURCES MANAGEMENT IN A CHANGING WORLD, INTRODUCTION: WORLD TRENDS AND NEED,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 6E.
W78-05133

REPOPULATION AFTER A FISH KILL IN MUD CREEK, WASHINGTON COUNTY, ARKANSAS FOLLOWING PESTICIDE POLLUTION,
Duke Power Co., Huntersville, NC. Environment Lab.
L. L. Olmsted, and D. G. Cloutman.
Trans Am Fish Soc. 103(1), p 79-87, 1974.

Descriptors: *Arkansas, Cattle, Fishkills, Mud Creek(Ark), Pesticide residues, Poison, Ticks, *Fish repopulation, Water pollution control.

Repopulation after a fish kill caused by pesticide pollution in Mud Creek, Washington County, Arkansas is reported. Twenty-nine species of fishes were eliminated from the study area as a result of the poison used in ridding cattle of ticks. Repopulation began almost immediately after the pesticide dissipated, and was accomplished primarily by immature individuals. Chronology and rate of repopulation of each species are reported and factors influencing the rate of repopulation and population structure are discussed.--Copyright 1974, Biological Abstracts, Inc.
W78-05166

DECHLORINATION OF WATER FOR FISH CULTURE: COMPARISON OF THE ACTIVATED CARBON, SULFITE REDUCTION, AND PHOTOCHEMICAL METHODS,
Wisconsin Univ.-Milwaukee. Center for Great Lakes Studies.
G. L. Seegert, and A. S. Brooks.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 88-92, 1978. 1 fig, 1 tab, 18 ref.

Descriptors: *Chlorination, *Carbon, *Carbon filters, *Ultraviolet radiation, *Sodium compounds, *Toxicity, Laboratory equipment, *Reduction(Chemical), Water quality, Pumps, Methodology, Aquiculture, Fish farming, *Dechlorination, Sodium sulfate, Activated carbon, Residual chlorine.

Activated carbon, ultraviolet radiation, and sodium sulfite were evaluated as dechlorinating agents. Activated carbon tested in a variety of commercial dechlorinators was not 100% effective in chlorine removal. The residual concentration

remaining after carbon dechlorination varied from 5 to 70 micrograms/l depending on how long the carbon had been in service and on the flow rate through the carbon bed. Ultraviolet radiation effectively removed residual chlorine from water but compared with the other two methods was considerably more expensive. Sodium sulfite was 100% effective but required a failsafe injection system. A system combining the reliability of carbon dechlorination with the effectiveness of sulfite reduction was developed and shown to be safe, effective, and reliable. (Deal)
W78-05167

BIOMONITORING WITH FISH: AN AID TO INDUSTRIAL EFFLUENT AND SURFACE WATER QUALITY CONTROL,
National Inst. for Water Research Pretoria (South Africa).
For primary bibliographic entry see Field 5A.
W78-05171

AQUATIC TOXICOLOGY: A NEW ELEMENT IN THE SAFETY TESTING OF SURFACTANTS,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5C.
W78-05177

DRINKING WATER AND HUMAN HEALTH,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 5A.
W78-05195

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

EVENT-BASED FORMULATION OF WATERSHED MANAGEMENT,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 4D.
W78-04712

SYSTEMS FOR RAPID RANKING OF ENVIRONMENTAL POLLUTANTS,
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5A.
W78-04806

MULTIOBJECTIVE WATER RESOURCE PLANNING,
Massachusetts Inst. of Tech., Cambridge.
D. C. Major.
Water Resources Monograph 4, American Geophysical Union, Washington, D.C., 1977. 81 p, 7 tab, 21 fig, 80 ref. OWRT C-2129(No. 3367)(4).

Descriptors: *Water resources development, *Multiobjective planning, *Political decision process, *Investment criteria, Benefit-cost accounting, Net benefits, Alternative costs, Interest rates, Budgetary restrictions, Risks, Pricing, Cost-sharing, Water policy, Irrigation demand, Optimization, Benefit maximization, Design, Projects, Constraints, Weights, Scheduling, Social preferences, Regional income, Environmental quality.

Multiobjective analysis is a generalization of traditional benefit-cost analysis, emphasizing the design of projects and programs in terms of all relevant objectives. Objectives for which water resources development schemes are taken range across the entire spectrum of social decision making: regional development, social-well being, national defense, international trade, national economic development, and environmental improvement. Chapter 1 of this monograph describes the background and development of multiobjective analysis. In chapter 2 the political decision process appropriate to multiobjective planning is presented. Considered are net benefits, social preferences, weights and constraints, the design and display of objectives, and the four steps of planning suggested by Maass et al. Chapter 3 presents rules for multiobjective benefit-cost accounting together with other investment criteria expressed in multiobjective terms. Considered here are: national income, irrigation water demand and benefit maximization, regional income, environmental quality, social objectives, alternative costs, interest rates, scheduling, budget constraints, risk and uncertainty, and pricing and cost sharing. In chapter 4, an introduction to multiobjective planning in practice is given, guidelines for key steps in applied multiobjective planning are presented, and four case studies are described. These include: NAR Water Resources Study; Rio Colorado, Argentina, Study; Big Walnut Study; and Managua Irrigation Scheme. (Bell-Cornell)
W78-04811

APPLICATION OF RESIDUALS MANAGEMENT FOR ASSESSING THE IMPACTS OF ALTERNATIVE COAL-DEVELOPMENT PLANS ON REGIONAL WATER RESOURCES,
Geological Survey, Reston, VA. Water Resources Div.; and Geological Survey, Lakewood, CO. Water Resources Div.
I. C. James, II, and T. D. Steele.
Paper presented at the Third International Symposium in Hydrology, Colorado State University, Fort Collins, Colorado, June 27-29, 1977. 23 p, 2 fig, 21 ref.

Descriptors: *Model studies, *Regional analysis, *Environmental effects, *Coal mines, *Water resources, Planning, Decision making, Water demand, Water supply, *Residuals management, Impact assessment, Energy development, River quality assessment.

The development of coal resources in a region has a variety of effects on available water resources. Direct effects from coal mining, processing, and transport and conversion techniques utilized in or proposed for the region. Indirect effects are related to the growth of population, public services, and commercial activities in the region. Both types of effects impact upon regional water resources in terms of quantity (water withdrawal and consumptive use) and quality, including the capacity to assimilate discharged residuals. Assessment of material and energy balances of the activities causing direct effects, coupled with an economic and technical evaluation of alternatives methods of residuals modification, will provide the primary input data for regional environmental models. An analysis of residuals resulting from activities causing indirect effects will provide additional data for these models. Techniques of regional-residuals management, including modeling the release and movement of residuals in the environment, are used to determine the potential effects of alternative levels of coal development and environmental standards in the Yampa River basin, Colorado and Wyoming. The results provide regional planners with a summary of the potential effects of coal development on the environment and economy upon which they can base decisions concerning the type and extent of development that is desirable. (Woodard-USGS)
W78-04879

6B. Evaluation Process

DECISION STRUCTURE FOR ASSESSMENT OF THE ECONOMIC IMPACT OF WATER QUALITY STRATEGIES IN AN INDUSTRIAL WATERSHED,
Wisconsin Univ.-Madison Dept. of Real Estate and Urban Land Economics.
For primary bibliographic entry see Field 5G.
W78-04701

ACHIEVING URBAN WATER CONSERVATION--A HANDBOOK,
Colorado Univ., Boulder. Dept. of Civil, Environmental and Architectural Engineering
For primary bibliographic entry see Field 3D.
W78-04702

ACHIEVING URBAN WATER CONSERVATION: TESTING COMMUNITY ACCEPTANCE,
Colorado State Univ., Fort Collins. Dept. of Political Science.
For primary bibliographic entry see Field 3D.
W78-04703

IMPACT OF SOCIAL ATTITUDES ON MANAGING THE ENVIRONMENT,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W78-04724

A PRIORITY-TRADEOFF-SCANNING APPROACH TO EVALUATION IN ENVIRONMENTAL MANAGEMENT,
California Univ., Los Angeles.
C. A. Davos.
Journal of Environmental Management, Vol. 5, No. 3, p 259-273, 1977. 4 tab, 16 ref. B-57027.

Descriptors: *Environmental management, *Evaluation, *Decision-making, *Analytical techniques, *Priorities, Scanning, Planning, Goals, Competing uses, Consensus, Tradeoffs, Problem ranking.

A priority-tradeoff-scanning (PTS) approach is proposed to help satisfy three objectives in environmental management evaluation: (1) to record the impact of each option on all goals and interest groups; (2) to scan all feasible goal-priority tradeoffs for each interest group; (3) to scan priority tradeoffs that are actually acceptible to those groups. On the decision-making evaluation level, the objectives of the PTS approach are: (1) to identify decision choices which will maximize consensus on goal priorities; (2) to identify choices which will maximize the satisfaction of individual interests of competing groups; and (3) to scan priority tradeoffs for maximizing achievement of goals, satisfying the aspirations of planners, and maximizing consensus. This paper is an approach to evaluation, rather than an evaluation methodology, in providing a framework for interpreting and synthesizing all information inputs pertinent to evaluation, instead of generating particular information inputs. The paper also focuses on evaluation of options, not actions. In PTS, pertinent information for each of the three evaluation objectives is synthesized in the form of a matrix; (1) goals-achievement matrix (GAM); (2) goal-priority-tradeoff matrix (GPTM); and (3) interest-priority-tradeoff matrix (IPTM). Each of these matrices is discussed and explained. (Lynch-Wisconsin)
W78-04795

OPPORTUNITIES FOR LARGE SAVINGS BY ALTERING SOME INLAND WATERWAY OPERATIONS.
Comptroller General of the United States, Washington, DC.
Report CED-78-12, to the Congress, December 12, 1977. 42 p, 6 append.

Descriptors: *Bridges, *Locks, *Dismal Swamp Canal(NC), *Inland waterways, *Canals, *Costs, North Carolina, Economic efficiency, U.S. Army Corps of Engineers, U.S. Coast Guard, Navigation, Navigable waters, Atlantic Intracoastal Waterway.

Because of low traffic at predictable times each day, it is recommended that operating hours of many drawbridges and locks on the nation's inland waterways be curtailed, resulting in savings of millions of dollars. The drawbridges and locks identified are currently operated 24 hours a day, seven days a week, under regulations of the U.S. Coast Guard, which by law must provide for the reasonable needs of navigation. Due to availablility of land transportation, such round-the-clock is no longer necessary. Twenty-nine drawbridges and locks are specified, on which commercial and recreational traffic is very low between six p.m. and six a.m. There are ten in Florida, eight in North Carolina, four in Virginia, five in the U.S. Army Corps' Wilmington District, and two in the Norfolk District. In addition, Maintenance by the Corps of the Dismal Swamp Canal, an alternate route along the Atlantic Intracoastal Waterway in North Carolina, is no longer justified as no commerical tonnage is transported on the canal. Annual operating expenses for the canal are currently about $435,000. Closing the canal to traffic could also save the Corps and the state of North Carolina $27.4 million on a proposed bridge project; with the canal in operation two high-level bridges would be necessary, whereas with the canal closed low-level fixed-span bridges could be constructed. The reaction of the U.S. Coast Guard to these recommendations was negative. (Lynch-Wisconsin)
W78-04799

MANAGEMENT EVALUATION OF STOCKED NORTHERN PIKE IN COLORADO'S SMALL PLAINS RESERVOIRS,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
J. H. Clark.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-247 363, Price codes: A05 in paper copy, A01 in microfiche. August 1975. 66 p, 17 tab, 23 ref, 6 append. 1-100-R, NOAA 6-11-D, 1-100-R.

Descriptors: *Colorado, *Northern pike, *Fish stocking, *Reservoirs, *Fish management, *Project benefits, *Evaluation, Pikes, Esox lucius, Fish, Fishing, Recreation, Fish establishment, Rough fish, Pan fish, Fisheries, Lakes, Fort Collins(CO).

Fingerling and yarling northern pike (Esox lucius) were stocked in eleven small privately owned reservoirs near Fort Collins, Colorado in an effort to improve existing fishing both by introduction of the new species and by exerting predation on rough fish and stunted panfish. Follow-up evaluation showed that neither size proved successful from a management standpoint. In 16 of 18 introductions of the 50-mm fingerlings the pike did not establish in sufficient numbers to be of interest to fisherman, while the unit cost of the surviving 377-mm yearlings was excessively high ($4.62). For the fingerlings, 50% of the introductions resulted in no observable northern pike populations, 39% resulted in unacceptably small populations (0.8% survival at a cost per surviving fish of $5.90), and only 11% produced acceptable densities, at a cost per surviving fish of $0.14. Survival of the fingerlings depended on availability of large numbers of small forage fish. The fingerlings were stocked at a rate of 62 fish/ha in all of the reservoirs in June 1973, and in seven reservoirs in May 1974. Obtained from research ponds in Colorado, they cost $0.03 each to produce. Yearling pike captured in Minnesota's Red Lake region and purchased at a cost of $1.41 each were stocked in four reservoirs during the winter of 1973-74 at a rate of 25 fish/ha. Seine sampling was conducted several weeks after stocking to estimate total fish populations, and during April-May 1975 northern pike were sampled with gill nets. (Lynch-Wisconsin)
W78-04803

WATER MANAGEMENT REGIONAL PROGRAMS: MORE POTENTIAL THAN SUCCESS,
Delta Coll, University Center, MI. Dept. of Social Science.
B. F. Smith, and W. N. Thompson.
Water and Sewage Works, Vol 125, No 5, p 86-90, May, 1977. 6 tab, 7 ref.

Descriptors: *Michigan, *Watershed management, *Water management(Applied), Regions, *Regional analysis, *Regionalism, Voluntary organizations, Grand River Watershed Council(MI), *Effectiveness perception, *Perception of local impact, *Organizational success, Intergovernmental organizations.

Members of a voluntary Michigan watershed council were interviewed to determine attitudinal and behavioral factors which contribute to the success of a voluntary Regional Water Management organization. The interviews were conducted among 29 members of the Grand River Watershed Council, created in 1966 to coordinate water management problems among local government units. However the council has almost no direct authority to deal with pollution abatement within the jurisdiction of local government units. Oral and written interviews were conducted with the 29 council members, with responses scored and tabulated. The survey covered perceptions of effectiveness awareness, and local impact. Also measured was the relationship between council service and perceptions, and the relation between occupation, area residency and length of residency. Analysis of the data suggests the council's best interests are served by naming as council members individuals of local prestige who can be induced to remain on the council for an extended period. Positive perceptions of the council's effectiveness is related to length of service on the council. Also suggested is that public servants and professionals be named to the council because of their direct stake in the success of an organization of which they are a part. (Coyle-Wisconsin)
W78-04804

PLANNING FOR WATER RESOURCES,
Thames Water Authority, London (England). Corporate Planning.
D. Perret.
Long Range Planning, Vol. 10, No. 2, p 65-72, April 1977. 8 fig, 1 tab, 7 ref.

Descriptors: *Planning, *Thames Water Authority(Great Britain), *Water management(Applied), *Water allocation(Policy), Regional development, Administrative agencies, Water policy, Economics, Economic justification, Economic feasibility, Agriculture, Fisheries.

The Thames Water Authority is one of the ten regional water authorities created in April, 1974 in England and Wales by the 1973 Water Act. The Thames Water Authority consists of a chairman and 57 members, of whom 36 are nominated by local authorities, 17 are appointed by the Secretary of State for the Environment and four are appointed by the Minister of Agriculture, Fisheries and Food. The chief executive and directors implement the Authority's policies through the management structure which consists of nine operating divisions. Each of the nine operating divisions is under supervision of either the director or the assistant director. Operating divisions deal with the following: (1) design of strategies to meet the long term objectives of the authority; (2) assessment of proposals from different parts of the authority; (3) economic studies related to water resources planning; (4) maintenance of the management information system; (5) evaluation of the future options for water resources. The organizational characteristics of the authority are such that it is able to deal with all problem aspects of water resources in the region. (Harris-Wisconsin)
W78-04805

AN ECONOMIC ANALYSIS OF OPTIMAL INVESTMENT SCHEDULING FOR SALINITY CONTROL IN THE COLORADO RIVFR,
California Univ., Berkeley. Dept. of Civil Engineering: California Univ., Berkeley. Graduate School of Management.
For primary bibliographic entry see Field 5G.
W78-04817

FLOOD PLAIN DWELLERS' PERCEPTION OF FLOOD HAZARD,
Alberta Univ., Edmonton. Dept. of Geography.
For primary bibliographic entry see Field 6F.
W78-04933

PROCEEDINGS OF THE 20TH ANNUAL ARIZONA WATERSHED SYMPOSIUM,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 4D.
W78-04934

ARIZONA STATE WATER PLAN--PHASE II,
Arizona Water Commission, Phoenix.
For primary bibliographic entry see Field 6E.
W78-04935

PRIVATE AND COMMERCIAL TRIPS IN THE GRAND CANYON. RIVER CONTACT STUDY, PART IV.
Human Ecology Research Services, Inc., Boulder, CO.
B. Shelby, and J. M. Nielsen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 729, Price codes: A04 in paper copy, A01 in microfiche. National Park Service, Grand Canyon National Park Report Series, Colorado River Research Program, Technical Report No. 4, June 1976. 46 p, 23 tab, 20 ref.

Descriptors: *Recreation, Psychological aspects, Wild rivers, Cruises, Campsites, Economics, Recreation facilities, Beaches, Tourism, Transportation, Water management(Administrative), *Boating, *Colorado River, *Arizona, *National Parks, *Grand Canyon National Park.

To preserve the quality of the river experience, many resource managers have instituted use restrictions. These limits have produced controversy over the proportions of total use allocations. The history of the private-commercial controversy is discussed and arguments summarized. Private and commercial users differ on a number of background variables, and trips differ in structural characteristics. Private users tend to be younger and with earlier first wilderness experience, are more likely to belong to outdoor organizations, and report slightly lower incomes. Private trips are usually longer, have more stops at attraction sites, and tend to be oar-powered. The attitudes and perceptions of private users are different from those of commercial users as a whole, but are similar to those of commercial oar passengers. Implications for management are discussed. (Payton-Arizona)
W78-05058

AN OVERVIEW OF THE EFFECT OF LAKE POWELL ON COLORADO RIVER BASIN WATER SUPPLY AND ENVIRONMENT,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 4A.
W78-05131

MANAGEMENT OF SCIENTIFIC COLLABORATION IN THE LAKE POWELL RESEARCH PROJECT,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 4A.
W78-05132

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ECONOMICS OF ALTERNATIVE BEEF WASTE MANAGEMENT SYSTEMS,
Nebraska Univ., Lincoln. Dept. of Agricultural Economics.
M. Baker.
In: Managing Livestock Wastes, ASAE Publication PROC-275, Proceedings of the 3rd International Symposium on Livestock Wastes held at the University of Illinois, Urbana-Champaign, April 21-24, 1975. p 37-40, 2 fig, 6 tab.

Descriptors: *Feed lots, *Alternative costs, *Manure, *Waste disposal, Economics, Cattle, Farm management, Farm wastes, Waste management, Livestock, Agricultural runoff, Costs, Solid wastes, Investment, Sewage ponds, Sewage disposal.

Analysis of costs of waste management systems for the beef industry show that investments of $4,000 for drylot systems and $50,000 for housed facilities are not uncommon. Annual per-head capacity costs of waste management systems decline as the size of the feeding operation increases, in part because large lots are more likely to be used year-round. Two open drylot waste systems were evaluated: (1) a continuous flow system, and (2) a terraced syste. The major difference is in where settleable solids are stopped and how liquids are transported to detention ponds. Per-head investment costs for the two systems were comparable, ranging from $9.75-$4.60 for lots of 350-7500 head. Annual costs were also similar, ranging from $1.79-$1.10 per head for 350-7500 head lots. Four housed-facility systems were assessed: (1) oxidation ditch system, (2) deep pit system, (3) shallow pit system, and (4) slot flush system. For 500 and 100-0667 head lots, the respective per head investment costs were: (1) $88-78, (2) $110-89, (3) $87-68, and (4) $56-41. Depreciation, interest on investment, insurance, taxes, and operating costs were included in the annual cost figures. A description of the operation of all six systems is given, as well as a further breakdown of costs. (Lynch-Wisconsin)
W78-05130

6D. Water Demand

ACHIEVING URBAN WATER CONSERVATION--A HANDBOOK,
Colorado Univ., Boulder. Dept. of Civil, Environmental and Architectural Engineering.
For primary bibliographic entry see Field 3D.
W78-04702

ACHIEVING URBAN WATER CONSERVATION: TESTING COMMUNITY ACCEPTANCE,
Colorado State Univ., Fort Collins. Dept. of Political Science.
For primary bibliographic entry see Field 3D.
W78-04703

WATER SUPPLY AND WATER QUALITY CONTROL STUDY, STONEWALL JACKSON RESERVOIR, WEST FORK RIVER BASIN, WEST VIRGINIA.
Department of Health, Education, and Welfare, Wheeling, WV.; Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 5G.
W78-04807

WATER SUPPLY AND WATER QUALITY CONTROL STUDY, BUCK CREEK RESERVOIR, MIAMI RIVER BASIN, OHIO,
Public Health Service, Charlottesville, VA. Region III.
For primary bibliographic entry see Field 5G.
W78-04808

AN ECONOMIC ANALYSIS OF OPTIMAL INVESTMENT SCHEDULING FOR SALINITY CONTROL IN THE COLORADO RIVER,
California Univ., Berkeley. Dept. of Civil Engineering: California Univ., Berkeley. Graduate School of Management.
For primary bibliographic entry see Field 5G.
W78-04817

GROUND-WATER RESOURCES OF COLQUITT COUNTY, GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04875

WATER SUPPLY DILEMMAS OF GEOTHERMAL DEVELOPMENT IN THE IMPERIAL VALLEY OF CALIFORNIA,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 4B.
W78-05028

6E. Water Law and Institutions

THE CHALLENGE TO AMERICAN AGRICULTURE OF P.L. 92-500 FROM A NATIONAL VIEWPOINT - FOCUS ON 'POLITICAL RULINGS AS THEY AFFECT NPS PROGRAMS',
Environmental Protection Agency, Washington, DC. Water Planning Div.
For primary bibliographic entry see Field 5G.
W78-04720

TAX PLANNING FOR POLLUTION CONTROL EQUIPMENT UNDER THE TAX REFORM ACT OF 1976,
Texas Tech. Univ., Lubbock. Dept. of Accounting.
For primary bibliographic entry see Field 5G.
W78-04797

PLANNING FOR WATER RESOURCES,
Thames Water Authority, London (England). Corporate Planning.
For primary bibliographic entry see Field 6B.
W78-04805

COMMENT: WATER LAW - CESSATION OF RETURN FLOW AS A MEANS OF COMPLYING WITH POLLUTION CONTROL LAWS,
Wyoming Univ., Laramie. Coll. of Law.
R. G. Berger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 324, Price codes: A03 in paper copy, A01 in microfiche. Land and Water Law Review, Vol 12, No 2, p 431-456 (1977). OWRT A-023-WYO(1). 14-34-0001-7108.

Descriptors: *Water law, *Water pollution control, *Return flow, Social aspects, Legal aspects, Economic impact, Water quality control, Total containment control system, Cessation of return flow.

Social, legal, and economic policies in regard to the creation and continuation of the total containment water quality control system are examined. Discussed are whether the intentional disposal of water by evaporation incident to industrial or municipal uses is a beneficial use for which water may be appropriated and the means and policies available for determination of whether a beneficial use exists. Assuming disposition of polluted water by the total containment system is a reasonable beneficial use, the author discusses the relative rights of the junior appropriator and the no-discharge user when both depend directly or indirectly on return flow to satisfy their appropriations. Finally, an economic analysis of the total containment system is made. Arguments for and against allowing the total containment process as a means of meeting water quality control requirements are discussed. It is concluded that the legal and economic structure suggests the total containment rights should be denied. The denial is based on the principal that the costs of a total containment system should be absorbed by the pollutor and consumer who benefit from operations causing pollution. In the total containment system the social and economic costs can be internalized only if the water user is denied the right to cease return flow in lieu of treating and discharging the polluted effluent.
W78-04815

ARIZONA STATE WATER PLAN--PHASE II,
Arizona Water Commission, Phoenix.
W. E. Steiner.
In: Proceedings of the 20th Annual Arizona Watershed Symposium, Arizona Water Commission, Report. No 8, September 15, 1976, p 6-10, 1 fig.

Descriptors: *Arizona, *Water resources, *Water resources development, *Federal-State Water Right Conflicts, *Water resources planning, Water Allocation(Policy), Planning, Federal project policy, Water policy, Water requirements, Competing uses, Water utilization, Future planning(Projected), State governments, *Central Arizona Project.

This serves as a partial progress report on water resource activities in Arizona during recent years. The Central Arizona Project and Indian water rights are discussed. In the early 1970's the author called for a much more comprehensive and agressive water resources development planning program. He felt and still feels that if Arizona is to chart her own destiny, she must perform enough of the basic water planning to be able to articulate her desires concerning development and break the historic mold of virtually complete reliance on the Federal planning, but not without sufficient state and local planning. Phase I of the proposed state water plan provides for an inventory of the state's water resurces and current uses, Phase II will look at the water options available to the state of Arizona. (See also W78-04934) (Jamail-Arizona)
W78-04935

FOREST SERVICE'S ROLE IN ARIZONA'S WATER FUTURE,
Forest Service, Albuquerque, NM.
M. J. Hassell.
In: Proceedings of the 20th Annual Arizona Watershed Symposium, Arizona Water Commission, Report No 8, September 15, 1976, p 40-42.

Descriptors: *Arizona, *Watershed management, *Watersheds(Basins), *Forest watersheds, *Water pollution control, Pollution abatement, Forests, Water quality, Water demand, Southwest US, Water resources, Environmental effects, Water conservation, Water supply, Planning, US Forest Service.

The Forest Service plays a vital role in watershed management in Arizona. That role is briefly described. The provisions of the Federal Water Pollution Control Act of 1972, Public Law-92-500, that are concerned with the Forest Service are discussed. The most important sections of the bill are those concerned with nonpoint source pollution abatement planning by the states and a dredge and fill permit program administered by the Corps of Engineers. A positive spin-off from this law is the arrangement that requires Federal, state and local agencies and citizen groups such as the Arizona Water Resources Committee to work

together toward a common objective. Some examples of Forest Service work in watershed management over the past twenty years is reported. (See also W78-04934) (Jamail-Arizona)
W78-04938

THE EFFECT OF PUBLIC LAW 92-500 ON ARIZONA'S WATER FUTURE,
Southwest Forest Industries, Phoenix, AZ.
For primary bibliographic entry see Field 5G.
W78-04939

THE CAP IN CONTROVERSY,
Central Arizona Project Association, Phoenix.
R. Johnson.
In: 20th Annual Arizona Watershed Symposium, Arizona Water Commission, Report No 8, September 15, 1976, p 59-60.

Descriptors: *Water supply, *Colorado River, *Arizona, *Federal project policy, *Water resources, *Water resources development, Competing uses, Irrigation, *Central Arizona Project, Indian water rights, Tucson, Phoenix.

The Central Arizona Project has been the subject of controversy for over 30 years. The opposition positions to the CAP are outlined and discussed. One of these is that the Colorado River is bankrupt; that there is no water available for the CAP. It is pointed out that while this may be true on paper, there is actually a surplus of water. Another opposition claim is that central Arizona urban municipalities have no need for CAP water either now or in the future. However, Tucson is likely to require additional water supplies in the near future. Indian water claims are discussed. It is maintained that if Indian water claims are sanctioned by Congress, then Central Arizona's population will be forced to depend entirely upon the continued and increased use of already overdrafted groundwater, and will more desperately than ever need the imported CAP water. (See also W78-04934) (Jamail-Arizona)
W78-04941

ANALYSIS OF SOME AQUATIC ENVIRONMENTS OF THE VALLEY OF KATHMANDU DURING THE MONSOON PERIOD: AUGUST-SEPTEMBER, 1971, (IN FRENCH),
Centre Univ. de Savoie, Chambery (France). Lab. de Biologie Vegetale.
For primary bibliographic entry see Field 5G.
W78-04962

INSTITUTIONAL DESIGN FOR IMPROVED ENVIRONMENTAL QUALITY: LEGAL AND ECONOMIC ASPECTS IN WISCONSIN,
Wisconsin Univ.-Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W78-04971

REPORT TO THE CONGRESS ON OCEAN POLLUTION, OVERFISHING, AND OFFSHORE DEVELOPMENT.
National Oceanic and Atmospheric Administration, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-04972

QUALITY ASSURANCE RESEARCH PLAN FY 1978-82.
Environmental Protection Agency, Washington, DC. Office of Research and Development.
For primary bibliographic entry see Field 5G.
W78-05007

1975 WORLD SURVEY OF CURRENT RESEARCH AND DEVELOPMENT ON ROADS AND ROAD TRANSPORT.
International Road Federation, Washington, DC.
For primary bibliographic entry see Field 4C.
W78-05049

SYMPOSIUM ON WATER RESOURCES MANAGEMENT IN A CHANGING WORLD, INTRODUCTION: WORLD TRENDS AND NEED,
Colorado Univ., Boulder. Inst. of Behavioral Science.
G. F. White.
Natural Resources Journal, Vol. 16, No. 4, p 737-741, October 1976. 5 ref.

Descriptors: *Water management(Applied), *Water resources development, *Planning, *Water demand, *United Nations Water Conference(1977), Regional development, History, Environmental effects, Water pollution control, Water supply, Groundwater, Natural resources, International waters, Water policy.

The United Nations Water Conference during March 1977 will focus on several new aspects of water policy. The new orientation reflects a basic change in perspective regarding what constitutes integrated development in the world context, a stronger recognition of the environmental impact of water projects, deepened public concern for water pollution, and greater stress on water management in urban areas and areas sharing groundwater resources. A broader view is taken of the scope of water management, extending it from water supply to water demand, from effluent disposal to control of industrial production processes, and from flood control to flood plain planning. These concerns have replaced earlier emphases on data collection, modes of analysis, and integrated river basin development. Principal current international problems are: (1) unsuitable domestic water supplies for 20% of the urban population and 75% of the rural population; (2) increasing degradation of water quality due to waste disposal and nonpoint pollution; (3) rapid increase in complexity and volume of industrial waste discharge, including enlarged mutagenic and carcinogenic effects; (4) continued destruction of soil fertility through waterlogging, salinization, alkalinization, and erosion in agricultural areas; (5) accelerated exhaustion of groundwater supplies; (6) needlessly high cost for water use; and (7) conflicts over water rights. (Lynch-Wisconsin)
W78-05133

WATER LEGISLATION AND INSTITUTIONS--THEIR ROLE IN WATER RESOURCES DEVELOPMENT AND MANAGEMENT,
F. O. C. Hodges.
Water International, Vol 2, No 3, p 3-9, September, 1977. 13 ref.

Descriptors: *Water law, *Water rights, *Administrative agencies, Riparian rights, Prior appropriation, Irrigation, Land use, Groundwater, Surface waters, Water resources development, Institutions, Priorities.

As countries develop using their available water to an increasing extent, it is a sad fact that water resources legislation tends to lag behind the need for it. Though conditions differ greatly from country to country thus necessitating respective differences in water laws and institutions, one common factor--the best interests of the inhabitants--should be the basis for any nation's legislation. This paper provides an overview of existing systems of laws relating to water use from both surface and underground sources. Three broad categories of existing legal systems are discussed: reparian rights, prior appropriation, and administrative disposition of water-use rights. Further comments are made on the subjects of priorities for use, surface-ground water relationships, abatement of pollution, land reform, overpumping and salt water intrusion, and governmental powers in water emergencies. The paper advocates a democratic and interdisciplinary approach to worldwide water resources planning in the future. (Eberle-NWWA)
W78-05180

WATER ALLOCATION BILLS PASSED BY SOUTH DAKOTA LEGISLATURE.
From the State Capitals, Water Supply Report No 3, p 3-4, March 10, 1978.

Descriptors: *South Dakota, *Water law, *Water allocation(Policy), Legislation, Groundwater, Irrigation, Pumping, Water levels, Water table.

Increasing use of ground water for irrigation is one of the factors which has prompted the passage of new bills by the South Dakota legislature. First come, first serve policy has prevailed in the past, but declining water levels aggravated by recent drought conditions have led to a re-evaluation of priorities. Many of the bills give more control to the Water Rights Commission under the State Department of Natural Resources Development. Among the items awaiting final passage and signature are bills calling for: (1) a temporary hold on irrigation from ground water sources; (2) maintaining minimum flows in streams and restriction of ground water pumpage should rivers begin to dry up; (3) future appropriations of water to be delegated to water districts; (4) allowing water permits to be transferred between users, and; (5) monitoring of certain irrigation systems. (Eberle-NWWA)
W78-05186

6F. Nonstructural Alternatives

BIG THOMPSON FLOOD EXPOSES NEED FOR BETTER FLOOD REACTION SYSTEM TO SAVE LIVES,
Colorado Univ., Boulder. Inst. of Behavioral Science.
E. C. Gruntifest, T. E. Downing, and G. F. White.
Civil Engineering-ASCE, Vol. 48, No. 2, p 72-73, February 1978. 2 fig.

Descriptors: *Disasters, *Flash floods, *Colorado, *Hazards, Behavior, Social aspects, Attitudes, Warning systems, Flood protection, Flood forecasting, Flooding, Communication, *Big Thompson(Colo).

The actions people took in response to warnings of disaster in the Big Thompson flood of 1976 affected their chances for survival. No one who climbed the side of the canyon was killed in the flood. People who tried to escape in cars or stayed inside vulnerable buildings were less likely to survive. An effective flash flood warning system can save lives. To provide effective warnings, the system should include: early and reliable prediction and detection of the flood, careful preparedness planning, and consideration of the wording and dissemination of the warning message. An extensive public information program can inform people of the nature of the hazard and the range of alternatives in preparation for its occurrence. (Humphreys-ISWS)
W78-04852

BIG THOMPSON FLOOD DAMAGE WAS SEVERE, BUT SOME COULD HAVE BEEN PREVENTED,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
M. L. Albertson, M. Poreh, and G. A. Hurst.
Civil Engineering-ASCE, Vol. 48, No. 2, p 74-77, February 1978. 4 fig.

Descriptors: *Disasters, *Flash floods, *Colorado, *Flood damage, Floods, Flooding, Flood protection, Warning systems, Damages, Hazards, Erosion, Scour, Stream erosion, Flood plain zoning, *Big Thompson(Colo).

During the Big Thompson flood of 1976, damages resulted from impact by water and debris and from

erosion and scour. Houses were lifted from their foundations and floated away; buildings were filled with several feet of mud and debris; roadways were undermined and collapsed. Although these damages could not have been avoided completely, future damages can be reduced. Building within the flood plain should be prevented; those structures built in the flood plain should be anchored to massive foundations. Highways should be protected, either by rerouting them out of the flood zone or by constructing riprap or retaining walls to protect embankments from erosion. Equally important is a warning system that can operate even during a power and telephone failure. If such a warning system had been in existence in the Big Thompson canyon, it might have saved as many as half the lives lost, but probably would have done little to prevent damage to real property. (Humphreys-ISWS)
W78-04853

FLOOD PLAIN DWELLERS' PERCEPTION OF FLOOD HAZARD,
Alberta Univ., Edmonton. Dept. of Geography.
H. J. McPherson, and T. F. Saaringn.
Arizona Review, University of Arizona, College of Business and Public Administration, Vol 29, No 12, p 1-10, December 1977. 8 tab, 1 fig.

Descriptors: *Attitudes, *Flood plains, Flood plain zoning, Flood plain insurance, *Flood control, Flood damage, *Arizona, Social aspects, Tucson(Ariz).

Floodplain residents in Tucson are satisfied with their present location, and see no real disadvantages. A high proportion, 61%, believe that they are not in a flood danger zone and only 35% believe they would be personally affected in the event of a flood. In general, residents believe a severe flood in Tucson would be less serious than their general concept of a flood. Only a small percentage, 14.8%, intends to purchase flood insurance. The major responsibility for flood control is seen as belonging to government, and faith in technology to overcome problems is implicit in these reactions. Personal responsibilities for flood control were mentioned only 7% of the time. It is felt that these responses should be evaluated carefully in terms of future flood control implementation. (Payton-Arizona)
W78-04933

ASSESSMENT OF FLOOD AND EROSION ASSISTANCE PROGRAMS, RONDEAU COASTAL ZONE EXPERIENCE, LAKE ERIE,
Waterloo Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 4A.
W78-05037

6G. Ecologic Impact Of Water Development

IMPACT OF SOCIAL ATTITUDES ON MANAGING THE ENVIRONMENT,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W78-04724

SUMMARY REPORT 1975: FOOD PROTECTION AND TOXICOLOGY CENTER, UNIVERSITY OF CALIFORNIA, DAVIS.
California Univ., Davis. Food protection and Toxicology Center.
For primary bibliographic entry see Field 5C.
W78-04745

A PRIORITY-TRADEOFF-SCANNING APPROACH TO EVALUATION IN ENVIRONMENTAL MANAGEMENT,
California Univ., Los Angeles.
For primary bibliographic entry see Field 6B.
W78-04795

APPLICATION OF RESIDUALS MANAGEMENT FOR ASSESSING THE IMPACTS OF ALTERNATIVE COAL-DEVELOPMENT PLANS ON REGIONAL WATER RESOURCES,
Geological Survey, Reston, VA. Water Resources Div.; and Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 6A.
W78-04879

IRRATIONAL LAND USE AND DESERTIFICATION IN RAJASTHAN DESERT,
Central Arid Zone Research Inst., Jodhpur (India).
For primary bibliographic entry see Field 4C.
W78-04924

INSTITUTIONAL DESIGN FOR IMPROVED ENVIRONMENTAL QUALITY: LEGAL AND ECONOMIC ASPECTS IN WISCONSIN,
Wisconsin Univ.-Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W78-04971

DEVELOPMENT AND OPERATION OF HF OCEAN CURRENT MAPPING RADAR UNITS,
National Oceanic and Atmospheric Administration, Seattle, WA. Wave Propagation Lab.
For primary bibliographic entry see Field 2L.
W78-04974

SURFACE CURRENTS OF THE NORTHEAST CHUKCHI SEA,
Bureau of Land Management, Groton, CT.
For primary bibliographic entry see Field 5B.
W78-04975

CURRENT MEASUREMENT IN POSSIBLE DISPERSAL REGIONS OF THE BEAUFORT SEA,
Washington Univ., Seattle. Dept. of Oceanography; and Washington Univ., Seattle. Applied Physics Lab.
For primary bibliographic entry see Field 5B.
W78-04976

EFFECTS OF SEASONABILITY AND VARIABILITY OF STREAMFLOW ON NEARSHORE COASTAL AREAS,
Alaska Univ., Inst. of Water Resources.
For primary bibliographic entry see Field 4A.
W78-04977

GULF OF ALASKA STUDY OF MESOSCALE OCEANOGRAPHIC PROCESSES (GAS-MOP),
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W78-04978

NUMERICAL STUDIES OF ALASKAN REGION,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W78-04979

BRISTOL BAY OCEANOGRAPHIC PROCESSES (B-BOP),
National Oceanic and Atmospheric Administration, Boulder, CO. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 5B.
W78-04980

STD MEASUREMENTS IN POSSIBLE DISPOERSAL REGIONS OF THE BEAUFORT SEA,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-04981

YUKON DELTA COASTAL PROCESSES STUDY,
Houston Univ., Houston, TX. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W78-04982

LAGRANGIAN SURFACE CURRENT MEASUREMENTS ON THE OUTER CONTINENTAL SHELF,
National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 5B.
W78-04983

STUDY OF CLIMATIC EFFECTS ON FAST ICE EXTENT AND ITS SEASONAL DECAY ALONG THE BEAUFORT-CHUKCHI COASTS,
Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
For primary bibliographic entry see Field 5B.
W78-04984

MECHANICS OF ORIGIN OF PRESSURE RIDGES, SHEAR RIDGES AND HUMMOCK FIELDS IN LANDFAST ICE,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W78-04985

MORPHOLOGY OF BEAUFORT, CHUKCHI AND BERING SEAS NEAR SHORE ICE CONDITIONS BY MEANS OF SATELLITE AND AERIAL REMOTE SENSING,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W78-04986

EXPERIMENTAL MEASUREMENTS OF SEA ICE FAILURE STRESSES NEAR GROUNDED STRUCTURES,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W78-04987

BEAUFORT SEA, SHUKCHI SEA, AND BERING STRAIT BASELINE ICE STUDY,
Alaska Univ., College.
For primary bibliographic entry see Field 2C.
W78-04988

DEVELOPMENT OF HARDWARE AND PROCEDURES FOR IN SITU MEASUREMENT OF CREEP IN SEA ICE,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W78-04989

OPERATION OF AN ALASKAN FACILITY FOR APPLICATIONS OF REMOTE-SENSING DATA TO OCS STUDIES,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2L.
W78-04990

CIRCULATION AND WATER MASSES IN THE GULF OF ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W78-04991

MARINE CLIMATOLOGY OF THE GULF OF ALASKA, THE BERING AND BEAUFORT SEAS,
Alaska Univ., Anchorage. Arctic Environmental Information and Data Center.
For primary bibliographic entry see Field 2B.
W78-04992

CLIMATIC ATLAS OF THE OUTER CONTINENTAL SHELF WATERS AND COASTAL REGIONS OF ALASKA,
Alaska Univ., Anchorage. Arctic Environmental Information and Data Center; and National Climatic Center, Ashville, NC.
For primary bibliographic entry see Field 2B.
W78-04993

NEAR-SHORE METEOROLOGY,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 2L.
W78-04994

A STUDY OF BEAUFORT SEA COASTAL EROSION NORTHERN ALASKA,
For primary bibliographic entry see Field 2J.
W78-04995

MODELING OF TIDES AND CIRCULATIONS OF THE BERING SEA,
Rand Corp., Santa Monica, CA.
For primary bibliographic entry see Field 2L.
W78-04996

COASTAL METEOROLOGY OF THE ALASKAN ARCTIC COAST,
Washington Univ., Seattle. Polar Research Center.
For primary bibliographic entry see Field 2B.
W78-04997

NORTON SOUND/CHUKCHI SEA OCEANOGRAPHIC PROCESSES (N-COP),
Washington Univ., Seattle. Dept. of Oceanography; and National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.
For primary bibliographic entry see Field 2L.
W78-04998

HICKORY CREEK DRY RESERVOIR: A COMPROMISE DESIGN FOR BOTH FLOOD CONTROL AND NATURAL AREA PROTECTION,
Illinois State Dept. of Transportation, Springfield. Div. of Water Resources.
For primary bibliographic entry see Field 4A.
W78-05026

ECOLOGICAL COMPARISONS BETWEEN A FRESH-WATER TIDAL MARSH AND ADJOINING IMPOUNDMENT IN SOUTHEASTERN PENNSYLVANIA,
Pennsylvania State Univ., University Park. School of Forestry.
For primary bibliographic entry see Field 2L.
W78-05090

THE INFLUENCE OF SUBMERSED AQUATIC PLANTS ON TEMPERATURE GRADIENTS IN SHALLOW WATER BODIES,
Guelph Univ., (Ontario). Dept. of Botany and Genetics.
For primary bibliographic entry see Field 2H.
W78-05091

THE IMPACT OF DEVELOPMENT PROJECTS ON ESTUARINE AND OTHER WETLAND ECOSYSTEMS,
Transport and Environment Studies. London (England).
J. B. Elkington.
Environmental Conservation, Vol. 4, No. 2, p 135-144, Summer, 1977. 4 fig, 31 ref.

Descriptors: *Estuaries, *Land use, *Recreation, *Urban land use, *Agriculture, Wetlands, Water pollution effects, Polychlorinated biphenyls, Reclamation, Third World countries, Airports, Lake Nakuru(Kenya), Hudson River, Exotic flora, Lake Manzala(Egypt), Lake Hornborgasjon(Sweden), Aquaculture.

Despite various campaigns to publicize the value and plight of wetlands, pressures for development and economic growth are often such that ecological issues are obscured. The biology of the estuarine environment is discussed as a first step to evaluating the impact of pollution and land use policies. The impacts of urban, agricultural and recreational use of wetland areas are reviewed with particular reference to wetland ecosystems of Third World countries. The importance of experiment in evaluating alternative land use options (such as intensive fish farming) is stressed, and a simple model for ecologically sound development is proposed which could apply to Lake Manzala in the Arab Republic of Egypt's Northern Wetlands. (Stihler-Mass)
W78-05095

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA. SUBPROJECT NO. 2. A STUDY OF THE IMPACT OF SELECTED BANK STABILIZATION STRUCTURES ON GAME FISH AND ASSOCIATED ORGANISMS,
Iowa Cooperative Fishery Research Unit, Ames.
A. L. Witten, and R. V. Bulkley.
Fish and Wildlife Service, Office of Biological Services Report 76/12, May, 1975. 116 p, 7 fig, 15 tab, 23 ref, 4 append.

Descriptors: *Stream improvement, Stream stabilization, *Warm-water fish, *Fish management, *Iowa, *Aquatic insects, *Habitat improvement, Streams, Streambeds, Stream erosion, Scour, Bank erosion, Retaining walls, Barriers, Jetties, Fish, Bullheads, Channel catfish, Sunfishes, Mayflies, Dragonflies, Caddisflies, Bank stabilization structures, Game fish.

Four types of stream bank stabilization structures (revetments, retards, permeable jetties, impermeable jetties) were studied to determine their impact upon game fish habitat. Permeable jetties and retards deepened the channel near the structures 7 to 110% greater than the maximum depth in control sections. No other significant differences in either physical parameters or in mean body length or abundance of game fish were found between structured and non-structured stream sections. Unusually high water during the sampling period may have allowed fish to remain dispersed throughout the streams rather than concentrating in the deep pools at or near stabilization structures. Rock revetments and impermeable jetties fostered the growth of some invertebrates, primarily mayflies and caddisflies. Revetments, which presented the most rock surface for invertebrate colonization, had the greatest impact on invertebrate abundance. A long rock jetty, extending far enough into the stream to produce a scour hole, would combine most of the advantages noted in the structures studied. For habitat improvement, rock was superior to steel as a construction material, and structures which cause the formation of scour holes superior to those that do not deepen the stream. (Steiner-Mass)
W78-05097

WETLAND INVENTORY, ONEIDA COUNTY, NEW YORK,
Oneida County Environmental Management Council, Utica, NY.
B. Gilman.
February, 1976. 69 p, 5 fig, 3 tab, 33 ref, 4 append.

Descriptors: *Wetlands, *New York, *Census, *Conservation, *Biological community, *Hydrologic aspects, *Aesthetics, Bogs, Aquatic habitats, Freshwater marshes, Data collections, Surveys, Developed waters, Preservation, Deltas, Swamps, Marshes, Attitudes, Natural resources, Psychological aspects, Water utilization, *Oneida County(NY), Biological aspects.

An inventory method was designed to record the present status of county wetlands, identifying those that are endangered by development, valuable as a natural resource, or desirable for preservation. Wetland sites observed were classified into their basic types (natural, enhanced, artificial, isolated, bog, ponded, streamside, deltaic) with three wetland values distinguished (biologic, hydrologic, potential human use). For each value, several criteria--weighted for their importance--were developed to produce a total rating. Enhanced streamside and pondside sites scored highest in biologic importance while all types scored well in human use, noticeably the ponded, streamside, and bog sites. Natural deltaic and enhanced ponded wetlands scored high in hydrologic importance, probably as a result of their ability to store large quantities of water. Only the deltaic sites scored high in all three categories. Wetlands located in the northwestern county region, where bedrock materials were conducive to groundwater recharge, scored consistently higher in hydrologic importance than those of other regions. County-wide wetland ratings in biologic and human use values did not show recognizable patterns with county physiography. Evaluation scores for those values were influenced by a variety of wetland characteristics with wetland type playing a major role. (Steiner-Mass)
W78-05099

THE VEGETATION OF BRITISH INLAND SALT MARSHES,
Manchester Univ. (England) Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-05100

IMPACT OF WATER LEVEL CHANGES ON WOODY RIPARIAN AND WETLAND COMMUNITIES. VOLUME I: PLANT AND SOIL RESPONSES TO FLOODING,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
R. O. Teskey, and T. M. Hinckley.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $0.00. Fish and Wildlife Service, Office of Biological Services Report 77/58, December, 1977. 30 p, 1 fig, 1 tab, 103 ref.

Descriptors: *Riparian plants, *Water level fluctuations, Documentation, *Physiological ecology, *Resistance, *Root development, Wetlands, Riparian land, Banks, Swamps, Water levels, Soil-water-plant relationships, Aeration, Moisture, Soil water, Excess water(Soils), Soil chemical processes, Publications, Data collections, Plant physiology, Environmental effects, Flood plains, Floods, Rhizosphere, Nutrients, Plant growth, Tolerance mechanisms.

A comprehensive literature review of general plant physiological responses to managed or natural changes in water levels (i.e., submersion, flooding, soil saturation) and on plant tolerance mechanisms involved in water level changes is presented. The major effect of flooding is the creation of an anaerobic environment surrounding the root system and the maintenance of proper root functioning is the factor which determines tolerance to flooding. Physical tolerance mechanisms involve

processes designed to increase oxygen content in the roots either by transport of oxygen from the stem or from parts of the root system where oxygen is more available. Metabolic mechanisms enable the plant to utilize less toxic end-products. Tolerant species are able to maintain root systems with a minimum of stress by incorporating a variety of tolerance mechanisms. Soil factors may ameliorate or accentuate the problem caused by flooding on physiological changes. Soils which are flooded show a decrease in oxygen concentration which leads to changes in soil chemistry (pH and redox potential) and nutrient availability. Five water level factors--time of year, flood frequency, duration, water depth, and siltation--are considered critical in determining a plant's physiological responses. (See W78-05102 and W78-05103) (Steiner-Mass)
W78-05101

IMPACT OF WATER LEVEL CHANGES ON WOODY RIPARIAN AND WETLAND COMMUNITIES. VOLUME II: THE SOUTHERN FOREST REGION,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
R. O. Teskey, and T. M. Hinckley.
Available from the Supt. of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Fish and Wildlife Service, Office of Biological Services, Report 77/59, December, 1977. 46 p, 1 fig, 2 tab, 55 ref.

Descriptors: *Southeast U.S., *Trees, *Floods, *Resistance, Documentation, *Ecological distribution, *Data collections, Biological communities, Wetlands, Riparian land, Riparian plants, Swamps, Water levels, Water level fluctuations, Soil water, Excess water(Soils), Publications, Physiological ecology, Environmental effects, Flood plains, Plant growth, Deciduous trees, Succession, Forests, Mixed forests, Forest management, Southern forests(US), Ecoregions, Flood plain forest, Bluestem prairie.

A description and documentation of the natural plant ecoregions (communities) occurring in the Southern Forest region as affected by flood inundation presented. The four ecoregions described are: Southern Mixed Forest, Southern Floodplain Forest, Beech-Sweetgum-Magnolia-Pine-Oak Forest, and Bluestem Prairie. Within each ecoregion, site characteristics for dominant species are followed by lists of the associated species arranged in order of increasing site-soil moisture. In addition, the climate, soils, general physiography and bottom land successional pattern for each ecoregion is developed. A table summarizes information from existing literature regarding mature tree and seedling survival in 66 species under three water conditions: total submersion, partial submersion, and soil saturated. The information is also divided into flood periods during the growing season, the dormant season, and year-round. Associated with this table is a ranking of relative tolerance to flooding of these species. (See also W78-05101) (Steiner-Mass)
W78-05102

IMPACT OF WATER LEVEL CHANGES ON WOODY RIPARIAN AND WETLAND COMMUNITIES. VOLUME III: THE CENTRAL FOREST REGION,
Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.
R. O. Teskey, and T. M. Hinckley.
Available from the Supt. of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Fish and Wildlife Service, Office of Biological Services, Report 77/60, December, 1977. 36 p, 1 fig, 2 tab, 43 ref.

Descriptors: *Central U.S., *Trees, *Floods, *Resistance, Documentation, *Ecological distribution, Biological communities, Wetlands, Oak trees, Hickory trees, Riparian land, Riparian plants, Swamps, Water levels, Water level fluctuations, Soil water, Excess water(Soils), Publications, Data collections, Physiological ecology, Environmental effects, Flood plains, Plant growth, Deciduous trees, Succession, Forests, Forest management, *Central U.S. forests, Ecoregions.

A description and documentation of the natural plant ecoregions (communities) occurring in the Central Forest Region as affected by flood inundation is presented. The three ecoregions described are: Oak-Hickory Forest, Oak-Hickory Bluestem Parkland, and Oak-Bluestem Parkland. Within each ecoregion, site characteristics for dominant species are followed by lists of the associated species arranged in order of increasing site-soil moisture. In addition, the climate, soils, general physiography and bottomland succession pattern for each ecoregion is developed. A table summarizes information from existing literature regarding mature tree and seedling survival in 53 species under three water conditions: total submersion, partial submersion, and soil saturated. The information is also divided into flood periods during the growing season, the dormant season, and year-round. Associated with this table is a ranking of relative tolerance to flooding of these species. (See also W78-05101) (Steiner-Mass)
W78-05103

AN OVERVIEW OF THE EFFECT OF LAKE POWELL ON COLORADO RIVER BASIN WATER SUPPLY AND ENVIRONMENT,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 4A.
W78-05131

MANAGEMENT OF SCIENTIFIC COLLABORATION IN THE LAKE POWELL RESEARCH PROJECT,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 4A.
W78-05132

SYMPOSIUM ON WATER RESOURCES MANAGEMENT IN A CHANGING WORLD, INTRODUCTION: WORLD TRENDS AND NEED,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 6E.
W78-05133

7. RESOURCES DATA

7A. Network Design

RECOMMENDED METHODS FOR WATER DATA ACQUISITION,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-04867

PROCEEDINGS OF CONFERENCE ON ENVIRONMENTAL QUALITY SENSORS (SECOND) HELD AT NATIONAL ENVIRONMENTAL RESEARCH CENTER, LAS VEGAS, NEVADA ON OCTOBER 10-11, 1973.
National Environmental Research Center, Las Vegas, NV.
For primary bibliographic entry see Field 5A.
W78-04947

INTEGRATED REMOTE SENSING SYSTEM,
Environmental Protection Agency, Las Vegas, NV. Monitoring Operations Lab.
For primary bibliographic entry see Field 5A.
W78-04948

THE NATIONAL ENVIRONMENTAL MONITORING SYSTEM,
Magnavox Co., Fort Wayne, IN.
For primary bibliographic entry see Field 5A.
W78-04955

MEMBRANE FILTER RETENTION: A SOURCE OF ERROR IN THE 14C METHOD OF MEASURING PRIMARY PRODUCTION,
Atomic Energy of Canada Ltd., Chalk River (Ontario). Environmental Research Branch.
For primary bibliographic entry see Field 5A.
W78-05172

7B. Data Acquisition

COMPARISON OF EFFICIENCY OF CAPTURE OF TWO ZOOPLANKTON NETS: SELECTION OF A STATISTICAL ANALYSIS MODEL AND VERIFICATION OF ITS ACCURACY, (IN ITALIAN),
Consiglio Nazionale delle Ricerche, Pavia (Italy). Lab. Genetica and Biochemica Evoluzionistica.
O. Rossi, and I. Ferrari.
Boll Pesca Piscic Idrobiol 30(1), p 57-70, 1975.

Descriptors: Model studies, *Statistical methods, Constaceans, *Sampling, *Testing, Copepod, Plankton, Rotifer, *Zooplankton nets.

The catch efficiency of 2 zooplankton nets was compared using a statistical linear additive model. The figures analyzed were drawn from 18 series of samplings carried out at 3 depth layers in Lake Mergozzo (N Italy), using 2 Clarke-Bumpus plankton samplers: one with 45 meshes/cm the other with 69 meshes/cm. The degree of agreemment between the main hypothesis of the model was tested: additivity, normality of the distribution of the dependent variable and reality of the available data. The Tukey test (non-addivity test) showed that only by transforming all data into the log 10 of the same were these 2 base conditions met. The catch efficiency of the 2 nets is not the same for the 3 main systematic groups (Rotifers, Copepods, Cladocera), but the differential efficiency of the 2 nets is substantially the same in the layers explored and in each sampling time.--Copyright 1977, Biological Abstracts, Inc.
W78-04714

THE U.S. GEOLOGICAL SURVEY AND LAND USE MAPPING,
Geological Survey, Reston, VA.
J. R. Anderson.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada, on October 10-11, 1973. Published December 1973, Section V, p 1-16. 9 ref.

Descriptors: *Mapping, *Maps, *Land use, Remote sensing, Classification.

The increasing number and complexity of land-use conflicts indicate a need for positive planning efforts. Urbanization was absorbing about 730,000 acres/yr during the 1960's, and another 130,000 acres/yr were being transferred to transportation from other uses. Presently there is no systematic compilation of information on existing land use and its changes on a national basis. For planning at the local level, ground surveys supplemented by aerial photographs are used, or land use information is hypothesized from utility hookups data, school population or building permits. In response to the need for better land-use data, the U.S. Geological Survey issued in October 1972 'A Land Use Classification System for Use with Remote Sensor Data' (Geological Survey Circular 671). The system, which is resource- rather than people-oriented, is designed to meet the need of federal and state agencies for an up-to-date overview of land use throughout the country which is uniform

in date, scale, and categorization at the more generalized first and second levels. ERTS-1, high-altitude aircraft platforms, and the USGS Special Mapping Center at Reston, VA, are sources of remote sensing data. The USGS Land Use Data Program provides transparent overlays depicting current land use, computer-generated graphic displays (maps), computer tapes of land-use data, and statistical data on land-use patterns and changes. (Lynch-Wisconsin)
W78-04718

DETERMINATION OF WATER IN SURFACE SOILS BY ACOUSTIC METHODS,
South Dakota State Univ., Brookings. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 2G.
W78-04821

WETLAND CLASSIFICATION AND MAPPING IN WESTERN TENNESSEE,
Geological Survey, Reston, VA. Water Resources Div., and Tennessee Valley Authority, Chattanooga.
For primary bibliographic entry see Field 4A.
W78-04863

PROCEEDINGS OF CONFERENCE ON ENVIRONMENTAL QUALITY SENSORS (SECOND) HELD AT NATIONAL ENVIRONMENTAL RESEARCH CENTER, LAS VEGAS, NEVADA ON OCTOBER 10-11, 1973.
National Environmental Research Center, Las Vegas, NV.
For primary bibliographic entry see Field 5A.
W78-04947

INTEGRATED REMOTE SENSING SYSTEM,
Environmental Protection Agency, Las Vegas, NV. Monitoring Operations Lab.
For primary bibliographic entry see Field 5A.
W78-04948

EVALUATION OF THE ZEEMAN ATOMIC SPECTROMETER,
National Environmental Research Center, Las Vegas, NV. Monitoring Systems Research and Development Lab.
E. W. Bretthauer.
In: Proceedings of Conference on Environmental Quality Sensors (Second) Held at National Environmental Research Center, Las Vegas, Nevada on October 10-11, 1973, published December 1973, Section I, p 44-59. 4 fig, 1 tab.

Descriptors: *Mercury, *Spectrometers, Monitoring, Instrumentation, Pollutants, Evaluation, *Pollutant identification, *Isotope Zeeman Atomic Absorption spectrometer.

The Isotope-shifted Zeeman Atomic Absorption Spectrometer (IZAA) was developed at Lawrence Berkeley Laboratory for the direct analysis of mercury in the parts/per billion range in environmental samples. This report is a preliminary evaluation of the instrument by the National Environmental Research Center, Las Vegas (NERC-Las Vegas). In the IZAA the sample is thermally decomposed and oxidized in a furnace at 900 C, whereupon the gaseous sample is swept into a heated absorption tube by a stream of oxygen. Here it is probed by a dual-constituent light beam; one constituent has a wavelength centered on the absorption profile of natural Hg in air, while the other is slightly displaced (less than one cm) from the mercury absorption line. Absorption in the first constituent is caused by Hg vapor as well as by non-Hg decomposition products. The absorption of the second constituent is due only to the nonmercury products. The difference therefore indicates the absorption due to Hg alone. The two optical lines are generated through splitting with a magnetic field (the Zeeman effect). IZAA can directly analyze most types of samples in 30 sec. Results of testing indicate acceptable reproducibility in the 0.1-5.0 ppm range, and a reasonable independence of signal from concentration (0.4-5.0 ppm) and sample size (10-50 microliters) for aqueous solutions. The signal is reasonably independent of the chemical form of mercury; however, combinations of different chemical forms of Hg in the same aqueous sample produced signals which were nonadditive. (See also W78-04947) (Lynch-Wisconsin)
W78-04949

MULTIWAVELENGTH LIDAR FOR REMOTE SENSING OF CHLOROPHYLL-A IN PHYTOPLANKTON,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-04950

SUMMARY OF NASA LANGLEY RESEARCH CENTER REMOTE SENSING ACTIVITIES UNDER THE ENVIRONMENTAL PROTECTION AGENCY INTERAGENCY AGREEMENTS: POTENTIAL FOR REGIONAL APPLICATIONS,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 5A.
W78-04951

THE REMOTE DETECTION AND IDENTIFICATION OF SURFACE OIL SPILLS,
Spectrogram Corp., North Haven, CT.
For primary bibliographic entry see Field 5A.
W78-04952

VIDEO DETECTION OF OIL SPILLS,
National Aeronautics and Space Administration, Moffett Field, CA. Ames Research Center.
For primary bibliographic entry see Field 5A.
W78-04953

MEASUREMENTS OF THE DISTRIBUTION AND VOLUME OF SEA-SURFACE OIL SPILLS USING MULTIFREQUENCY MICROWAVE RADIOMETRY,
Hulburt (E.O.) Center for Space Research, Washington, DC. Space Science Div.
For primary bibliographic entry see Field 5A.
W78-04954

THE NATIONAL ENVIRONMENTAL MONITORING SYSTEM,
Magnavox Co., Fort Wayne, IN.
For primary bibliographic entry see Field 5A.
W78-04955

SKYLAB APPLICATION TO ENVIRONMENTAL MONITORING,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 5A.
W78-04956

ERTS-1 DETECTION OF ACID MINE DRAINAGE SOURCES,
Ambionics Inc., Washington, DC.
For primary bibliographic entry see Field 5A.
W78-04957

WATER QUALITY ANALYSIS USING ERTS-A DATA,
Moore School of Electrical Engineering, Pennsylvania, PA.
For primary bibliographic entry see Field 5A.
W78-04958

SATELLITE STUDIES OF TURBIDITY, WASTE DISPOSAL PLUMES AND POLLUTION-CONCENTRATING WATER BOUNDARIES,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5A.
W78-04959

DATA COLLECTION PLATFORMS FOR ENVIRONMENTAL MONITORING,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 5A.
W78-04960

LIDAR POLARIMETER MEASUREMENTS OF WATER POLLUTION,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 5A.
W78-04961

MORPHOLOGY OF BEAUFORT, CHUKCHI AND BERING SEAS NEAR SHORE ICE CONDITIONS BY MEANS OF SATELLITE AND AERIAL REMOTE SENSING,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W78-04986

DEVELOPMENT OF HARDWARE AND PROCEDURES FOR IN SITU MEASUREMENT OF CREEP IN SEA ICE,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W78-04989

OPERATION OF AN ALASKAN FACILITY FOR APPLICATIONS OF REMOTE-SENSING DATA TO OCS STUDIES,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2L.
W78-04990

HYDROLOGIC DATA RELAY BY SATELLITE FROM REMOTE AREAS,
Canada Dept. of Fisheries and Environment, Ottawa (Ontario).
R. A. Halliday.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-24555, Price codes: A02 in paper copy, A01 in microfiche. Report No. HC A02/MF A01, March, 1977. 21 p, 1 fig, 2 tab, 7 ref.

Descriptors: *Satellites, *Remote sensing, *Data collections, *Canada, *Hydrologic data, *LANDSAT, *Geostationary Operational Environmental Satellite(GOES), *Tiros-N, *Communications satellite, ERTS, Satellite data relay, Data collection platform, Hydrologic sensor, Hydrologic data relay, Data collection system, Geostationary equatorial satellite, Low near polar satellite, Remote areas.

LANDSAT Geostationary Operational Environmental Satellites (GOES), Tiros-N, and communications satellites are compared. Since the launch of LANDSAT-1 in 1972, experiments have been conducted using these satellite systems to collect and relay hydrologic data from remote areas of Canada. All have desirable features and some drawbacks. The potential user must evaluate each system to select the one that best meets local requirements. The satellite technology has been accurate, reliable and cost effective; further development is warranted. The program of the Water Survey of Canada is described in detail and future plans for satellite data relay are discussed. Cost analyses are included. (Seip-IPA)
W78-05005

RADARSCOPE INTERPRETATION: SEVERE THUNDERSTORMS AND TORNADOES,
Air Weather Service, Scott AFB, IL.
For primary bibliographic entry see Field 2B.
W78-05006

FINAL REPORT OF INVESTIGATION OF PEARL RIVER DATA COLLECTION SYSTEM APPLICATIONS.
Mississippi Air and Water Pollution Control Commission, Jackson.
For primary bibliographic entry see Field 7C.
W78-05008

DETECTION AND MAPPING (DAM) PACKAGE,
Lockheed Electronics Co., Inc., Houston, TX. Aerospace Systems Div.
For primary bibliographic entry see Field 7C.
W78-05009

SEA-SURFACE TEMPERATURE AND SALINITY MAPPING FROM REMOTE MICROWAVE RADIOMETRIC MEASUREMENTS OF BRIGHTNESS TEMPERATURE,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 2L.
W78-05017

LAND USE CHANGE DETECTION WITH LANDSAT-2 DATA FOR MONITORING AND PREDICTING REGIONAL WATER QUALITY DEGRADATION,
Arkansas Univ., Fayetteville. Dept. of Geology.
For primary bibliographic entry see Field 5B.
W78-05018

SOIL MOISTURE SENSING WITH AIRCRAFT OBSERVATIONS OF THE DIURNAL RANGE OF SURFACE TEMPERATURE,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 2G.
W78-05027

PSEUDO-LAGRANGIAN DISPERSION ESTIMATES FROM CURRENT METERS,
Ontario Ministry of the Environment, Toronto. Water Resources Branch.
For primary bibliographic entry see Field 2H.
W78-05040

MEASUREMENTS BY GEOMAGNETIC INDUCTION OF VOLUME TRANSPORT IN A SALT MARSH DRAINAGE CHANNEL,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 2L.
W78-05094

MEASUREMENT OF WATER MOVEMENT IN REFERENCE TO BENTHIC ALGAL GROWTH,
Hawaii Univ., Honolulu. Dept. of Botany.
M. S. Doty.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 468, Price codes: A02 in paper copy, A01 in microfiche.
Botanica Marina, Vol 14, p 25-32, 1971. 1 fig, 1 tab, 11 ref. AT(04-3)-235.

Descriptors: *Water movement, *Algae, *Benthic flora, *Eutrophication, Clod-cards, Plant growth, Plaster of Paris, Hawaii, Methodology, Research equipment, Instrumentation, On-site investigations, Diffusion.

A device for measuring water movement is described, as well as experiments showing positive correlation of water movement with algal growth. Small plaster of Paris blocks, formed in oblong, round-bottomed ice-cube trays, are cemented onto thin plastic cards with epoxy or contact cement. After 24 hours they are dry-weighted and the weight (generally about 30 g) entered on the card. Calibration is accomplished for each lot of these clod-cards by immersing five cards in a water sample from the area to be monitored for four days, changing the water each day. A calibration value (k), calculated from the resulting mass loss, measures the solution, dissolution, and diffusion rates of the calcium sulfate from the clods under the given conditions. Clod-cards are kept in the field for 24 hours, which exposes them to changes related to diurnal and tidal factors. They are either taped to bricks or affixed to stakes or pegs driven into mud flats or cracks in rocks. After exposure, cards are rinsed in fresh water and dry-weighted. The weight loss can be used as a clod-card index value (CV), or divided by k to obtain a diffusion index factor (DF). A correlation coefficient of 0.70 for CV to standing crop of reef algae at Honolulu, Hawaii was found. Wild values which appeared embarrassingly often in tests of the clod-cards were apparently due to loss of solid pieces, bubbles in the clods, or animal nibbling. (Lynch-Wisconsin)
W78-05106

PROBLEMS INVOLVED IN MEASURING THE SOIL THERMAL CONDUCTIVITY AND DIFFUSIVITY IN A MOIST SOIL,
Agricultural Research Organization, Bet-Dagan (Israel). Div. of Soil Physics.
For primary bibliographic entry see Field 2G.
W78-05122

REMOTE SENSING ANALYSIS OF LAKE LIVINGSTON AQUATIC PLANTS, 1975 FINAL REPORT,
Texas A and M Univ., College Station. Remote Sensing Center.
For primary bibliographic entry see Field 5A.
W78-05134

7C. Evaluation, Processing and Publication

COMPUTER MONITORING OF ENVIRONMENTAL CONDITIONS IN A WATERSHED,
Purdue Univ., Lafayette, IN. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4D.
W78-04733

MODELING OF ACID MINE DRAINAGE AND OTHER POLLUTANTS IN THE MONOGAHELA RIVER BASIN UNDER LOW FLOW CONDITIONS,
West Virginia Univ., Morgantown. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-04746

SYSTEMS FOR RAPID RANKING OF ENVIRONMENTAL POLLUTANTS,
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5A.
W78-04806

SOIL HYDRAULIC PROPERTIES DETERMINED BY INFILTRATION EXPERIMENTS AND SIMULATION,
Wyoming Univ., Laramie. Water Resources Research Inst.
For primary bibliographic entry see Field 2G.
W78-04812

THE SMALL SAMPLE EXPECTATION OF RESCALED POPULATION AND RESCALED ADJUSTED RANGES,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulics and Water Power.
For primary bibliographic entry see Field 2E.
W78-04831

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. GREAT LAKES, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey, Reston, VA. Water Resources Div.
Office of Water Data Coordination Report, 1977. 125 p, 5 fig, 5 tab.

Descriptors: *Hydrologic data, *Information retrieval, *Coasts, *United States, *Great Lakes, Indexing, Streamflow, Groundwater, Surface waters, Water quality, Federal government, State governments, Local agencies, Other agencies.

The Catalog of Information on Water Data is a computerized information file about water-data-acquisition activities in the United States and its territories and possessions. The information contains input from Federal, State, and local agencies, and private organizations. The Catalog is a file about water-data-acquisition activities and not a file of the actual water data. This special report provides information about water data stations located in the coastal areas. Four separate volumes present the information respectively for the Atlantic Coast (including Puerto Rico), the Gulf Coast, the Pacific Coast (including Alaska, Hawaii, and other Pacific Islands), and the Great Lakes. This volume includes the Great Lakes. The information should be useful both in planning for additional data needs and in planning for the best use of coastal resources. (Woodard-USGS)
W78-04855

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. ATLANTIC COAST, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey, Reston, VA. Water Resources Div.
Office of Water Data Coordination report, 1977. 283 p, 5 fig, 5 tab.

Descriptors: *Hydrologic data, *Information retrieval, *Coasts, *United States, *Atlantic Ocean, *Puerto Rico, Indexing, Streamflow, Groundwater, Surface waters, Water quality, Federal government, State governments, *Atlantic Coast, Local agencies, Other agencies.

The Catalog of Information on Water Data is a computerized information file about water-data-aquisition activities in the United States and its territories and possessions. The information contains input from Federal, State, and local agencies, and private organizations. The Catalog is a file about water-data-acquisition activities and not a file of the actual water data. This special report provides information about water data stations located in the coastal areas. Four separate volumes present the information respectively for the Atlantic Coast (including Puerto Rico), the Gulf Coast, the Pacific Coast (including Alaska, Hawaii, and other Pacific Islands), and the Great Lakes. This volume includes the Atlantic Coast and Puerto Rico. The information should be useful both in planning for additional data needs and in planning for the best use of coastal resources. (Woodard-USGS)
W78-04856

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. GULF COAST, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey Reston, VA. Water Resources Div.
Office of Water Data Coordination report, 1977. 208 p, 5 fig, 5 tab.

Descriptors: *Hydrologic data, *Information retrieval, *Coasts, *United States, *Gulf Coastal Plains, Indexing, Streamflow, Groundwater, Surface waters, Water quality, Federal government, State governments, *Gulf coast, Local agencies, Other agencies.

The Catalog of Information on Water Data is a computerized information file about water-data-acquisition activities in the United States and its territories and possessions. The information contains input from Federal, State, and local agencies, and private organizations. The Catalog is a file about water-data-acquisition activities and not a file of the actual water data. This special report provides information about water data stations located in the coastal areas. Four separate volumes present the information respectively for the Atlantic Coast (including Puerto Rico), the Gulf Coast, the Pacific Coast (including Alaska, Hawaii, and other Pacific Islands), and the Great Lakes. This volume includes the Gulf Coast. The information should be useful both in planning for additional data needs and in planning for the best use of coastal resources. (Woodard-USGS)
W78-04857

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. PACIFIC COAST, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey, Reston, VA. Water Resources Div.
Office of Water Data Coordination report, 1977. 295 p, 5 fig, 5 tab.

Descriptors: *Hydrologic data, *Information retrieval, *Coasts, *United States, *Pacific Coast region, Indexing, Streamflow, Groundwater, Surface waters, Water quality, Federal government, State governments, Local agencies, Other agencies.

The Catalog of Information on Water Data is a computerized information file about water-data-acquisition activities in the United States and its territories and possessions. The information contains input from Federal, State, and local agencies, and private organizations. The Catalog is a file about water-data-acquisition activities and not a file of the actual water data. This special report provides information about water data stations located in the coastal areas. Four separate volumes present the information respectively for the Atlantic Coast (including Puerto Rico, the Gulf Coast, the Pacific Coast (including Alaska, Hawaii, and other Pacific Islands), and the Great Lakes. This volume includes Pacific Coast, Alaska, Hawaii, and other Pacific Islands. The information should be useful both in planning for additional data needs and in planning for the best use of coastal resources. (Woodard-USGS)
W78-04858

HYDROLOGY OF LAKE PANASOFFKEE, SUMTER COUNTY, FLORIDA,
Geological Survey, Orlando, FL. Water Resources Div.
G. F. Taylor.
Water-Resources Investigations 77-88 (open-file report), 1977. 1 sheet, 7 fig, 6 ref.

Descriptors: *Florida, *Lake basins, *Hydrologic properties, *Water quality, Inflow, Discharge(Water), Artesian heads, Streamflow, Rainfall-runoff relationships, *Lake Panasoffkee(Fla), *Sumter County(Fla).

Lake Panasoffkee, in midwest Sumter County of central Florida, receives water from three creeks and discharges water through Outlet River at an average daily rate of 207 cubic feet per second. The eastern shore of the lake is marsh and wooded swamp with inflow to the lake coming from the northeast and southeast. About 15 percent of the basin contributes surface water to the lake and about 50 percent of the 420-square-mile topographic drainage basin contributes ground water to the lake. The water from the remainder of the basin either evaporates from low areas or directly recharges the Floridan aquifer for discharge outside the basin. The maximum stage on record is 44.28 feet above mean sea level and the minimum stage on record is 37.65 feet above. The lake level is partly affected by the Wysong Dam and has stabilized in recent years at about 40.95 feet above mean sea level. The quality of the water is generally good. The lake supports a favorably balanced fish population even though minor fish kills were reported in 1973 and 1974. These kills were probably the result of algal blooms. (Woodard-USGS)
W78-04859

A GUIDE FOR APPLICATION OF THE COMPUTER PROGRAM FOR THE MODIFIED EINSTEIN METHOD OF COMPUTING TOTAL SEDIMENT DISCHARGE (MODEIN),
Geological Survey, Menlo Park, CA. Water Resources Div.
D. E. Burkham, C. G. Kroll, and G. Porterfield.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 429, Price codes: A07 in paper copy, A01 in microfiche.
Geological Survey Computer Contribution, Report USGS/WRD/WRI-77/004, January 1977. 138 p, 2 fig, 1 tab.

Descriptors: *Sediment transport, *Computer programs, *Sediment discharge, *Open channels, Computers, Methodology, *Modified Einstein method, *Fortran IV(G-Level).

The computer program for MODEIN (the modified Einstein method of computing total sediment discharge) is patterned after a program developed by the U.S. Bureau of Reclamation (written commun., 1969). The program is written in Fortran IV. Execution time on the IBM 370/155 computer is about 2.0 seconds for each total sediment discharge computation. Data required for the program are the same as those required for normal hand computations. (Woodard-USGS)
W78-04860

WETLAND CLASSIFICATION AND MAPPING IN WESTERN TENNESSEE,
Geological Survey, Reston, VA. Water Resources Div., and Tennessee Valley Authority, Chattanooga.
For primary bibliographic entry see Field 4A.
W78-04863

HYDROLOGY - 1976,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2A.
W78-04864

RECOMMENDED METHODS FOR WATER DATA ACQUISITION,
Geological Survey, Reston, VA. Water Resources Div.
A. I. Johnson.
Reprint from: EOS Transactions, American Geophysical Union, Vol 57, No 10, October 1976. 2 p.

Descriptors: *Water resources, *Data collections, *Methodology, Surface waters, Groundwater, Water quality, Fluvial sediments, Federal Government, Inter-agency cooperation, *Water data acquisition.

A Federal Interagency Work Group was impaneled by the U.S. Geological Survey's Office of Water Data Acquisition to develop recommended methods for water data acquisition. Six task groups were established by the work group, each of which was assigned a specific area of concern. More than 70 scientists, representing 17 federal agencies, participated in the task groups. Their efforts resulted in the production in December 1972 of a preliminary report, 'Recommended Methods for Water Data Acquisition.' This report discussed data acquisition methodology related to surface water, groundwater, chemical and biological water quality, fluvial sediment, and automatic water quality monitors. The report does not have legal status, but it does represent a consensus among the individuals and agencies involved regarding the most appropriate methods for water data acquisition within their fields of competence. The purpose of this paper is to communicate to the technical community the status of this important activity related to water data acquisition methodology. (Woodard-USGS)
W78-04867

GROUND-WATER RESOURCES OF CHESTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04869

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 3. SOUTHWEST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 898, Price codes: A99 in paper copy, A01 in microfiche.
Water-Data Report FL-76-3, (two reports), July 1977. 1070 p, 16 fig, 1 tab, 48 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Southwest Florida.

Water resources data for the 1975 water year in southwest Florida are contained in two publications (pages 1 to 460 and pages 461 to 1070). The data consist of discharge records for 70 streams, stage-only records for 31 streams, elevations for 107 lakes, and daily water level measurements for 352 wells. Water quality data for approximately 220 surface sites and 700 wells are included; as are miscellaneous measurement and crest-stage partial records. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W78-04871

HYDROLOGIC EVALUATION OF THE ARIKAREE FORMATION NEAR LUSK, NIOBRARA AND GOSHEN COUNTIES, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-04873

A COMPARISON BETWEEN VARIOUS CRITERIA FOR THE INTERPRETATION OF

BIOLOGICAL DATA IN THE ANALYSIS OF THE QUALITY OF RUNNING WATERS,
Parma Univ. (Italy). Lab. di Ecologia.
For primary bibliographic entry see Field 5A.
W78-04901

DATA COLLECTION PLATFORMS FOR ENVIRONMENTAL MONITORING,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 5A.
W78-04960

DEVELOPMENT AND OPERATION OF HF OCEAN CURRENT MAPPING RADAR UNITS,
National Oceanic and Atmospheric Administration, Seattle, WA. Wave Propagation Lab.
For primary bibliographic entry see Field 2L.
W78-04974

HYDROLOGIC DATA RELAY BY SATELLITE FROM REMOTE AREAS,
Canada Dept. of Fisheries and Environment, Ottawa (Ontario).
For primary bibliographic entry see Field 7B.
W78-05005

FINAL REPORT OF INVESTIGATION OF PEARL RIVER DATA COLLECTION SYSTEM APPLICATIONS.
Mississippi Air and Water Pollution Control Commission, Jackson.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-15472, Price codes: A03 in paper copy, A01 in microfiche. Report No. NASA-CR-150138, November 1976, 35 p, 4 fig, 3 tab, 2 append. NAS 8-31351.

Descriptors: *Data collection, *Remote sensing, *Buoys, *Floats, *Mississippi, Satellites, Data transmission, Computers, Data storage and retrieval, Hydrology, Water analysis, Water quality, Water pollution(Stream), Dissolved oxygen, Temperature, Conductivity, Hydrogen ion concentration, *Pearl River(Miss), Data collection platform, ERTS, Hydrolab.

The reliability of employing NASA developed remote sensing data collection platforms (DCP's) was demonstrated and evaluated for the monitoring of water quality of the Pearl River in Mississippi. Three DCP's were employed in the Jackson area from April 1975 to October 1976, and a fourth in the Monticello area from June 1976 to October 1976 with analytical equipment measuring pH, dissolved oxygen, temperature, and conductivity. Water quality data were received, processed and retransmitted from an ERTS satellite to the Mississippi Air and Water Pollution Control Commission via computer linkup. Routine maintenance problems resulting from limited access to buoys, rapid changes in river stage, vandalism, and worn and broken part replacement delays hampered continuous acquisition of reliable data. The three DCP's in the Jackson area provided efficient and accurate data during the fall of 1975 and early spring of 1976. It was concluded by fall of 1976 that the quantity and quality of the data did not justify the capital expenses or daily operation and maintenance costs for continued efficient operation. DCP's provide a valuable monitoring system only if there exists a reasonably stale hydraulic system skilled and available manpower, and easy access to the DCP's. Data and equipment diagrams are presented in the appendices. (Seip-IPA)
W78-05008

DETECTION AND MAPPING (DAM) PACKAGE,
Lockheed Electronics Co., Inc., Houston, TX. Aerospace Systems Div.
E. H. Schlosser, and M. L. Brown.
Available from the National Technical Information Service, Springfield, VA 22161 Vol 1: as E77-10102 General Procedure, Jun 76. 25 p, 6 fig. Vol 2a: as E77-10101 Software User Manual (Part 1), Jun 76, 76 p. Vol 2b: as E77-10102 Software User Manual (Part 2), Jun 76, 141 p, 7 append. Vol 3: Maas E77-10103 Control Network Establishment, Jun 76, 46 p, 18 fig, 2 ref, append. NAS 9-1200.

Descriptors: *Computer programs, *Remote sensing, *Satellites, *Areal, *Data collections, *Mapping, Hydrography, Topographic mapping, Land resources, Water resources, Natural resources, *Computer mapping, *LANDSAT, Software.

The DAM package is an integrated set of manual procedures, computer programs, and graphic devices designed for efficient production of precisely registered and formatted maps from digital LANDSAT multispectral scanner (MSS) data. The software can be readily implemented on any Univac 1100 series computer with standard peripheral equipment. This version of the software includes pre-defined spectral limits for use in classifying and mapping surface water. (Seip-IPA)
W78-05009

WATER-QUALITY AND RAINFALL DATA COLLECTED WITH AUTOMATED FIELD STATION, FORT MCCLELLAN, ALABAMA,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 5A.
W78-05010

SNOW MAPPING, AND LAND USE STUDIES IN SWITZERLAND,
Zurich Univ. (Switzerland). Dept of Geography.
For primary bibliographic entry see Field 2C.
W78-05012

COMPUTER-ASSISTED FURNACE ATOMIC ABSORPTION SPECTROMETRIC ANALYSIS,
Environmental Research Lab.-Duluth, MN.
For primary bibliographic entry see Field 5A.
W78-05014

SEA-SURFACE TEMPERATURE AND SALINITY MAPPING FROM REMOTE MICROWAVE RADIOMETRIC MEASUREMENTS OF BRIGHTNESS TEMPERATURE,
National Aeronautics and Space Administration, Langley Station, VA. Langley Research Center.
For primary bibliographic entry see Field 2L.
W78-05017

COMPUTER PROGRAMMING FOR MAXIMUM MODELING INFORMATION TRANSFER,
Booker Associates, Inc., Lexington, KY.
For primary bibliographic entry see Field 2E.
W78-05025

LAKE ERIE BEGINNING-OF-MONTH WATER LEVELS AND MONTHLY RATES OF CHANGE OF STORAGE,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Labs.
For primary bibliographic entry see Field 4A.
W78-05048

DETERMINATION OF PRIMARY PRODUCTIVITY AND COMMUNITY METABOLISM IN STREAMS AND LAKES USING DIEL OXYGEN MEASUREMENTS,
Geological Survey, Bay Saint Louis, MS. Water Resources, Div.; and National Aeronautics and Space Administration, Bay Saint Louis, MS. National Space Technology Labs.
For primary bibliographic entry see Field 5C.
W78-05119

8. ENGINEERING WORKS

8A. Structures

OPPORTUNITIES FOR LARGE SAVINGS BY ALTERING SOME INLAND WATERWAY OPERATIONS.
Comptroller General of the United States, Washington, DC.
For primary bibliographic entry see Field 6B.
W78-04799

CAP UPDATE,
Bureau of Reclamation, Phoenix, AZ. Arizona Projects Office.
For primary bibliographic entry see Field 4A.
W78-04940

THE CAP IN CONTROVERSY,
Central Arizona Project Association, Phoenix.
For primary bibliographic entry see Field 6E.
W78-04941

HICKORY CREEK DRY RESERVOIR: A COMPROMISE DESIGN FOR BOTH FLOOD CONTROL AND NATURAL AREA PROTECTION,
Illinois State Dept. of Transportation, Springfield. Div. of Water Resources.
For primary bibliographic entry see Field 4A.
W78-05026

8B. Hydraulics

PORTABLE, ADJUSTABLE FLOW-MEASURING FLUME FOR SMALL CANALS,
Agricultural Research Service, Phoenix, AZ. Water Conservation Lab.
J. A. Replogle.
Transaction of the American Society of Agricultural Engineers, Vol. 20, No. 5, p 928-933, September-October 1977. 5 fig, 5 ref, 2 append.

Descriptors: *Flumes, *Flow measurement, *Canals, Channels, Instrumentation, Hydraulics, On-site investigations, Measurement, Flow, Design, Caliper-flume.

A portable, field-site, survey flume was constructed and used to verify placement and design of permanent metering flumes. The portable system consisted of a trapezoidal throat that can be raised and lowered in a flowing field ditch to establish limits of free-flow operation and backwater effects on upstream structures. Mechanical solutions to problems of maintaining gage-zero on a movable-throated flume, stilling-well readout, and movable seals between ditch and flume, were presented. A family of concrete throat sections differing only in height of installation from the canal floor, were recommended for the permanent installations. Flows between about 0.5 cfs (0.01 cu m) and 25 cfs (0.7 cu m) can be measured with the portable system. Satisfactory operation can be achieved with less than 4-in (10-cm) head loss to the canal system. Permanent structures can be installed with high assurance that they will operate as intended, will be convenient enough to be used routinely, and will be rugged enough to remain reliable and accurate, well within the + or - 5% tolerance usually ascribed to field installations. (Lee-ISWS)
W78-04844

ANNUAL GRASSES FOR TEMPORARY PROTECTION OF EARTH SPILLWAYS,
Agricultural Research Service, Stillwater, OK.
For primary bibliographic entry see Field 4D.
W78-04845

TURBULENT DIFFUSION IN CHANNELS WITH A SURFACE COVER,
University of Science and Technology, Kumasi (Ghana), Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-04848

FLOW CHARACTERISTICS IN LOCAL SCOUR AT BRIDGE PIERS,
Auckland Univ. (New Zealand). School of Civil Engineering.
B. W. Melville, and A. J. Raudkivi.
Journal of Hydraulic Research, Vol. 15, No. 4, p 373-380, 1977. 5 fig, 4 ref.

Descriptors: *Scour, *Piers, *Laboratory tests, Flow, Distribution patterns, Erosion, Laboratory equipment, Testing procedures, Stream erosion, Turbulence, Shear stress, Velocity, Boundaries(Surfaces), Open channel flow, Channels, Data collections, Beds, Stream erosion, Bridge piers.

Results are summarized of an investigation of flow patterns, turbulence intensity distributions, and boundary shear stress distribution in the scour zone of a circular pier under clear water scour conditions. At the bottom of the scour hole, a rim, concentric with the cylinder, was observed for most of the time upstream of the cylinder. This rim was formed by the deflection upwards of the downflow in front of the cylinder where this upflow meets with the horseshoe vortex. The erosion occurs below the rim, which collapses irregularly in sand avalanches, forcing the material up the slope and into the flow. The eroded material is carried by the flow into the wake region. In the equilibrium scour the shear stresses are generally lower than in the intermediate scour hole or on the level bed, yet visually the surface appears to be at threshold condition. This indicates that the equilibrium conditions is maintained by the combined effect of the temporal mean shear stress, the weight component, and the turbulent agitation which everywhere add up to the local threshold condition for sediment transport. A comparison of the shear stress and turbulence intensity plots showed a tendency for the bed shear to be larger where the turbulence intensity is lower, and vice-versa. In the wake behind the cylinder, the turbulence spectrum was found to be broader than that of mean flow. It contained more energy at frequencies less than 10 Hz. The measurements of the vortex shedding frequency showed a variation in vertical plane. The shedding was in spanwise cells of constant frequency with discrete changes between cells. Over the depth investigated, the variation was of the order of 4%. (Humphreys-ISWS)
W78-04849

DEVELOPMENT OF MODELS FOR PREDICTION OF SHORT-TERM FATE OF DREDGED MATERIAL DISCHARGED IN THE ESTUARINE ENVIRONMENT,
Tetra Tech, Inc., Pasadena, CA.
For primary bibliographic entry see Field 5B.
W78-04854

PROGRESS REPORT TO THE ARKANSAS STATE HIGHWAY AND TRANSPORTATION COMMISSION FOR YEAR ENDING SEPTEMBER 30, 1977,
Geological Survey, Little Rock, AR. Water Resources Div.
M. S. Hines.
Open-file report 77-846, 1977. 21 p, 1 plate, 1 tab.

Descriptors: *Flood frequency, *Peak discharge, *Bridge design, *Road design, *Arkansas, Streamflow, Gaging stations, Rainfall-runoff relationships.

The Arkansas State Highway and Transportation Commission and the U.S. Geological Survey have a mutual interest in flood-frequency and open-channel hydraulics for the economic design of bridges and culverts. This report is a summary of the accomplishments of the cooperative program. Included are plans for future work and a brief description of related water-resources programs of the Geological Survey in Arkansas. Peak stages and discharges were determined for 106 sites. Drainage areas for Ouachita River and Red River basins were determined. Hydraulic analyses were made for five bridge sites. (Woodard-USGS)
W78-04868

THE ANALYSIS OF SMALL WATER DISTRIBUTION SYSTEMS,
Guam Univ., Agana. Water Resources Research Center.
S. J. Winter, and C. K. Liu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 636, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No 4, January 1978. 24 p, 4 fig, 2 tab, 2 append. OWRT A-006-GUAM(1). 14-34-0001-7024.

Descriptors: *Water distribution(Applied), Leakage, Rural areas, *Distribution systems, Methodology, Pipe flow, Networks, *Guam.

A method is derived for determining the flow lost per foot of pipe in situations involving pipes having leaks or illegal connections. The flow into the pipe and the pressure drop over the length of the pipe must be known. An example problem is solved. A modification of the Hardy-Cross technique of pipe network analysis is presented which accounts for flow out of the network per foot of pipe. This modification can be used to account for unintentional loss as well as outflow to consumers in situations where an accurate description of the flow is required. This situation is most likely to arise in small distribution systems where the outflow to each consumer may be a significant part of the total flow in a pipe. Two example problems are solved, the second involving an expansion of the network considered in the first.
W78-04943

NEAR-BOTTOM WATER MOTION UNDER OCEAN WAVES,
Hawaii Univ., Honolulu. Dept. of Civil Engineering.
R. A. Grace.
Sea Grant Reprint No. UNIHI-SEAGRANT-CP-77-03, Reprinted from: Proceedings 15th Coastal Engineering Conference held Honolulu, Hawaii, July 11-17, 1976. (ASCE), Chap 139, p 2371-2386. 6 fig, 3 tab, 15 ref.

Descriptors: *Waves(Water *Foundations *Piles(Foundations), *Pipes, Offshore platforms, Baseline studies, Resources development, Underwater structures.

A two-year ocean experiment involving wave-induced forces on a test pipe mounted on the sea floor involved the measurement of various quantities other than the pipe forces per se. A pair of these involved surface wave characteristics and wave-induced water motion at the level of the pipe centerline but off to one end of the pipe. These wave-kinematics data have been combined, and the results of this work make up this paper in which the emphasis is on the deterministic approach to data interpretation. Presented are comparisons of the velocity and acceleration data with the predictions of Airy and stream function theories plus discussion of the dispersion of the field data. The primary intent of the paper is to suggest to designers of bottom-laid structures, such as pipes, how values of the peak velocity and maximum acceleration of the water motion associated with a non-breaking design wave of specified characteristics can be chosen. (NOAA)
W78-04967

A SIMPLE HYDRAULIC SIMULATOR,
Mekoroth Water Co. Ltd., Tel Aviv (Israel). Engineering Div.
E. Damelin, and U. Shamir.
Water Resources Bulletin, Vol. 14, No. 1, p 12-23, February 1978. 8 fig, 1 ref.

Descriptors: *Canals, *Mathematical models, *Hydraulic systems, Waves(Water), Dispersion, Hydrology, Channel flow, Model studies, Reservoirs, Pumping, Equations, *Surrogate model, Flow simulator, Outflow generator.

A simple simulator was constructed, calibrated, programmed, and used in management studies of a hydraulic system containing two pumping stations in series, connected by canals and reservoirs. The features of the model, its calibration, and its use were described, and comparisons between measured and computed hydraulic behavior were presented. (Lee-ISWS)
W78-05020

SHALLOW WAVE PROPAGATION IN OPEN CHANNEL FLOW,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
V. M. Ponce, and D. B. Simons.
Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol. 103, No. HY12, Proceedings Paper 13392, p 1461-1476, December 1977. 4 fig, 2 tab, 10 ref, 2 append.

Descriptors: *Open channel flow, *Canals, *Waves(Water), Celerity, Attenuation, Dynamics, Hydraulics, Shallow water, Equations, Dynamic characteristics, Kinematics, Propagation, Shallow water waves.

The propagation characteristics of various types of shallow water waves in open channel flow were calculated on the basis of linear stability theory. The celerity and attenuation functions of kinematic, diffusion, convective dynamic, dynamic, and gravity waves were derived. For the most general case, i.e., the dynamic wave model, the propagation characteristics are expressed as a function of the steady uniform flow Froude number and the dimensionless wave number of the unsteady component of the motion. For the dynamic model, the wave number spectrum is divided into three bands: (1) a gravity band corresponding to large wave number, where the wave celerity is the gravity wave celerity; (2) a kinematic band corresponding to a small wave number where the wave celerity is the kinematic wave celerity; and (3) a dynamic band corresponding to mid-spectrum values of the wave number, where the wave celerity falls between the gravity and kinematic celerity values. (Lee-ISWS)
W78-05045

IMPINGEMENT OF AXISYMMETRIC DEVELOPING JETS,
Research Council of Alberta, Edmonton. Transportation and Surface Water Engineering Div.
S. Beltaos, and N. Rajaratnam.
Journal of Hydraulic Research, Vol. 15, No. 4, p 311-326, 1977. 8 fig, 2 tab, 19 ref.

Descriptors: *Jets, *Laboratory tests, *Boundaries(Surfaces), *Flow, Transition flow, Hydraulics, Shear stress, Turbulent flow, Dimensional analysis, Equations, Analysis, Analytical techniques, Measurements, Model studies, Testing procedures, Foreign research, *Wall jets.

The impingement of turbulent jets on solid boundaries has been studied extensively in the past. It has been established that flow parameters in the impingement region are governed by the impingement height, H, and the initial kinematic momentum flux of the jet. This results from the fact that the jet can be considered as a point source of momentum whenever it is fully developed before entering the impingement region. This finding is

suspect in cases of 'small' values of H. An experimental and analytical study of developing jets, impinging on a smooth wall, was presented. Measurements of the velocity field, static pressure in excess of ambient, and wall shear stress were reported. Analysis of the results showed that impingement region flow parameters are governed by the diameter, d, and the initial jet velocity but are independent of H. The impingement region was found to extend 1.2d above the wall and 1.4d radially from the stagnation point. Semi-empirical methods for predicting the velocity field, static pressure, and wall shear stress were developed. The radial growth of the jet from the stagnation point, including the wall jet region, was analyzed. Using the quantitative relation governing the stagnation pressure as a criterion, it was proposed that values of H less than approximately 5.5d be considered as 'small', greater than about 8.3d as 'large', and the range of H from 5.5d to 8.3d being transitional. (Humphreys-ISWS)
W78-05047

DECREASE IN HARBOR MAINTENANCE DREDGING THROUGH THE USE OF PILE DIKES AND RELATED STRUCTURES TOGETHER WITH AN ANALYSIS OF ESTUARINE SEDIMENTATION PROBLEMS,
Naval Academy Annapolis, MD. Dept. of Oceanography.
J. F. Hoffman.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 905, Price codes: A03 in paper copy, A01 in microfiche. Report USNA-EPRD-29, June 1976. 25 p, 5 tab, 84 ref.

Descriptors: *Dredging, *Harbors, *Estuaries, Bathymetry, Oceanography, Hydrology, Piles(Foundations), Channels, Estuarine environment, Tidal waters, Sediments, *Harbor maintenance dredging, River-channel harbors, Tidal estuaries, Estuarine sediments, Spoil disposal problems.

Most harbors in the continental United States of interest to the Navy are located within estuaries. Because of the presence of freshwater as well as salt water, special sedimentation problems are created. Most estuaries are the repository for fine-grained sediments ranging from clay to fine sand in size. In the natural course of events, these sediments eventually would fill the estuary. A certain amount of sediment buildup within the estuary can be tolerated. One long-term solution is to remove the sediments by dredging and depositing them elsewhere. A system to accomplish sediment removal by means other than dredging was discussed. Part of the system was to entrap estuarine sediment by means of pile dikes to prevent the sediment from entering dredged shipping channels. The pile dikes consisted of 2 to 7 rows of clusters of concrete piles extended perpendicularly to the river bank. The rows were spaced approximately 5 ft apart, the clusters 15 to 20 ft apart. Piles were driven about 20 ft to 30 ft below the bottom of the estuary. A second part of the system was to remove periodically the accumulated sedimentary material by a back-flushing and slurry pumping system. (Roberts-ISWS)
W78-05050

NUMERICAL SOLUTION OF SAND TRANSPORT IN HYDRAULIC FRACTURING,
Halliburton Service, Duncan, OK.
A. A. Daneshy.
Journal of Petroleum Technology, Vol 30, No 1, p 132-140, January, 1978. 11 fig, 10 ref, 4 append.

Descriptors: *Hydraulic fracturing, *Propping agents, Sand transport, Numerical analysis, Drilling, Wells, Fractures(Geology), Sands, Viscosity, Settling velocity, Profiles, Equilibrium, Slurries.

Most hydraulic fracturing treatments are performed with a slurry composed of a fracturing fluid and a propping agent (sand) with a particle size ranging from 4 to 60 mesh. Determination of a proppant schedule involves consideration of fracture geometry, settling velocity of sand, and volume of the fluid pad preceding the propping agent into the fracture. In this paper, a numerical method is developed for the solution of sand transport in fractures, including such factors as fluid leakoff. The method can be used to compute sand transport with varying sand computation of pad volume for fracturing with high-viscosity fluids. Examples of sand bed profiles for different fluid viscosities are presented, as well as equations for settling velocity, hindered settling velocity, and equilibrium bed height. The paper recommends use of sand-transport profiles when considering particle transport in hydraulic fracturing. (Eberle-NWWA)
W78-05184

HOW MUCH IS ENOUGH. A MINIMUM WELL FORMULA,
National Water Well Association, Worthington, OH.
J. A. Hunt.
Water Well Journal, Vol. 32, No. 2, p 53-55, February, 1978.

Descriptors: *Well regulations, *Water demand, *Water yield, Well permits, Water supply, Water wells, Drawdown, Pumping, Storage tanks.

In some low-yield areas of the United States, demands by FHA and other lending institutions that a domestic well yield 5 or more gallons per minute may be unreasonable. Since FHA has set no guidelines for pumping tests, the Connecticut Well Drillers Association developed an accurate standard for acceptable and safe minimum well requirements. The formula which considers such factors as well storage, well flow, peak load, and peak load time has been in use now for over ten years. The formula requires a well to supply the maximum amount of water needed within the shortest period it is used. This demand is satisfied when well flow multiplied by peak load time is added to well storage to obtain the peak load. Well storage is thus the key concept of the formula. When well storage exceeds peak load, well flow must only be sufficient to replace well storage between peak periods. Well storage is determined by well diameter, depth of pump placement, and height of water in the well. The peak load can be determined by multiplying the number of bedrooms by 100 gallons. Peak load time is determined by dividing peak load by 3 gallons per minute multiplied by the number of bathrooms. Practical examples for calculating the water yield necessary for specific situations are given. (Palmer-NWWA)
W78-05190

CASING STORAGE CAN AFFECT PUMPING TEST DATA,
Universal Oil Products, St. Paul, MN. Johnson Div.
D. C. Schafer.
Johnson Drillers Journal, Vol. 50, No. 1, p 1-5+, January-February, 1978. 10 fig, 1 tab, 6 ref.

Descriptors: *Pumping tests, *Well casings, *Transmissivity, Theis equation, Equations, Drawdown, Aquifers, Storage.

The modified non-equilibrium formula of Jacob derived from the Theis equation is often used by hydrologists to compute aquifer characteristics from pumping tests. A basic assumption made in deriving these equations is that all water pumped during a test comes from the aquifer and none from storage in the well. This condition is not fulfilled in practice. The Papadopulos-Cooper equation developed in 1967 does take casing storage into account, thus permitting more realistic interpretation of data from early phases of pumping tests. There is a certain point in time during such tests when casing storage effects become negligible and the 'correct' slope of the time-drawdown slope appears. This value can be computed using a formula developed by Papadopulous and Cooper and further refined by Ramey. (Eberle-NWWA)
W78-05193

REGIONAL GEOLOGY SERIES: PART 2, HIGH PLAINS GROUND WATER REGION,
National Water Well Association, Worthington, OH
For primary bibliographic entry see Field 2F.
W78-05199

8C. Hydraulic Machinery

A SIMPLE HYDRAULIC SIMULATOR,
Mekoroth Water Co. Ltd., Tel Aviv (Israel). Engineering Div.
For primary bibliographic entry see Field 8B.
W78-05020

CONTINUOUS CHAIN DRILL BIT ADVANCES THROUGH LAB TESTS,
Sandia Labs., Alburquerque, NM.
M. M. Newsom.
Oil and Gas Journal, Vol 76, No 5, p 151-160, January 30, 1978. 8 fig.

Descriptors: *Drill bits, *Drilling equipment, *Rotary drilling, Economics, Costs, Laboratory tests.

Laboratory tests indicate a down-hole changeable bit design is a structural and economic success. This continuous-chain bit contains 16 cutting surfaces that can be changed without making a trip. To cycle new cutters into place, the bit is pulled off bottom and the mud pumps are turned off. The drop of hydraulic pressure at the bit allows a spring, piston, and pawl mechanism to activate. When mud pumps are restarted, five new chain links advance to cutting position. The cutting surfaces themselves utilize a combination of natural diamonds and GE Stratapax synthetic diamonds. Comparisons with conventional diamond bits in laboratory testing show the continuous-chain design to have the superior rate of penetration. Some difficulty with the cycling mechanism did occur, but this problem will be corrected before field tests begin. Based on the results of experimentation to date, the economics of this system are sound, and substantial per-foot drilling cost savings are anticipated with its commercial use. (Eberle-NWWA)
W78-05181

CALCULATING AIR VOLUME NEEDED FOR AIR LIFT PUMPING,
Corner S. A., Sao Paulo (Brazil).
H. Basano, Jr.
Johnson Drillers Journal, Vol 49, No 6, p 9-10, November-December, 1977, 2 fig.

Descriptors: *Pumping, *Air compressors, *Air-lift pumping, Water wells, Equations, Brazil.

Although most production wells in Brazil are pumped with line-shaft turbines or submersible pumps, many wells are still being operated by the air-lift system. Some factors accounting for the use of air-lift are: (1) presence of sand or other solids in the well water which could damage a turbine; (2) need for aeration of the water, and; (3) availability of compressed air service in factories where air can be used for pumping when not needed for other uses. Many drilling contractors also develop wells and run pumping tests by using engine-driven air compressors in certain situations. To make it easier to select an air compressor of appropriate capacity for pumping situations,

this article presents a modification of the Rix and Abrams equation which relates air flow required for pumping to total lift and submergence of the air pipe. By rearranging the terms in the equation, it can be shown that the relationship between air flow required to lift one gallon per minute or one cubic meter per hour from a given depths is a straight line for any given percentage of submergence of the air pipe. (Eberle-NWWA)
W78-05182

REPLACING A SUBMERSIBLE PUMP,
W. C. Kunst.
Water Well Journal, Vol 32, No 3, p 65-67, March, 1978.

Descriptors: *Submersible pumps, *Pumps, Water wells, Failures, Equipment, Installation, Inspection, Aquifers, Well casings.

Submersible pump replacements occur for three basic reasons: (1) the former unit has failed; (2) more water is desired; or (3) the owner wishes to replace a jet or cylinder system with a submersible. The proportion of submersible pump failures resulting from manufacturing faults is small. Thorough examination of a water system before the pump is replaced usually will indicate external causes of pump failure such as lightning, sand pumping, or incrustation. Inspection of bearing and impellers from the old pump offers further clues to abrasion or cavitation problems. Pump replacement in gravel aquifers, especially in cases where higher water capacities are desired, must be undertaken with caution in order to avoid inducing sand pumping in a formerly stable well. Visual inspection of a well to static water level, plumbing in a formerly stable well. Visual inspection of a well to a static water level, plumbing its depth and straightness, determining casing depth, and test pumping are all recommended procedures for insuring that a submersible replacement installation provides safe and adequate water delivery to the well owner. (Eberle-NWWA)
W78-05185

INSTALLING A REBUILT SUBMERSIBLE MOTOR,
Magney Electric Motors, Inc. Chandler, AZ.
H. C. Magney.
Water Well Journal, Vol 32, No 3, p 60-61, March, 1978.

Descriptors: *Submersible pumps, *Pumps, Electric motors, Water wells, Electric cables, Voltage, Storage, Installation.

Even the best rebuilt submersible pump motor can be ruined by careless handling and/or improper installation. Proper care begins with receipt of the product; the motor should be checked for damage, and the voltage, speed and horsepower should be correct for the intended application. Storage procedure is crucial as well. Motors should always be stored in an upright position if kept for more than a few days, and should be left crated when possible. During installation, the motor-to-pump coupling should be a proper fit, and proper alignment between motor and pump parts must be correct. Finally, cable selection and handling should be considered one of the most important points of any submersible installation. This article as a whole presents detailed advice on equipment and procedure relating to all the aforementioned topics. (Eberle-NWWA)
W78-05187

PROVINCIAL DRILLING METHODS IN BANGLADESH: PART III,
National Water Well Association, Worthington, OH.
J. A. Hunt.
Water Well Journal, Vol. 32, No. 2, p 57-59, February, 1978.

Descriptors: *Water wells, *Bangladesh, Well casings, Well screens, Well filters, Shallow wells, Pumping, Jets, Surging, Circulation.

This report, which describes a Bangladesh drilling program sponsored by the Joint Christian Catholic Irrigation Project and directed by Chief Driller Bruce Eaton, examines various methods used to establish low-cost tubewells in Bangladesh. Many wells were developed either by bailing or by air-lift pumping the well intermittently. Because the water table is high, the backwashing effects were negligible, but the method is commonly used because of its simplicity and the availability of air compressors. Isolated wells were developed by overpumping with propeller pumps. Often, however, these pumps were damaged if the formation contained fine or abrasive sands, so this method is not recommended. Inadequately developed wells were redeveloped by high velocity jetting, which can be adapted for hand-pump use in tubewells. The method is very successful and is recommended for similar conditions because the equipment is simple and highly portable. Bamboo filters wrapped with rope and casing of bamboo wrapped with oil-coated burlap proved unsatisfactory. Screens were successfully fabricated from longitudinally slotted bamboo. These filters can be locally manufactured quickly and inexpensively using locally available materials and a circular saw with small blades. (Palmer-NWWA)
W78-05188

WHIRRING WINDMILLS PROMISE POWER,
R. Larsen.
Irrigation Age, Vol. 12, No. 5, p 46-47+, February, 1978.

Descriptors: *Windmills, *Electric power production, Wind velocity, Irrigation wells, Turbines, Turbine blades, Rotors, Pumps.

Wind turbines are being developed for rural power applications in the 10 to 200 kW power range. A wind turbine having a radius of 11.3 meters at the middle and standing 16.8 m high produces a power rating of 40 kW at 11.2 m/sec wind speeds at a test facility of the USDA Southwest Great Plains Research Center at Bushland, Texas. The turbine delivers power through an 18:1 speed increaser, a right-angle drive, and an over-running clutch to a vertical turbine pump. A wind-speed sensor controls the starter motor and brake, while an electric motor supplements wind power. The system can pump approximately 47 liters/second against a total dynamic head of 80 meters. DOE maintains a similar test facility at Rocky Flats, Col., in which a turbine mounted on a 40-foot tower and having a 3-blade, 12-foot rotor produces a power rating of 2000 Watts at a wind speed of 25 mph. A second facility, in the contract stage, will house a 2.5 megawatt electrical generating system. The system, which will have a 300-foot rotor, is designed for a site having a mean annual wind speed of 14 mph. It will eclipse General Electric's Boone, North Carolina facility, which currently generates 2 megawatts of power at 24 mph wind speeds. Energy officials feel that wind power may offer an economical alternative energy resource if system costs can be reduced and storage battery problems can be solved. (Palmer-NWWA)
W78-05189

POSSIBLE ENERGY SAVINGS IN IRRIGATION,
Nebraska Univ., Lincoln. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 4B.
W78-05191

KELLY VALVE CUTS WASTE OF TIME AND MUD,
Drilco, Morgan City, LA.
S. Wooley.
Oil and Gas Journal, Vol. 76, No. 8, p 115-116, February 20, 1978. 3 fig.

Descriptors: *Drilling equipment, *Drilling fluids, *Valves, Kellys, Mud, Costs, Safety, Wells.

An automatic drill Kelly valve has been developed which can be used to improve rotary drilling economics by increasing on-bottom time and saving costly drilling fluids. The valve is attached just below the kelly and automatically closes when mud pumps are shut off, thereby saving mud that would otherwise be spilled. At least 30 seconds of crew time is saved for each drill string joint made, since waiting for the kelly to drain becomes unnecessary. Other benefits of using the kelly valve include: (1) added safety around the rotary table due to cleanliness; (2) less pollution around the rig; (3) less chance of stuck pipe during connections, since pumps are off for shorter periods; (4) in dry areas, lower drill water and cleanup water requirements. (Eberle-NWWA)
W78-05192

SEPIOLITE MUDS USED FOR HOT WELLS, DEEP DRILLING,
Dresser Industries Inc., Houston, TX. Magcobar Div.
For primary bibliographic entry see Field 8G.
W78-05194

GROUND WATER 'FLOOD' POSSIBLE IN DOWNTOWN LOUISVILLE, KENTUCKY.
For primary bibliographic entry see Field 4A.
W78-05196

GROUND WATER HEAT PUMPS,
R. Gannon.
Water Well Journal, Vol 32, No 3, p 54-58, March, 1978. 2 fig, 1 tab. Reprinted from Popular Science, February, 1978.

Descriptors: *Groundwater heat pumps, *Heat pumps, Energy, Groundwater, Heating, Cooling, Temperature, Costs, Scaling, Corrosion.

Most homeowners know at least something about conventional heat pumps, the air-to-air or air-source models. Although air-source heat pumps have the potential for very high heating and cooling efficiency under favorable conditions, efficiency plummets when the sources air dips below freezing during the heating cycle or rises into the 90's during the cooling cycle. Unlike air or surface water, ground water has a stable temperature corresponding to the mean annual temperature of the overlying air, making groundwater air ideal heat source or heat sink. Although the idea of the ground water heat pump is not new, several factors have slowed its adoption by developers and homeowners: (1) the need for a well; (2) high initial costs; (3) fear and prejudice on the part of the public against using 'unseen' ground water resources; (4) manufacturers are not promoting this new idea, are concentrating instead on conventional well-established, high business volume systems; (5) potential problems with scaling and corrosion due to ground water quality problems--it is suggested that proper design can eliminate most of such difficulties, however. (Eberle-NWWA)
W78-05197

SUN SHINES ON A NEW IRRIGATION PROJECT.
For primary bibliographic entry see Field 3F.
W78-05198

8D. Soil Mechanics

MOBILE CONTROLS FOR WATER RESOURCES PROJECTS,
Windsor Univ. (Ontario). Dept. of Civil Engineering.
S. P. Chee.
Water Resources Bulletin, Vol. 14, No. 1, p 99-108, February 1978. 3 fig, 4 tab, 6 ref.

Descriptors: *Dams, *Earth dams, *Erosion, *Flood control, Model studies, Hydraulic models, Sediment transport, Structures, Control structures, Hydraulic structures, Floods, Design, Washouts, Embankments, *Erodible dams, Fuse plugs, Breaching.

An investigation of the erosion mechanics and washout time rates of erodible control embankments was made with hydraulic scale models in the laboratory. The water control dams have both homogeneous and clay cores. A wide range of configurations and layouts were tested, and equations were developed to make possible the computation of erosion rates. Model scale relationships were analyzed from the developed equations and compared with the results obtained analytically from sediment transport equations. (Sims-ISWS)
W78-05024

LIME TREATMENT OF DAMS CONSTRUCTED WITH DISPERSIVE CLAY SOILS,
Soil Conservation Service, Grenada, MS.
J. P. Perry.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 6, p 1093-1099, November-December 1977. 7 fig, 2 tab, 6 ref.

Descriptors: *Earth dams, *Repairing, *Erosion control, *Mississippi, Soil tests, Soil properties, Testing procedures, Lime, Soils, Clays, Erosion, Soil erosion, Slopes, Costs, On-site investigations, *Dispersive clays, *Bluff Hills Region(Miss).

Reported herein was a description of the existence and performance of dispersed clay soil in earth embankment dams and the construction requirements and experience in the use of lime in the treatment of such clay soil. The addition of lime to a dispersive soil converts the soil to a nondispersive state immediately. The modified hydrometer (turbidity) test is the most reliable field test for quality control of lime-soil construction for the Bluff Hills. The addition of lime changes Proctor's moisture-density relationship. Optimum moisture is increased by about 2 to 3 percentage points, and the plasticity index is reduced with curing. The laboratory pinhole test is the most reliable measure of erosiveness and future performance of the earth structure. The writer suggested that the air-water permeability ratio test (Agriculture Handbook No. 60) would correlate well with the pinhole test. Research is needed to determine the amount of effective clay, expressed as a fraction of the total soil matrix, to provide a non-erosive structure. Dispersive soils can be used to backfill around principal spillway pipes or other structures traversing a dam laterally. (Humphreys-ISWS)
W78-05035

8G. Materials

CONTINUOUS CHAIN DRILL BIT ADVANCES THROUGH LAB TESTS,
Sandia Labs., Alburquerque, NM.
For primary bibliographic entry see Field 8C.
W78-05181

CALCULATING AIR VOLUME NEEDED FOR AIR LIFT PUMPING,
Corner S. A., Sao Paulo (Brazil).
For primary bibliographic entry see Field 8C.
W78-05182

RESULTS OF INTERFERENCE TESTS FROM TWO GEOTHERMAL RESERVOIRS,
California Univ., Berkeley. Lawrence Berkeley Lab.
For primary bibliographic entry see Field 4B.
W78-05183

REPLACING A SUBMERSIBLE PUMP,
For primary bibliographic entry see Field 8C.
W78-05185

INSTALLING A REBUILT SUBMERSIBLE MOTOR,
Magney Electric Motors, Inc. Chandler, AZ.
For primary bibliographic entry see Field 8C.
W78-05187

PROVINCIAL DRILLING METHODS IN BANGLADESH: PART III,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 8C.
W78-05188

KELLY VALVE CUTS WASTE OF TIME AND MUD,
Drilco, Morgan City, LA.
For primary bibliographic entry see Field 8C.
W78-05192

CASING STORAGE CAN AFFECT PUMPING TEST DATA,
Universal Oil Products, St. Paul, MN. Johnson Div.
For primary bibliographic entry see Field 8B.
W78-05193

SEPIOLITE MUDS USED FOR HOT WELLS, DEEP DRILLING,
Dresser Industries Inc., Houston, TX. Magcobar Div.
J. K. Bannerman, and N. Davis.
Oil and Gas Journal, Vol. 76, No. 9, p 144-150, February 27, 1978. 3 fig, 12 tab.

Descriptors: *Drilling fluids, *Geothermal wells, *Sepiolite, Clay minerals, Rotary drilling, Mud, Viscosity, Bentonite.

An increasing number of drilling mud systems are using sepiolite clay for temperature stability, fluid loss control, viscosity control, and environmental compatability. Sepiolite is a fibrous, magnesium-rich clay mineral; while similar to attapulgite in structure, it is characterized by wider lath-shaped particles and fewer isomorphous substitutions within the lattice. These laths can associate in 'haystack' bundles to provide a thixotropic gel rather than the typical 'house of cards' association found in layered swelling clays. Sepiolite retains its reversible gel-forming ability even after high temperature static heat aging. Because of their unique properties, sepiolite muds offere distinct advantages over bentonite systems for geothermal well drilling where bottom-hole temperatures usually exceed 360 degrees F. Data from 10 wells in California's Imperial Valley show better control of circulation loss and reduction of mud costs by substituting sepiolite for bentonite as the primary viscosifier in the drilling fluid system. (Eberle-NWWA)
W78-05194

GROUND WATER HEAT PUMPS,
For primary bibliographic entry see Field 8C.
W78-05197

8I. Fisheries Engineering

MANAGEMENT EVALUATION OF STOCKED NORTHERN PIKE IN COLORADO'S SMALL PLAINS RESERVOIRS,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
For primary bibliographic entry see Field 6B.
W78-04803

SURVEY OF FISHES, MAMMALS AND HERPETOFAUNA OF THE COLORADO RIVER IN GRAND CANYON,
Mississippi State Univ., Mississippi State.
For primary bibliographic entry see Field 2E.
W78-05001

HUDSON RIVER ECOSYSTEM STUDIES - EFFECTS OF ENTRAINMENT BY THE INDIAN POINT POWER PLANT ON BIOTA IN THE HUDSON RIVER ESTUARY.
New York Univ. Medical Center, NY.
For primary bibliographic entry see Field 5C.
W78-05089

A STUDY OF THE EFFECTS OF STREAM CHANNELIZATION AND BANK STABILIZATION ON WARMWATER SPORT FISH IN IOWA. SUBPROJECT NO. 2. A STUDY OF THE IMPACT OF SELECTED BANK STABILIZATION STRUCTURES ON GAME FISH AND ASSOCIATED ORGANISMS,
Iowa Cooperative Fishery Research Unit, Ames.
For primary bibliographic entry see Field 06G.
W78-05097

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

WATER QUALITY EFFECTS OF POTENTIAL URBAN BEST MANAGEMENT PRACTICES: A LITERATURE REVIEW,
Wisconsin Dept. of Natural Resources, Madison. Bureau of Water Quality.
For primary bibliographic entry see Field 05G.
W78-04744

10D. Specialized Information Center Services

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. GREAT LAKES, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 07C.
W78-04855

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. ATLANTIC COAST, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 07C.
W78-04856

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. GULF COAST, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 07C.
W78-04857

CATALOG OF INFORMATION ON WATER DATA, INDEX TO STATIONS IN COASTAL AREAS. PACIFIC COAST, PART A-STREAMFLOW AND STAGE; PART B-QUALITY OF SURFACE WATER; PART C-QUALITY OF GROUND WATER.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 07C.
W78-04858

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SELECTED WATER RESOURCES ABSTRACTS

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VOLUME 11, NUMBER 12
JUNE 15, 1978

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Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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01 NATURE OF WATER
Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE
Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

UNITED STATES GEOLOGICAL SURVEY YEARBOOK, FISCAL YEAR 1977.
Geological Survey, Reston, VA.
For primary bibliographic entry see Field 9D.
W78-05419

2A. General

WATER AVAILABLE FOR RUNOFF FOR 4 TO 15 DAYS DURATION IN THE SNAKE RIVER BASIN IN IDAHO,
National Oceanic and Atmospheric Administration, Silver Spring, MD. Office of Hydrology.
For primary bibliographic entry see Field 4A.
W78-05365

TEHM: A TERRESTRIAL ECOSYSTEM HYDROLOGY MODEL,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 2G.
W78-05565

A BAYESIAN APPROACH TO MULTIVARIATE HYDROLOGIC SYNTHESIS,
Massachusetts Inst. of Tech., Cambridge Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 8B.
W78-05586

EXPERIMENTAL INVESTIGATION OF WATERSHED SURFACE RUNOFF A CONTRIBUTION TO THE INTERNATIONAL HYDROLOGICAL DECADE,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W78-05587

CATALOG OF UNITED STATES CONTRIBUTIONS TO THE INTERNATIONAL HYDROLOGICAL DECADE 1965-1974.
National Committee for the International Hydrological Decade, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 155, Price codes: A12 in paper copy, A01 in microfiche.
National Academy of Sciences, Washington, D.C., 1975. 271 p. NSFC-310, TO 153.

Descriptors: *International Hydrological Decade, *United States, *Publications, Mathematical models, Evaporation, Bibliographies, Stations, Sediment transport, Lakes, Reservoirs, Snow, Projects, Data collections, Rainfall, Streamflow, Glaciers, Hydrologic cycle, Hydrology, Reviews, Water balance, Groundwater, Demonstration watersheds, Education, Training, Information exchange, *Catalogs, Decade stations, Benchmark stations.

The International Hydrological Decade (1965-1974) was a cooperative international program coordinated by UNESCO and involving the efforts of more than 100 nations. Its purpose were to strengthen the scientific basis for water use and conservation, to stimulate education and training in hydrology, and to improve the ability of developing and developed countries alike to cope with their water problems. Each country participating in the Decade was responsible for its own program. The U.S. program included some new, distinctively IHD activities, and many projects selected from the ongoing activities of federal, state, and private agencies. Those projects selected from ongoing activities, together with the distinctly IHD activities, are called the U.S. contributions to the International Hydrological Decade, and their results were presented here in summary form. The information on each listed activity includes project title, agency principal investigator, objectives, significant results, and reports available publicly. This information was supplied by the individual agency conducting the activity. (Froehlich-ISWS)
W78-05590

2B. Precipitation

WATER AVAILABLE FOR RUNOFF FOR 4 TO 15 DAYS DURATION IN THE SNAKE RIVER BASIN IN IDAHO,
National Oceanic and Atmospheric Administration, Silver Spring, MD. Office of Hydrology.
For primary bibliographic entry see Field 4A.
W78-05365

OPTIMAL SAMPLING AND ANALYSIS USING TWO VARIABLES AND MODELED CROSS-COVARIANCE FUNCTIONS,
North Dakota Univ., Grand Forks, Dept. of Aviation.
P. J. Brady.
Journal of Applied Meteorology, Vol. 17, No. 1, p 12-21, January 1978. 10 fig, 3 tab, 7 ref. NSF GA-16034.

Descriptors: *Radar, *Precipitation(Atmospheric), *Rainfall, *Analytical techniques, Data processing, Mathematical models, Statistics, Correlation analysis, Aircraft, Rain gages, Measurement, Meteorology, *Radar-rainfall relationships.

An objective analysis technique of the Eddy-Gandin type was discussed. The technique permits the analysis and investigation of multivariate as well as univariate data sets. A multivariate data configuration consisting of raingage/radar precipitation measurements was analyzed. Analysis included determination of spatial-temporal correlation and cross-correlation structure functions from the observations, univariate and multivariate analysis of the surface precipitation field, and an exploration of the relative worth of different Z-R relationships in a multivariate environment. Investigative results indicated that the structure functions were quite dependent on the spatial-temporal form of the precipitation system, that the multivariate analyses were consistently better than the univariate analyses, and that the Z-R relationship normally did not produce noticeable differences when used in a multivariate environment. The incorporation of this analysis technique with a nonlinear programming algorithm for use as an experimental design tool also was discussed. The potential of this design methodology was presented using raingage/radar structure functions. Optimal spatial sensor configurations were determined for one sensor type, and trade-offs between different instrument types using that configuration were explored. (Sims-ISWS)
W78-05378

RAINFALL FIELDS IN ISRAEL AND JORDAN AND THE EFFECT OF CLOUDING SEEDING ON THEM,
Hebrew Univ., Jerusalem (Israel). Inst. of Earth Sciences.
For primary bibliographic entry see Field 3B.
W78-05379

THE PRACTICABILITY OF DRY ICE FOR ON-TOP SEEDING OF CONVECTIVE CLOUDS,
Bureau of Reclamation, Miles City, MT.
For primary bibliographic entry see Field 3B.
W78-05380

MICROPROBE ANALYSIS OF PROJECT DUSTORM HAILSTONE SAMPLES,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 2K.
W78-05381

AIR-TRUTH LIDAR POLARIZATION STUDIES OF OROGRAPHIC CLOUDS,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
K. Sassen.
Journal of Applied, Meteorology, Vol 17, No 1, p 73-91, January 1978. 22 fig, 5 tab, 6 ref. NSF ATM 75-02515, ATM76-17352.

Descriptors: *Remote sensing, *Cloud physics, *Instrumentation, Equipment, Measurement, Clouds, Snow, Ice, Rime, Crystals, Precipitation(Atmospheric), Aircraft, Meteorology, *Lidar, Hydrometeor, Orographic clouds.

The results of a field program of coordinated lidar and aircraft observations of orographically induced clouds were reported. An evaluation of polarization diversity lidar for cloud physics research applications on the basis of the air-truth measurements and earlier findings indicated that the remote sensing technique can monitor some kinds of cloud microphysical information currently measured only through in situ sampling methods. In particular, lidar polarization measurements were indicated from the observations to be sensitive to the composition of mixed phase clouds, including a measure of cloud ice balance, and to permit observations of the ice particle riming process in precipitation formation. Detailed vertical cross sections of hydrometeor content were derived from height versus time displays of lidar returns in combination with the polarization analysis, revealing some interesting features of the structure of complex orographic cloud systems. As a further aid in the evaluation of lidar, the operational restrictions of typical lidars during field operations also were discussed. It was concluded that polarization diversity lidar displays the potential for important applications in cloud physics and modification research programs involving the study of particles in the ice phase. (Sims-ISWS)
W78-05382

A COMMENT ON THE SIZE DISTRIBUTION OF THE DROPLETS FOUND IN CLOUD BASES,
Maine Univ. at Orono. Dept. of Physics.
J. Fastook, and M. A. Vietti.
Journal of Applied Meteorology, Vol 17, No 1, p 115-117, January 1978. 1 fig, 9 ref.

Descriptors: *Cloud physics, *Drops(Fluids), *Model studies, Mathematical models, Laboratory tests, Nucleation, Salts, Temperature, Humidity, Growth rates, Clouds, Precipitation(Atmospheric), Meteorology, *Cloud droplets, Size distributions.

Growth histories of droplets were compared, and a qualitative argument was given for the generation of the droplet size distribution in the base of a cloud. The distribution was generated by considering only the effects of vapor depletion and environmental heating and by assuming that the condensation nuclei was organized into families of the same critical supersaturation, which begin to mix after moving up through the lower levels of the cloud. (Sims-ISWS)
W78-05383

THE INFLUENCE OF CLIMATE ON FLOODS IN SMALL BASINS, AS DEFINED BY RAINFALL-RUNOFF MODELING,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.

W78-05423

A STUDY OF HAWAIIAN WARM RAIN SHOWERS BASED ON AIRCRAFT OBSERVATION,
Hawaii Univ., Hilo. Cloud Physics Observatory.
T. Takahashi.
Journal of the Atmospheric Sciences, Vol. 34, No. 11, p 1773-1790, November 1977. 16 fig, 1 tab, 21 ref. NSF ATM76-18553, ONR N00014-77-C-0031.

Descriptors: *Rainfall, *Cloud physics, *Aircraft, *Hawaii, On-site investigations, On-site data collections, Model studies, Instrumentation, Sampling, Raindrops, Particle size, Temporal distribution, Electrical conductance, Meteorology, *Cloud models, Raindrop size distribution, Warm showers.

Warm rain off the island of Hawaii was followed by aircraft beneath the cloud base from the beginning of the shower to the end, and newly designed instruments were used to observe time and spatial distributions of rainwater content and raindrop size distribution as a function of cloud-top height. Based on 110 h of observation, rain showers were classified into two main groups: isolated showers and line showers. Isolated showers were subdivided into base showers (showers developing under the cloud base) and side showers (showers developing outside of the cloud area). Line showers were subdivided into showers moving at right angles to the cloud line, showers moving parallel to the cloud line, standing showers, and showers which formed successively upwind of the present shower line. These cloud classes are intimately related to the profile of upper wind. The following observations were reported: Two shower peaks, with weak showers at the cloud center are observed along the flight line when the upper wind is weak, irrespective of cloud type, while only a single shower peak is seen when a strong wind shear exists near the cloud top. Initial weak rainfall with small raindrops is followed by heavy rainfall with large raindrops (1.5-2.5 mm in diameter). Then the rain gradually weakens with small raindrops. On the other hand, in many cases raindrops from side rain are small and there are no peak raindrops. Differences were observed in different cloud types with respect to shower lifetime and magnitude of rainwater content. For isolated side showers, lifetime is about 10 min, while for isolated base showers it is 20 min; for line showers, it is 30 min. In isolated clouds, rain starts when the cloud top height reaches 2 km (cloud base is around 600 m); in line clouds, rain starts when the cloud top reaches 1.5 km. Higher clouds produce heavier rain. An isolated cloud with cloud-top height of 2.5 km produces maximum rainwater of lg/cu m, while a line shower from clouds of similar height produces rain two to three times heavier. Line showers also have higher mean time and space rainwater content than isolated showers. Observational results from base showers were compared with an axiimmetric cloud model. The reason for longer shower life and heavier rainfall from line clouds may be the existence of strong inflow near the surface and updraft over a broad area which maintains the line cloud. (Sims-ISWS)
W78-05582

EXPERIMENTAL INVESTIGATION OF WATERSHED SURFACE RUNOFF A CONTRIBUTION TO THE INTERNATIONAL HYDROLOGICAL DECADE,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
Y. Y. Shen, B. C. Yen, and V. T. Chow.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 582, Price codes: A10 in paper copy, A01 in microfiche. Hydraulic Engineering Series No. 29, 1974. 215 p, 52 fig, 4 tab, 69 ref, 2 append. NSF GK-11292, NSF GK 40867.

Descriptors: *Demonstration watersheds, *Storm structure, *Rainfall intensity, *Dimensional analysis, Time lag, Peak discharge, Hydrology, Recession curves, Rainfall-runoff relationships, Methodology, *Rainstorm characteristics, Basin characteristics, Storm movement.

An extensive systematic experimental program was conducted to test the effects of rainstorm characteristics including: (1) rainfall intensity, (2) rainfall duration, (3) velocity of rainstorm movement, and (4) non-uniform areal distribution of rainfall. Also tested were the watershed characteristics including size, shape, and slope of the watershed on producing surface run-off from an inpervious basin. The peak discharge and characteristic times of surface run-off hydrographs included were: (1) the time of occurrence of peak discharge, (2) the time from rainfall commencement to the first occurrence of runoff at the watershed outlet, (3) the time lag between the centroid of the hydrograph and the time of peak discharge, and (4) the recession time required for the runoff to reduce from peak to half peak value. Through a dimensional analysis, the experimental results were presented in a non-dimensional form for general use, interpretation, and discussion. (Singh-ISWS)
W78-05587

BIBLIOGRAPHY OF STATISTICAL AND METEOROLOGICAL METHODOLOGY IN WEATHER MODIFICATION,
Florida State Univ., Tallahassee. Dept. of Statistics.
For primary bibliographic entry see Field 3B.
W78-05591

PROJECT SKYWATER 1973-74 BIENNIAL REPORT.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 3B.
W78-05594

RAINFALL NETWORK SYSTEMS ANALYSIS: THE OPTIMAL ESTIMATION OF TOTAL AREAL STORM DEPTH,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
R. L. Lenton, and I. Rodriguez-Iturbe.
Water Resources Research, Vol. 13, No. 5, p 825-836, October 1977. 8 fig, 2 tab, 23 ref, 1 append. C-4118(No 9021)(15), OWRT 14-31-0001-9021, NOAA 4-3673.

Descriptors: *Network design, *Rain gages, *Model studies, Numerical analysis, Rainfall, Precipitation(Atmospheric), Storms, Runoff, Networks, Variability, Costs, Systems analysis, Measurement, Meteorology, Mathematical models.

The design of rainfall networks for the purpose of estimating areal averages of rainfall was formulated as a mathematical programming problem whose objective function is the minimization of the cost and mean square error of the network and whose decision variables are the total number of rain gages, the corrdinates of each, and the estimator weights. A two-stage methodology was proposed, wherein the optimal configuration of the network is determined first, followed by the optimal estimator weights. A case study was presented in order to illustrate the various concepts developed. (Sims-ISWS)
W78-05669

2C. Snow, Ice, and Frost

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XV. TRANSPORT.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05220

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XVI. HAZARDS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05221

BIOGEOCHEMISTRY OF DEEP LAKES IN THE CENTRAL ALASKAN RANGE,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5A.
W78-05358

SUPPRESSION OF ICE FOG FROM COOLING PONDS,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2D.
W78-05359

WATER AVAILABLE FOR RUNOFF FOR 4 TO 15 DAYS DURATION IN THE SNAKE RIVER BASIN IN IDAHO,
National Oceanic and Atmospheric Administration, Silver Spring, MD. Office of Hydrology.
For primary bibliographic entry see Field 4A.
W78-05365

A STUDY OF MICROWAVE EMISSION PROPERTIES OF SEA ICE - AIDJEX 1972,
Aerojet ElectroSystems Co., Azusa, CA.; and Department of the Environment, Ottawa (Ontario); and Geological Survey, Tacoma, WA. Water Resources Div.
D. C. Meeks, R. O. Ramseier, and W. J. Campbell.
In: Proceedings of the IXth International Symposium on Remote Sensing of the Environment, Vol 1, held in Ann Arbor, Michigan, April 15-19, 1974, p 1-14, 1974. 17 fig, 8 ref.

Descriptors: *Remote sensing, *Microwaves, *Instrumentation, *Sea ice, *Arctic Ocean, Analytical techniques, Mapping, Salinity, Contours, *Microwave emissivities, Surface-truth measurements, Pack ice age.

Results derived from a comparative study of surface-based 13.4 GHz passive microwave measurements with detailed surface-truth measurements concerning the physical, chemical, and structural properties of Arctic sea ice illustrate distinct decreasing microwave emissions for first-year, transitional and multiyear sea ice types. For transitional and multiyear ice, a structural relationship for microwave emissions by sea ice exists. Both vertically and horizontally polarized measured brightness temperatures decrease linearly with increasing average ice porosity. In the case of first-year ice, however, measured brightness temperatures are comparatively uniform and microwave emission appears to be more strongly influenced by high near-surface salinity concentrations combined with the occurrence of uniform porosity. (Woodard-USGS)
W78-05425

DAM IN THE VILYUY HYDRAULIC POWER SYSTEM,
For primary bibliographic entry see Field 8D.

W78-05589

HYDROLOGICAL FIELD INVESTIGATIONS FOR DESIGNING HYDROELECTRIC POWER-PLANTS,
For primary bibliographic entry see Field 8C.
W78-05593

OBSERVATIONS ON ICE DEPOSITED BY WAVES ON ALASKAN ARCTIC BEACHES,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
A. D. Short.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 818, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 211, June 1976. Reprint from LaRevue de Geographie de Montreal, Vol 30, No 1-2, p 115-122, 1976. 11 fig, 14 ref. ONR N00014-69-A-0211-0005.

Descriptors: *Ice, *Beaches, *Alaska, *Arctic, Cold regions, Waves(Water), Ocean waves, Coasts, Lagoons, Sea ice, Sediments, Deposition(Sediments), Melting, Geomorphology, On-site investigations, Deposition(Ice).

Ice deposited by waves on Alaskan arctic beaches is derived from either pack ice or newly formed sludge ice of frazil and is dependent upon wind- and tide-generated currents to move it into the nearshore zone and on wave action to carry it onto the beach. Three basic types of ice are involved: (1) drift ice, consisting of pieces of multi-year or pack ice, may be deposited at any time during the summer season; (2) sludge ice, first forms on brackish lagoonal and estuarine water bodies from which currents regulary flush it into the nearshore zone where waves may wash it onto the shore; (3) swash mass, foam, and spray begin to freeze on the beach face as both air and water temperatures drop below 0C. The above processes result in formation of beach structures composed of embedded pieces of ice, sludge ice beams, layers of sediment. The winter beach also may contain ice ridges commonly 2-3 m high resulting from icefoot development and pack ice buckling over shorefast ice. Melting of the ice and snow generates beach subsidence and collapse features such as dettle holes, elongate depressions, sand-gravel piles and ridges, and distorted bedding. (Sims-ISWS)
W78-05595

APPARATUS AND METHOD FOR RECOVERING OIL FROM ICY WATERS,
Artec, Inc., Columbia, MD. (Assignee).
For primary bibliographic entry see Field 5G.
W78-05609

THE INTERACTION OF OIL WITH SEA ICE IN THE ARCTIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-05629

DYNAMICS OF NEAR-SHORE ICE,
Cold Regions Research and Engineering Lab., Hanover, NH.
A. Kovacs, and W. F. Weeks.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 16. Hazards, p 151-163, March 1977. 01-5-022-1651.

Descriptors: *Sea ice, *Remote sensing, *Hazards, Baseline studies, Resources development, Engineering structures, *Outer Continental Shelf, Beaufort Sea, Bering Strait, Prudhoe Bay, Petroleum development, Offshore operations.

A knowledge of motion, deformation and physical characteristics of both the near-shore pack ice and the fast ice is essential to adequately design and estimate the hazards associated with a variety of engineering options that may be considered for offshore operations in the near coastal areas of the Beaufort and Chukchi Seas (e.g. construction of gravel islands, structural platforms, causeways, buried pipelines, or the utilization of the ice sheet itself to carry large, long-term loads). Laser observations of fast ice motion at sites close to Narwhal Island show long term changes in the distance to targets located on the ice that are believed to be primarily the result of the thermal expansion of the sea ice. The main ice motion was outward normal to the coast (in the least-constrained direction). Observations coupled with published U.S. and Russian results suggest that very large areas of sea ice have sufficiently similar c-axes orientations to act as a large single crystal. If this proves to be the case off-shore structures may have to be designed for 'hard-fail' ice strengths which are 2 to 6 times the strength values normally used. The Russian theory that such orientations are aligned parallel to the magnetic field is shown to be doubtful. (See also W78-05221) (Sinha-OEIS)
W78-05630

DYNAMICS OF NEAR SHORE ICE,
Washington Univ., Seattle. Div. of Marine Resources.
For primary bibliographic entry see Field 5B.
W78-05631

THE ENVIRONMENTAL GEOLOGY AND GEOMORPHOLOGY OF THE GULF OF ALASKA COASTAL PLAIN AND THE COASTAL ZONE OF KOTZEBUE SOUND,
Alaska Univ., College. Dept. of Solid Earth Science.
For primary bibliographic entry see Field 2L.
W78-05632

THE ENVIRONMENTAL GEOLOGY AND GEOMORPHOLOGY OF THE GULF OF ALASKA COASTAL PLAIN,
Alaska Univ., College. Div. of Geoscience.
For primary bibliographic entry see Field 2L.
W78-05633

DELINEATION AND ENGINEERING CHARACTERISTICS OF PERMAFROST BENEATH THE BEAUFORT SEA,
Cold Regions Research and Engineering Lab., Hanover, NH.
P. F. Sellmann, S. Blouin, J. Brown, and E. Chamberlain.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 16. Hazards, p 385-395, March 1977. 1 fig, 1 tab. 01-50-22-2313.

Descriptors: *Permafrost, *Cold regions, *Hazards, Baseline studies, Resources development, Drilling, Alaska, *Outer Continental Shelf, *Subsea permafrost, Siting, Beaufort Sea, Prudhoe Bay, Petroleum development, Offshore operations, Natural hazards.

The Cold Regions Research and Engineering Laboratory (CRREL) spring 1976 drilling and in situ probing investigations provided numerous samples, data, and subsequent interpretations and have furthered understanding of subsea permafrost. Permafrost was present in the four holes drilled at Prudhoe Bay. Ice-bonded permafrost was absent in the upper 30 meters of sediment up to 17 kilometers from shore. Based on negative temperature gradients and pre water chemistry, ice-bonded permafrost should be encountered at 30- and 43-meter depths at sites PB-2 and PB-3, respectively. It appears that the depth to the ice-bonded permafrost decreases with increasing distance from shore and depth of water. Highly overconsolidated marine clays were encountered seaward of Reindeer Island. The overconsolidation probably resulted from the freeze-thaw history. The presence of these stiff, marine clay deposits is an important consideration for siting structures associated with offshore developments. Adequate delineation of the engineering properties of subsea permafrost is necessary in order to evaluate the hazards in and constraints of oil and gas developments in the Beaufort Sea. (See also W78-05221) (Sinha-OEIS)
W78-05634

OFFSHORE PERMAFROST STUDIES, BEAUFORT SEA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 2L.
W78-05635

MARINE ENVIRONMENTAL PROBLEMS IN THE ICE COVERED BEAUFORT SEA SHELF AND COASTAL REGIONS,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 2L.
W78-05636

OFFSHORE PERMAFROST - DRILLING, BOUNDARY CONDITIONS, PROPERTIES, PROCESSES AND MODELS. DELINEATION OF MOST PROBABLE AREAS FOR SUBSEA PERMAFROST IN THE CHUKCHI SEA FROM EXISTING DATA. SUBSEA PERMAFROST: PROBING, THERMAL REGIME AND DATA ANALYSIS,
Alaska Univ., College. Geophysical Inst.
W. D. Harrison, and T. E. Osterkamp.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 17. Hazards, p 424-466, March 1977. 8 fig, 2 tab, 12 ref, append. 03-5-022-55.

Descriptors: *Permafrost, *Ice, Baseline studies, Seasonal, Hazards, Alaska, Resources development, *Outer Continental Shelf, Chukchi Sea, *Beaufort Sea, Petroleum development, Environmental conditions.

Based on results to date the following conclusions were reached. Existing data suggest that permafrost may be largely absent in the southern Chukchi Sea except in near-shore areas. Ice-bearing subsea permafrost soil is mechanically bonded by the ice in some situations but not in others. Permafrost temperatures on land at Prudhoe Bay suggest a lower mean temperature over the past year or so than the recent average. Seasonal variations and mean annual sea bed temperature at Prudhoe Bay were studied. Probing measurements have identified a seasonally active permafrost layer under the sea bed in near shore areas. Application of a crude thermal model suggests that ice bearing permafrost may be found well out on the Beaufort Sea shelf. Some tentative remarks about the possible general and distribution of subsea permafrost in the Beaufort Sea were made. (See also W78-05222) (Sinha-OEIS)
W78-05641

BEAUFORT SEACOAST PERMAFROST STUDIES,
Alaska Univ., College. Geophysical Inst.
J. C. Rogers, and J. L. Morack.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 17. Hazards, p 467-510, March 1977. 17 fig, 1 tab, 16 ref. 03-5-022-55.

Descriptors: *Permafrost, *Baseline studies, Hazards, Alaska, Resources development, Foundations, *Barrier Islands, *Outer Continental Shelf, *Beaufort Sea, Petroleum development, Environmental conditions.

The objective of this study was to develop an understanding of the nature and distribution of permafrost beneath the ocean and barrier islands along the Alaskan Beaufort Sea Coast. One major implication is that bottom founded structures and buried pipelines will probably not be affected by offshore permafrost if they are sufficiently far from shore. Perhaps near the shore, it will be necessary to design hot oil pipelines supported by artificial causeways to bridge the shallow permafrost zone, but at greater distances from shore it may be possible to bury them. In all cases, the irregular and thermally fragile upper surface of the bonded permafrost warrants care in determining operational methods offshore. Seismic reconnaissance on three barrier islands indicates that they are not completely underlain by bonded permafrost, but that some may be completely free of ice-bonded permafrost. From the standpoint of offshore petroleum development, the islands may be useful platforms for drilling purposes. The fact that all offshore islands are not underlain by bonded permafrost provides an important distinction from the standpoint of their history and formation. A complete understanding of island growth and movement must include an understanding of their different permafrost characteristics. (See also W78-05222) (Sinha-OEIS)
W78-05642

SEISMICITY STUDIES: (A) NORTHEAST ALASKA AND (B) NORTON AND KOTZEBUE SOUNDS,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2L.
W78-05650

2D. Evaporation and Transpiration

WATER REQUIREMENTS AND APPLICATION RATES FOR LAWNS,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3D.
W78-05201

DIFFUSION RESISTANCE AND XYLEM POTENTIAL IN STRESSED AND UNSTRESSED NORTHERN HARDWOOD TREES,
Northeastern Forest Experiment Station, Durham, NH.
For primary bibliographic entry see Field 2I.
W78-05246

DIFFERING DIFFUSIVE RESISTANCE AND LEAF DEVELOPMENT MAY CAUSE DIFFERING TRANSPIRATION AMONG HARDWOODS IN SPRING,
Northeastern Forest Experiment Station, Durham, NH.
C. A. Federer.
Forest Science 22, p 359-364, September 1976. 2 fig, 1 tab, 15 ref.

Descriptors: *Transpiration, *Spring, *Stomata, Leaves, Phenology, Chlorophyll, Deciduous trees, Leaf conductance, Leaf resistance, Leaf development, New Hampshire.

Buds of several Betula and Prunus species and of Populus tremuloides broke before those of other species in spring, exposing green leaves having diffusive resistances as low as 5 s/cm. Leaves of Acer saccharum and Fagus grandifolia unfolded 10 days later and initially had resistances around 7 s/cm. Quercus rubra and Q. coccinea leaves developed still later, were initially chlorotic, and had resistances over 10 s/cm. This initially high resistance may help to reduce transpiration in these ring-porous species until the conducting system of the new annual ring is well developed. Resistance decreased during and after leaf expansion to final values of 3 to 5 s/cm in all species. Resistance of adaxial surfaces of all species were nearly always greater than 30 s/cm. Apparently in newly unfolded leaves, cuticular resistance is high, but in some species, stomata are open. Both leaf area and diffusive conductance and leaf length squared indicated that transpiration begins several weeks earlier in Betula and P. tremuloides than in Quercus; Prunus, A. saccharum, and F. grandifolia are intermediate. (Forest Service)
W78-05247

SUPPRESSION OF ICE FOG FROM COOLING PONDS,
Cold Regions Research and Engineering Lab., Hanover, NH.
T. McFadden.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A035 322, Price codes: A05 in paper copy, A01 in microfiche. CRREL Report 76-43, November 1976. 86 p, 50 fig, 8 tab, 81 ref, 1 append.

Descriptors: *Ice fog, *Cooling water, *Alaska, Monomolecular films, Cooling, Ice, Fog, Powerplants, Heat transfer, Microclimatology, Evaporation, Evaporation pans, *Eielson Air Force Base(Alaska), *Fairbanks(Alaska).

Ice fog generated at the Eielson AFB power plant cooling pond contributes heavily to the total ice fog problem on the base. Several methods for ice fog suppression were studied, and two techniques were tested experimentally. Experiments also were conducted to determine the magnitude of the various modes of heat transfer within the pond's microclimate. Values of evaporative and radiative heat loss during the fog were presented. Ice cover was shown to be an effective fog suppression technique. Monomolecular films were also shown to be effective and offered some unique advantages, such as the ease of application and low overall cost. The heat normally lost to evaporation has to be dissipated by other means during suppression. With the ice cover technique, this was accomplished by melting the ice cover. During suppression with monomolecular films, the heat has to be dissipated by increasing radiative and convective losses. The simplicity of application of monomolecular films and their lower cost combined to make this technique attractive; however, the lower pond temperatures and increased suppression effectiveness weighs heavily in favor of the ice-cover technique. (Roberts-ISWS)
W78-05359

THE STRATIGRAPHY AND GEOMORPHOLOGY OF THE HOFMANN FOREST POCOSIN,
Soil Conservation Service, Raleigh, NC. and North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2H.
W78-05577

2E. Streamflow and Runoff

ANALYSIS OF THE SEASONAL STREAMFLOW VARIATION FOR THE PRIMARY UNREGULATED WATER COURSES IN SOUTH DAKOTA,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
J. N. Dornbush.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 035, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, December, 1975. 35 p, 2 fig, 7 tab, 8 ref. OWRT A-033-SDAK(1), 14-31-0001-3542.

Descriptors: *Flow measurement, *Flow rates, *Low-flow frequency, *Streamflow, *River flow, Flow profiles, Flow duration, Flow characteristics, Irrigation, Irrigation permits, Dissolved oxygen, Seasonal, Fluctuations, Hydrology, Hydrometry, River basins, Drainage area, Surface waters, *South Dakota, *Flow gaging station, Average available flow, *Seasonal flow fluctuations, Median flow rates, White River(SD), Little White River(SD), Vermillion River(SD).

Flow-duration tables were prepared for 81 flow gaging stations on South Dakota rivers and streams. Flow frequency for each one-third month period throughout the year and the seasonal variation in streamflow were determined. Peak flows in the rivers and streams occurred during the spring; flows decreased through the summer and fall, reaching a minimum during mid-winter. (Extended periods of zero flow during the winter are common). Low or zero flows for extended periods were the limiting factors for the development of rivers and streams for beneficial uses, e.g., public water supply, irrigation, fish propagation, and recreation. Natural water quality varied inversely with streamflow; the greatest concentration of dissolved solids occurred during the low-flow season from November through February. Low dissolved oxygen concentration in a major river located downstream from a large discharge of treated wastewater was associated with low flows during the high-temperature summer period and the winter ice-cover period. Studies of White River Basin relating historical low-flow frequencies to the permitted withdrawals of irrigators reveal that there would have been insufficient flow in the river for a large percentage of the irrigation season if the irrigators had continuously withdrawn the quantity of water allowed by their permit. Average available flows for specific stream uses are more precisely defined by median flow (50%) than by mean flow. Flow-duration tables, included for 3 rivers, adequately describe South Dakota seasonal flow conditions. (Seip-IPA)
W78-05356

AUTORUN ANALYSIS OF HYDROLOGIC TIME SERIES,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power.
Z. Sen.
Journal of Hydrology, Vol 36, No 1/2, p 75-85, January 1978. 5 fig, 2 tab, 12 ref.

Descriptors: *Hydrology, *Time series analysis, Analytical techniques, Flow, Runoff, *Correlation analysis, Persistence, Statistics, Mathematics, Markov processes, Rivers, Streamflow, Methodology, *Autocorrelation analysis, *Autorun analysis.

A new methodology, which is referred to as the 'autorun analysis,' was developed to investigate the seyuential properties of a hydrologic time series. The relevance of the methodology as a potential tool in water-engineering applications, as well as in statistics, is due to its distribution-free behavior. The autorun analysis yields the same results as those of the autocorrelation analysis in the case of normally distributed random variables only. An application of the autorun analysis to some mean annual flow series was performed. (Sims-ISWS)
W78-05386

PERTURBATION SOLUTION OF SPATIALLY VARIED FLOW IN OPEN CHANNELS,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-05389

THE INFLUENCE OF CLIMATE ON FLOODS IN SMALL BASINS, AS DEFINED BY RAINFALL-RUNOFF MODELING,
Geological Survey, Reston, VA. Water Resources Div.
R. W. Lichty, and F. Liscum.
In: Second Conference on Hydrometeorology, October 25-27, 1977, Toronto, Ontario, Canada.

Published by American Meteorological Society, Boston, Massachusetts, p 124-131, 1977. 3 fig, 5 tab, 13 ref.

Descriptors: *Floods, *Model studies, *Climatic data, *Rainfall-runoff relationships, Flood frequency, Regional analysis, Regression analysis, Synthetic hydrology, Mathematical models, Hydrology.

The purpose of this report is twofold: First, to quantify the spatially varying influence of climate, C, as it affects floods from small basins, and secondly, to show its significance in relation to other important factors in a regional flood analysis. A rainfall-runoff model was used to generate a sample of 50 synthetic annual flood series using data at each of 33 rainfall sites. A flood-frequency curve was developed for each flood series and synthetic, 2-year floods were defined. Through regression, a generalized definition of synthetic, 2-year floods, as a function of model parameters, was developed for each one of the rainfall sites. The site-to-site variability of the regression constant, C, reflects the spatially varying influence of local climatic factors on synthetic floods. A contour map depicting the spatial variability of C was prepared and its utility in a regional flood frequency analysis was varified using observed flood peak records for a sample of 98 small basins located in Missouri, Illinois, Tennessee, Mississippi, Alabama, and Georgia. The relative significance of the climatic factor in explaining the variability of observed floods is discussed in relation to size of drainage area, a hydrograph shape factor, and an infiltration factor. (Woodard-USGS)
W78-05423

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70--PART 16. HAWAII AND OTHER PACIFIC AREAS.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-05431

TECHNIQUES FOR ESTIMATING FLOOD-DEPTH FREQUENCY RELATIONS ON NATURAL STREAMS IN GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
M. Price.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 381, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-90, August 1977. 33 p, 8 fig, 3 tab, 8 ref.

Descriptors: *Flood forecasting, *Depth-area curves, *Flood frequency, *Estimating, *Georgia, Streams, Natural flow, Regression analysis, Flood data, Gaging stations, Flow rates, Drainage area, *Flood-depth probability, Basin characteristics.

Regional relations are defined for estimating depth of floods having recurrence intervals of 10, 50, and 100 years on streams with natural flow in Georgia. Multiple-regression analysis of station data is used to define the relations between flood depths and frequency for streams draining from 1 to 1,000 square miles, and for 10 climatological and physical basin characteristics. The analysis indicates that the drainage area of the basin is the most significant variable. Five regions having distinct flood-depth frequency characteristics are delineated. The developed relations, expressed as equations and graphs, are considered usable for any site in Georgia where the drainage area is between 1 and 1,000 square miles, and the flow is natural; exceptions include streams that are urbanized, regulated, tide affected, channelized, or where manmade structures significantly affect peak stages. (Woodard-USGS)
W78-05443

STRATIFICATION AND OPEN CHANNEL FLOW,
Vanderbilt Univ., Nashville. TN. Dept. of Environmental Engineering and Policy Management.
For primary bibliographic entry see Field 8B.
W78-05566

TRANSVERSE BED SLOPES IN CURVED ALLUVIAL STREAMS,
Karlsruhe Univ. (West Germany). Inst. fuer Hydromechanik.
For primary bibliographic entry see Field 8B.
W78-05567

EFFECT OF CHANNEL MEANDERS ON FLOOD STAGE IN VALLEY,
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-05568

TEMPERATURE AND MISSOURI RIVER STAGES NEAR OMAHA,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. W. Shen, W. J. Mellema, and A. S. Harrison.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY1, Proceedings Paper 13460, p 1-20, January 1978. 8 fig, 3 tab, 26 ref, 2 append.

Descriptors: *Missouri River, *Stage-discharge relations, *Nebraska, *On-site data collections, Rivers, Water temperature, Water levels, Data collections, Analysis, Roughness(Hydraulic), Flow resistance, Sediment transport, Velocity, Streambeds, River beds, Alluvial channels, Navigable rivers, River flow, Sediments, Particle size, Omaha(Neb).

A pronounced correlation between water temperature, shifts in the stage-discharge relationship, and bed roughness forms in the Missouri River near Omaha was reported by the Army District after conducting a comprehensive data collection program in 1966-1969 and 1975 in a 7-mile reach of the Missouri River. This paper presented and analyzed field data collected in this research. It was found that the form resistance curve proposed by Einstein and Barbarossa can be used to describe the flow resistance and that the bed form prediction diagram presented by Vanoni is very applicable. Based on Vanoni's curve, a criterion was developed to predict the change of bed form in the Missouri River near Omaha due to river temperature. (See also W74-05735) (Humphreys-ISWS)
W78-05569

THEORETICAL ESTIMATIONS OF FLOOD ROUTING PARAMETERS,
Northeastern Univ., Boston, MA. Dept. of Civil Engineers.
For primary bibliographic entry see Field 8B.
W78-05572

ADSORPTION LOSSES AND PERFORMANCE OF 51CR-EDTA AND 198AU IN TRACING OF FLOOD RUNOFF,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
D. H. Pilgrim.
Journal of Hydrology, Vol. 36, No. 1/2, p 47-64, January 1978. 6 fig, 3 tab, 22 ref.

Descriptors: *Runoff, *Tracers, *Watersheds(Basins), *Australia, *Radioisotopes, *Chromium radioisotopes, Gold, *Gold radioisotopes, Floods, Flow, Hydrographs, Precipitation(Atmospheric), On-site investigations, Hydrology, Adsorption, Performance.

Flood runoff on a 0.39-sq km catchment was traced using 51Cr-EDTA and 198Au. A rigorous method was developed for computing the total activities of tracer passing the monitoring site at the catchment outlet, and conditions required for valid application were examined. Proportions of tracer reaching the monitoring site were determined for 44 tracing runs from seven injection sites. The results indicated that 51Cr-EDTA is a good tracer, but that large losses of 198Au occurred, although both tracers performed satisfactorily in terms of the overall objectives of the study. Adsorption losses are related to the time of travel of the tracer, the length of channels over which the runoff was traced, the dispersion of the tracer, and the flood discharge. All of these factors are interrelated. Most of the adsorption losses occurred near the injection sites. Hydrological processes also were shown to account for some of the tracer losses. (Sims-ISWS)
W78-05573

A BAYESIAN APPROACH TO MULTIVARIATE HYDROLOGIC SYNTHESIS,
Massachusetts Inst. of Tech., Cambridge Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 8B.
W78-05586

CALCULATION OF FLOOD DISCHARGES AND FLOOD HYDROGRAPHS IN KANSAS,
Kansas Univ./Center for Research, Inc., Lawrence.
R. L. Smith, and G. E. Hauser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 118, Price codes: A08 in paper copy, A01 in microfiche. Report No. FHWA-KS-RD-75-1, January 1976. 171 p, 38 fig, 5 tab, 2 append.

Descriptors: *Flood frequency, *Kansas, *Flood discharge, Floods, Hydrography, Discharge(Water), Watersheds(Basins), Hydrology, Model studies, Equations, *Non-linear hydrographs, Modified rational formula, Rational formula.

Specific design methodologies were developed for: (1) calculation of flood frequency relationships for both rural land and urban conditions, and (2) calculation of flood hydrographs for specified frequencies. The recommended procedures were based on the Frequency Equivalent Non-Linear Hydrograph (FENL-H) method developed at the University of Kansas. FENL-H utilizes a form of the modified rational formula Q = XZA, where Q = peak discharge in cfs, X = rainfall excess rate in in/hr, Z is the ratio of peak discharge to the equilibrium discharge, and A is the drainage area in acres. The time of concentration and the time of equilibrium were presumed to be equal. Application of the FENL-H model to 110 Kansas basins for which peak discharge records were available during a common 17 year period clearly showed that the time of concentration decreases as the rate of rainfall excess increases. The data also indicated that the bulk of the unexplained variance in current flood frequency equations in Kansas can be attributed to a very nominal variance in the frequency distributions of the input rainfall. It is believed that the design procedures presented in the report are applicable to watersheds ranging in size from 400 acres to 500 sq mi. (Lee-ISWS)
W78-05592

EVALUATION OF FLOOD RISK FACTORS IN THE DESIGN OF HIGHWAY STREAM CROSSINGS. VOL III. FINITE ELEMENT MODEL FOR BRIDGE BACKWATER COMPUTATION,
Water Resources Engineers, Springfield, VA.
For primary bibliographic entry see Field 8B.
W78-05596

2F. Groundwater

MODELLING OF LARGE MULTILAYERED AQUIFER SYSTEMS: THEORY AND APPLICATIONS,
Ecole National Superieure des Mines de Paris, Fontainebleau (France). Center for Geological Information.
G. De Marsily, E. Ledoux, A. Levassor, D. Poitrinal, and A. Salem.
Journal of Hydrology, Vol 36, No 1/2, p 1-34, January 1978. 7 fig, 17 ref.

Descriptors: *Aquifers, *Model studies, *Artesian aquifers, Mathematical models, Aquitards, Aquicludes, Groundwater, Groundwater movement, Velocity, Piezometry, Geology, Hydrogeology, Irrigation, Hydrology, *Algeria, *Oued R'hir aquifer(Algeria).

The paper presented flow mechanisms in large sedimentary basins, with a distinction between the behavior of aquifers and aquitards. Taking advantage of this difference, a discretization method was presented, with nesting square meshes of variable size in quasi three dimensions. A finite-differences technique gave a method for solving the flow equations on this discretized flow domain. An application of the method in the northern Sahara was presented, with special emphasis on the use of the model to optimize the exploitation of groundwater resources. Also, problems of mass transport in such systems were outlined. (Sims-ISWS)
W78-05384

DETERMINATION OF AQUIFER PARAMETERS BY A TWO-WELL PULSED METHOD USING RADIOACTIVE TRACERS,
UKAEA Hydrology and Coastal Sediment Group, Harwell (England).
M. Ivanovich, and D. B. Smith.
Journal of Hydrology, Vol 36, No 1/2, p 35-45, January 1978. 6 fig, 1 tab, 9 ref.

Descriptors: *Aquifers, *Groundwater movement, *Tracers, *Model studies, Mathematical models, Radioisotopes, Bromines, Wells, Water wells, Boreholes, Groundwater, Permeability, Dispersion, Hydrology, Geohydrology, Chalk aquifers, Tracer studies.

A pilot investigation of the behavior of water in a series of boreholes in the Chalk aquifer using 82Br as tracer was described. The method consisted of an instantaneous injection of the tracer into one borehole and subsequent measurement of the tracer concentration in the water abstracted from a neighboring borehole as a function of time. This paper presented the field data, the results of the data analysis using a simple statistical model to describe the shape of the observed pulse, and proposals for the future work deemed necessary to provide hydrological information about the behavior of groundwater in the Chalk using a two-well pulsed method. (Sims-ISWS)
W78-05385

DRAINAGE BY RECHARGE WELLS IN A LEAKY AQUIFER,
Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
P. K. Chowdhury, S. K. Shakya, and B. Anjaneyulu.
Journal of Hydrology, Vol 36, No 1/2, p 87-93, January 1978. 1 fig, 1 ref.

Descriptors: *Recharge wells, *Aquifers, *Model studies, Mathematical models, Recharge, Equations, Artificial recharge, Groundwater, Groundwater movement, Water levels, Potentiometric level, Infiltration, Hydraulic conductivity, Soils, Artesian aquifers, Confined water, Hydrology.

Theoretical solutions were developed for predicting the rate of recharge through a well in a leaky aresian aquifer overlain by an unconfined aquifer of limited areal extent. The ground surface was considered to be waterlogged. Solution to the basic steady-state differential equation was presented. The solution can be used to compute the recharge rate on the basis of aquifer characteristics and the steady infiltration rate of the soil. (Sims-ISWS)
W78-05387

FLOW TOWARD A PARTIALLY PENETRATING WELL IN A BOUNDED ARTESIAN AQUIFER,
Indian Inst. of Tech., Madras (India). Hydraulic Engineering Lab.
M. H. Abdul Khader, and D. Ramadurgaiah.
Journal of Hydrology, Vol 36, No 1/2, p 95-107, January 1978. 6 fig, 1 tab, 16 ref.

Descriptors: *Artesian aquifers, *Groundwater flow, *Model studies, Mathematical models, Aquifers, Confined water, Groundwater, Recharge, Water levels, Pumping, Water wells, Drawdown, Flow, Hydrology, Partially penetrating wells.

A more realistic theoretical solution to the problem of artesian well flow was developed, taking into consideration the partial penetration of the well and the finiteness of its radius. The aquifer was assumed to be homogeneous, anisotropic, confined between horizontal, impervius boundaries, and bounded laterally by a recharge boundary of uniform radius. Important results of the analysis were discussed, both in the transient and the steady-states of flow, with reference to the solutions of the previous investigators. (Sims-ISWS)
W78-05388

NON-DARCY FLOW AND ITS IMPLICATIONS TO SEEPAGE PROBLEMS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
P. Basak.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 103, No IR4, Proceedings Paper 13442, p 459-473, December 1977. 9 fig, 4 tab, 44 ref.

Descriptors: *Drainage, *Seepage, *Darcys law, Porous media, Confined water, Analytical techniques, Hydraulics, Equations, Flow, Discharge(Water), *Non-Darcy flow, Drainage spacing, Nonlinear velocity-gradient response.

Analytical solutions for the problems of drainage spacing in a ditch drainage system and steady-state seepage through confined aquifer of variable thickness incorporating Izbash's nonlinear velocity-gradient response v=M times i to the nth power were presented. The effecr on nonlinearity in the flow response on the drainage spacing, discharge characteristics, and piezometric pressure distribution in relation to the corresponding Darcian linear case was brought out. The solutions derived showed that nonrecognition of even a weak non-Darcy flow would lead either to an uneconomical or an unsafe 8depending on the value of non-Darcy parameter n) drainage spacing for ditch drainage problems and would lead to considerable over or under prediction of discharge for confined aquifer problem. Apart from the previously mentioned analytical soluions, a perspective view of non-Darcy flow through porous media was incorporated, and its importance in various drainage projects was examined. (Lee-ISWS)
W78-05392

POTENTIAL FOR LAND SUBSIDENCE DUE TO REDUCTION OF ARTESIAN HEAD IN THE ATLANTIC COASTAL PLAIN,
Geological Survey, Reston, VA. Water Resources Div.
G. H. Davis.
In: Hydraulics in the Coastal Zone; Proceedings of the 25th Annual Hydraulics Division Specialty Conference, held at Texas A & M University, College Station, August 10-12, 1977: American Society of Civil Engineers, p 152-160, 1977. 4 fig, 7 ref.

Descriptors: *Land subsidence, *Drawdown, *Artesian heads, *Artesian aquifers, *Atlantic Coastal Plain, Hydrogeology, Regional analysis, Aquifer characteristics, Withdrawal, Hydraulic properties, Georgia, *Savannah area(Geo).

This paper focuses on the potential for land subsidence due to reduction of head in artesian aquifers of the Atlantic Coastal Plain. The Atlantic Coastal Plain is characterized by a wedge of unconsolidated to poorly consolidated sediments thickening seaward from zero along the Piedmont Border to several thousand meters beneath the offshore continental shelf. In much of the Coastal Plain surface-water supplies are ample for municipal and industrial needs and ground water is little used in comparison to its potential, but where confined ground water is overdrawn the resulting decline in artesian head can be expected to cause compaction of fine unconsolidated or partly consolidated sediments and consequently subsidence of the land surface. The best documented use of land subsidence on the Atlantic Coastal Plain is that of Savannah, Georgia where decline in artesian head, mainly between 1935 and 1965, in the principal artesian aquifer, a limestone sequence of Tertiary age, has resulted in subsidence of as much as 270 mm. Subsidence is continuing unabated at a maximum rate of 4 mm per year even though the head decline has stabilized. (Woodard-USGS)
W78-05422

AVAILABILITY OF GROUND WATER IN SEMINOLE COUNTY AND VICINITY, FLORIDA,
Geological Survey, Orlando, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-05426

SUMMARY GROUND-WATER RESOURCES OF LANCASTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-05432

GROUND-WATER LEVELS IN THE UNITED STATES, 1974. SOUTHEASTERN STATES.
Geological Survey, Reston, VA. Water Resources Div.
Available from the Branch of Distribution, USGS, 1200 S. Eads St., Arlington, VA 22202, price $2.25. Water-Supply Paper 2165, 1977. 116 p, 12 fig.

Descriptors: *Water levels, *Groundwater, *Water wells, *Well data, *Southeast U.S., Measurement, Basic data collections, Aquifers, Alabama, Florida, Georgia, Kentucky, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia.

This report was prepared from ground-water levels measured during 1974 by the U.S. Geological Survey in cooperation with the States of Alabama, Florida, Georgia, Kentucky, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and West Virginia, and with other agencies. Water-level measurements in wells are given in feet with reference to either mean sea level or land-surface datum. Mean sea level is the datum plane on which the national network of precise levels is based; land-surface at each well. If known, the altitude of the land-surface datum above mean sea level is given in the well description. The height of the measuring point above or below land-surface datum is given in each well description. (Woodard-USGS)
W78-05433

GROUND-WATER LEVELS IN THE UNITED STATES, 1971-74. NORTHWESTERN STATES.
Geological Survey, Reston, VA. Water Resources Div.
Available from the Branch of Distribution, USGS, 1200 S. Eads St., Arlington VA 22202, Price $2.50. Water-Supply Paper 2161, 1977. 153 p, 9 fig.

Descriptors: *Water levels, *Groundwater, *Water wells, *Well data, Measurement, Basic data collections, Aquifers, Alaska, Colorado, Idaho, Montana, Oregon, Utah, Washington, Wyoming, *Pacific Northwest U.S.

This report was prepared ffom ground-water levels measured during 1971-74 by the U.S. Geological Survey in cooperation with the States of Alaska, Colorado Idaho, Montana, Oregon, Utah, Washington, and Wyoming, and with other agencies. Water-level measurements in wells are given in feet with reference to either mean sea level or land-surface datum. Mean sea level is the datum plane on which the national network of precise levels is based; land-surface datum is a datum plane that is approximately at land surface at each well. If known, the altitude of the land-surface datum above mean sea level is given in the well description. The height of the measuring point above or below land-surface datum is given in each well description. (Woodard-USGS)
W78-05434

GROUND-WATER RESOURCES OF CAMBODIA,
Geological Survey, Reston, VA. Water Resources Div.
W. C. Rasmussen, and G. M. Bradford.
Available from the Branch of Distribution, USGS, 1200 S. Eads St., Arlington, VA 22202, Price $3.75. Water-Supply Paper 1608-P, 1977. 122 p, 5 fig, 3 plates, 26 tab, 14 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Well data, *Asia, Foreign projects, Water wells, Water levels, Pumping, Water yield, Geology, Groundwater movement, Rainfall, Groundwater recharge, Water quality, *Cambodia.

Cambodia (now the Khmer Republic), in tropical, humid southeast Asia, has an area of 175,630 sq km and a population of about 5 million. During 1960-63, 1,103 holes were drilled in 16 of the 18 khets (provinces), of which 795 or approximately 72 percent, were productive wells at rates ranging from 1.1 to 2,967 liter/min. The productive wells ranged in depth from 2 to 209.4 meters and were 23.2 meters deep on the average. The principal aquifer tapped by drilled wells in Cambodia is the Old Alluvium. In many places, however, dug wells and a few shallow drilled wells obtain water from the Young Alluvium. Sandstone of the Indosinias Formation yields moderate to small quantities of water to wells in a number of places. Also, wells tapping water-bearing basalt have a small to moderate yield. The quality of water is recorded in only a few analyses. The dissolved-solids concentrations are generally low and the water is usable for most purposes without treatment. Some well waters, however, are high in iron and would have to be aerated and filtered before use. Well records are tabulated, and the geology and hydrology is discussed by khets. (Woodard-USGS)
W78-05435

AQUIFER TEST ANALYSES FOR THE FLORIDAN AQUIFER IN FLAGLER, PUTNAM, AND ST. JOHNS COUNTIES, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
C. B. Bentley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 790, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-36, 1977. 50 p, 29 fig, 2 tab, 27 ref.

Descriptors: *Aquifer characteristics, *Confined water, *Leakage, *Storage coefficient, *Transmissivity, Florida, Artesian wells, Drawdown, Water yield, Groundwater recharge, Water wells, Hydrogeology, Ground movement, Potentiometric level, Aquifer testing, Irrigation, Saline water intrusion, *Floridan aquifer, Flagler County, Putnam County, St. Johns County.

The Floridan aquifer in Flagler, Putnam, and St. Johns Counties of northeastern Florida consists primarily of limestone beds of the Ocala Group and the underlying Avon Park and Lake City Limestones, all of Eocene age. New data from eighteen aquifer tests were analyzed for transmissivity, storage coefficient, and leakance. In addition, the data and results of several tests made previously were analyzed and used to determine hydraulic characteristics of the Floridan aquifer. The analyses indicate that the aquifer has a transmissivity of about 60,000 feet squared per day and a storage coefficient of about 0.0008. Leakance, a property of the overlying and underlying confining beds, ranges from 0.00023 day northwest of Palatka to 0.016 day in the farming area near East Palatka. The transmissivity, storage coefficient, and leakance can be used to generate curves showing drawdown with time at any distance from a well that is discharging at any selected constant rate and at any depth of penetration into the aquifer. A method is outlined whereby the total amount of well discharge in the farming area near Hastings can be estimated on a seasonal and on an annual basis. This estimate can be compared with actual discharge figures, when they become available, to compute an estimate of the amount of leakage into the aquifer. (Woodard-USGS)
W78-05437

RECONNAISSANCE OF GROUND-WATER RESOURCES IN THE MOUNTAIN HOME PLATEAU AREA, SOUTHWEST IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-05438

STREAM SIMULATION IN AN ANALOG MODEL OF THE GROUND-WATER SYSTEM ON LONG ISLAND, NEW YORK,
Geological Survey, Mineola, NY. Water Resources Div.
A. W. Harbaugh, and R. T. Getzen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 369, Price codes: A02 in paper copy, A01 in microfiche. Water-Resources Investigations 77-58, September 1977. 15 p, 6 fig, 7 ref.

Descriptors: *Surface-groundwater relationships, *Groundwater movement, *Analog models, *New York, Water table, Elevations, Hydraulic gradient, Channel morphology, Streambeds, Hydrogeology, Seepage, Model studies, Simulation analysis, Methodology, *Long Island(NY).

The stream circuits of an electric analog of the ground-water system of Long Island, NY, were modified to more accurately represent the relationship between streamflow and ground-water levels. Assumptions for use of the revised circuits are (1) that streams are strictly gaining, and (2) that ground-water seepage into the streams is proportional to the difference between streambed elevation and the average water-table elevation near the stream. No seepage into streams occurs when ground-water levels drop below the streambed elevation. Regional simulation of the 1962-68 drought on Long Island was significantly improved by use of the revised stream circuits. (Woodard-USGS)
W78-05440

GROUND WATER IN THE KOEHN LAKE AREA, KERN COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-05442

TEHM: A TERRESTRIAL ECOSYSTEM HYDROLOGY MODEL,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 2G.
W78-05565

DISPERSIVE SOURCES IN UNIFORM GROUND-WATER FLOW,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-05571

NUMERICAL ANALYSIS OF ONE-DIMENSIONAL DECAY OF A PERCHED WATER TABLE,
Mississippi Agricultural and Forestry Experiment Station, Mississippi State.
K. K. Watson, F. D. Whisler, and A. A. Curtis.
Journal of Hydrology, Vol. 36, No. 1/2, p 109-119, January 1978. 10 fig, 1 tab, 8 ref.

Descriptors: *Soil water, *Soil water movement, *Groundwater, *Model studies, Mathematical models, Groundwater movement, Soils, Porous media, Sands, Loam, Flow, Moisture content, Hydraulic conductivity, Drainage, Water levels, Capillary fringe, Hydrology.

A numerical solution of the differential equation for the flow of water in unsaturated porous materials was used to study the one-dimensional decay of a perched water table. The perched condition results from the presence of a thin layer of less permeable material existing at the base of a homogeneous profile. Botany sand and Touchet silt loam were used in the analysis, and, for each material, eight cases were considered. These cases represent different thicknesses and saturated hydraulic conductivities of the impeding layer. The dimensionless outflow-time relationship was derived for each case, and typical pressure head profiles were presented. The downward movement of the top of the capillary fringe and the fall of the water table with time also were discussed. (Sims-ISWS)
W78-05574

A LAYERED INFILTRATION MODEL FOR HOMOGENEOUS SOILS,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-05575

THE COMPUTATION OF LEAKY AQUIFER FUNCTIONS,
Tulsa Univ., OK. Dept. of Petroleum Engineering.
G. W. Thomas, K. G. Keys, and A. C. Reynolds, Jr.
Journal of Hydrology, Vol. 36, No. 1/2, p 173-178, January 1978. 12 ref.

Descriptors: *Pumping, *Aquifers, *Model studies, *Mathematical models, Mathematics, Equations, Numerical analysis, Simulation analysis, Hydrology, *Leaky aquifer functions, Hantush function, Mathematical solutions, Computations.

A stable accurate method for computing leaky aquifer functions was presented and discussed. (Sims-ISWS)
W78-05583

VARIABLE THICKNESS TRANSIENT GROUNDWATER FLOW MODEL THEORY AND NUMERICAL IMPLEMENTATION,
Battelle Pacific Northwest Labs., Richland, WA.
K. L. Kipp, A. E. Reisenauer, C. R. Cole, and C. A. Bryan.
Available from the National Technical Information Service, Springfield, VA 22161 as BNWL-1703, Price codes: A04 in paper copy, A01 in microfiche. Report No. BNWL-1703/UC-11, 1976. 40 p, 18 fig, 10 ref, 4 append. ERDA AT)45-I)-2130.

Descriptors: *Washington, *Water table aquifers, *Computer models, *Waste disposal, Unsteady flow, Heterogeneity, Groundwater potential, Groundwater, Injection wells, Permeability, Aquifers, Equations, Model studies, Boussinesq equation, Finite difference analysis, Model verification.

Mathematical simulation of two-dimensional flow in an unconfined aquifer was accomplished using the nonlinear, transient Boussinesq equation with appropriate initial and boundary conditions. The heterogeneous permeability (hydraulic conductivity) distribution was derived by solution of the Boussinesq equation along instantaneous streamtubes of flow employing a measured water table surface and a limited number of field-measured hydraulic conductivity values. Use of a successive line over-relaxation technique with unequal time steps resulted in a more rapid convergence of the numerical solution than with previous techniques. A comparison of calculated and measured water table elevations was made at specific well locations, and the quality of the verification simulation was evaluated using a data retrieval and display system. Agreement between the model results and measured data was good over two-thirds of the Hanford Reservation. The capability of the model to simulate flow with time-varying boundary conditions, complex boundary shapes, and a heterogeneous distribution of aquifer properties was demonstrated. (Adams-ISWS)
W78-05584

2G. Water In Soils

STUDY ON THE STATE OF WATER IN DISPERSIONS OF H+, MG2+ AND FE3+ MONTMORILLONITES BY HIGH-RESOLUTION NMR, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics; and Moscow State Univ. (USSR). Dept. of Soil Melioration.
For primary bibliographic entry see Field 2K.
W78-05238

PRESERVING THE ENVIRONMENT OF A SANDHILLS REGION CONCURRENT WITH INTENSIVE IRRIGATION DEVELOPMENT,
Nebraska Univ., Lincoln. Water Resources Center.
For primary bibliographic entry see Field 3F.
W78-05348

LIQUEFACTION POTENTIAL OF DAMS AND FOUNDATIONS REPORT 3: DEVELOPMENT OF AN ELASTIC-PLASTIC CONSTITUTIVE RELATIONSHIP FOR SATURATED SAND,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
For primary bibliographic entry see Field 8D.
W78-05368

INCREASE IN ABUNDANCE OF SOLIDAGO SEMPERVIRENS ON A DIKED SALT MARSH IN SOUTHWESTERN CONNECTICUT,
Fairfield Univ., CT. Dept. of Biology.
B. Frankowski, F. Hernandez, T. Okon, and S. Bongiorno.
Bulletin of the Torrey Botanical Club, Vol 104, No 4, p 383-385, October-December, 1977. 2 fig, 14 ref.

Descriptors: *Coastal marshes, *Soil salinity, Wetlands, *Connecticut, Topography, *Salt marshes, *Seaside goldenrod, *Diked salt marsh, Spartina patens, Increase in abundance.

Although water content of the soil did not differ significantly between the diked and a natural marsh, soil salinity was much lower in the diked marsh. This is probably a result of leaching by precipitation. Salinity was also negatively correlated with elevation within the diked marsh. Seaside goldenrod increased in abundance on the slightly higher and less saline portions of the marsh. Some patches covered 400-1000 sq m. Once salinity is lowered, seaside goldenrod can successfully out-compete Spartina patens. (Stihler-Mass)
W78-05518

TEHM: A TERRESTRIAL ECOSYSTEM HYDROLOGY MODEL,
Oak Ridge National Lab., TN. Environmental Sciences Div.
D. D. Huff, R. J. Luxmoore, J. B. Mankin, and C. L. Begovich.
Report EDFB/IBP-76/8, ORNL/NSF/EATC-27, April 1977, 152 p, 30 fig, 20 tab, 60 ref. W7405-eng-26.

Descriptors: *Model studies, Hydrology, Runoff, Flow, *Soil water, *Ecosystems, Throughfall, *Infiltration, Evaporation, Transpiration, Drainage, Root zone.

The model described combines mechanistic models for climatic and hydrologic processes to simulate interception and throughfall; infiltration; root zone evaporation, transpiration, and drainage; plant and soil water potential; unsaturated and saturated subsurface flow; surface runoff; and open channel flow. Walker Branch Watershed on the Oak Ridge Reservation was used as an example to illustrate development of the input parameters and variables needed to execute the TEHM. (Chilton-ORNL)
W78-05565

NUMERICAL ANALYSIS OF ONE-DIMENSIONAL DECAY OF A PERCHED WATER TABLE,
Mississippi Agricultural and Forestry Experiment Station, Mississippi State.
For primary bibliographic entry see Field 2F.
W78-05574

A LAYERED INFILTRATION MODEL FOR HOMOGENEOUS SOILS,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
M. A. Gill.
Journal of Hydrology, Vol. 36, No. 1/2, p 121-131, January 1978. 4 fig, 1 tab, 8 ref.

Descriptors: *Infiltration, *Soil water movement, *Model studies, Mathematical models, Soils, Porous media, Soil water, Hydraulic conductivity, Laboratory tests, Saturated flow, Zone of saturation, Unsaturated flow, Groundwater, Groundwater flow, Flow, Hydrology.

A modification of the Green-Ampt equation for one-dimensional vertical infiltration into homogeneous soils was proposed. Infiltration was conceived to be occurring in a two-layered soil consisting of saturated and unsaturated zones. The predictions from the proposed model are in good agreement with Philip's results for infiltration into Yolo light clay. (Sims-ISWS)
W78-05575

THE INFLUENCE OF CATION EXCHANGE AND GYPSUM SOLUBILITY ON THE TRANSPORT OF SODIUM, CALCIUM AND SULPHATE THROUGH SOILS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soils and Fertilizers.
C. G. E. M. VanBeek, and R. Pal.
Journal of Hydrology, Vol. 36, No. 1/2, p 133-142, January 1978. 3 fig, 2 tab, 12 ref.

Descriptors: *Cation exchange, *Dispersion, *Laboratory tests, *Model studies, Mathematical models, Computer models, Solutes, Chemicals, Cations, Sodium, Calcium, Sulphates, Soils, Soil water, Gypsum, Chemistry, Soil physics, Soil chemistry.

Reported herein was the comparison of the breakthrough curves of various ions as determined experimentally and computerized according to the continuous simulation modelling program in the case of an experiment conducted using a column comprising carborundum, resin, and gypsum when percolated with different concentrations of different salts taken one after another. The agreement seems to be reasonably good. The deviation between the two curves was attributed to dispersion/diffusion not taken into account in the computer program. The dispersion coefficient as estimated from the chloride data was found to agree very well with the numerical dispersion coefficient. (Sims-ISWS)
W78-05576

THE STRATIGRAPHY AND GEOMORPHOLOGY OF THE HOFMANN FOREST POCOSIN,
Soil Conservation Service, Raleigh, NC. and North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2H.
W78-05577

ESTIMATION OF THE SPATIAL VARIABILITY OF THE SOIL WATER FLUX,
Florida Univ., Gainesville. Dept. of Soil Science.
P. S. C. Rao, P. V. Rao, and J. M. Davidson.
Soil Science Society of America Journal, Vol 41, No 6, p 1208-1209, November-December 1977. 1 tab, 4 ref. EPA-R-803067.

Descriptors: *Soil water movement, *Flow, *Model studies, Mathematical models, Equations, Monte Carlo method, Simulation analysis, Variability, Hydrology, Properties, Hydraulic conductivity, Moisture content, Soil water, *Microhydrologic properties, Taylor series expansion.

A simple method for estimating the spatial variability of the soilwater flux from known variability of soil microhydrologic properties was presented. The method is based on the theory of approximating a differentiable function using Taylor-series expansion. Published data for means and variances of the soil microhydrologic properties were used to estimate the mean and variance of the soil water flux in a draining profile of Panoche soil. These values were compared with those estimated using a Monte Carlo simulation procedure on the same set of data. Relative advantages and disadvantages of these two methods were discussed briefly. (Sims-ISWS)
W78-05578

FIELD MEASUREMENT OF DENITRIFICATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 5A.
W78-05619

AREAS OF FAULTING AND POTENTIALLY UNSTABLE SEDIMENTS IN THE ST. GEORGE BASIN REGION, SOUTHERN BERING SEA,
Geological Survey, Menlo Park, CA.

For primary bibliographic entry see Field 2J.
W78-05637

2H. Lakes

MATHEMATICAL MODELLING OF LIMNIC ECOSYSTEMS WITH RECURSIVE ESTIMATION METHODS, (IN GERMAN),
J. Gnauk, J. Wernstedt, and W. Winkler.
Int Rev Gesamten Hydrobiol 61(5), p 609-626, 1976.

Descriptors: Chlorophyll, *Ecosystems, *Mathematical models, Oxygen, *Recursive estimation method, Seston, Temperature, Reservoirs.

Limnic ecosystem models have been described by means of differential equations and time stationary statistical methods. But an accurate description of the ecosystem processes is only possible by time varying methods. Approaching deterministic techniques often leads to hardly computable nonlinear differential equations with disturbed parameters. Recursive estimation methods for ecosystems modeling in real-time are presented and the 1st results of the application to Saidenbach reservoir (East German) are given. The O2 balance of the surface and of 2 layer (depth 10 and 35 m) of the reservoir was modeled. The structue of all models was p-canonic with O2 as output and temperature, oxygen deficiency (BOD-2) (biological oxygen demand) seston, chlorophyll, NO3-N COD (Mn) (chemical oxygen demand), phosphate (PO4) as inputs on each level. For surface model the Seechi disk-transparency was used as an additional input.--Copyright 1977, Biological Abstracts, Inc.
W78-05237

STUDY OF THE ECOLOGY OF IRON BACTERIA OF FRESH WATER RESERVOIRS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow, Inst. Mikrobiologii.
For primary bibliographic entry see Field 5C.
W78-05269

BIOGEOCHEMISTRY OF DEEP LAKES IN THE CENTRAL ALASKAN RANGE,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5A.
W78-05358

LOCALISED DESTRATIFICATION OF LARGE RESERVOIRS TO CONTROL DISCHARGE TEMPERATURES,
Victoria State Rivers and Water Supply Commission, Melbourne (Australia).
For primary bibliographic entry see Field 8B.
W78-05370

HYDRODYNAMICS OF BUBBLE PLUMES AND OXYGEN ABSORPTION IN STRATIFIED IMPOUNDMENTS,
College of Petroleum and Minerals, Dharan (Saudi Arabia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-05371

NATURAL LAKE WATER TEMPERATURES IN THE NEARSHORE WATERS OF SOUTHEASTERN LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
E. Seibel, and J. C. Ayers.
Journal of Great Lakes Research, Vol 3, No 1-2, p 1-9, October 1977. 4 fig, 6 tab, 15 ref.

Descriptors: *Water temperature, *Lake Michigan, *Fluctuations, *Great Lakes, *Thermal properties, *Temperature, Physical properties, Thermal pollution, Water properties, Aquatic life, Properties, Thermal capacity, Lakes, Surface water, Aquatic environment, *Temperature fluctuation.

A five-year study of the lake-water temperature of southeastern Lake Michigan at four locations ranging in depth from 2 to 40 ft and at a distance of 300 to 3375 ft from shore has produced the conclusion that natural lake-water temperature fluctuations greater than 3 F are a common event, except during the month of January. The greatest and most frequent daily temperature fluctuations occurred during the months of June through September, with the observed maximum daily range of 27 F occurring on 20 July 1970. Direct wind-induced upweling of cold deep offshore waters is probably responsible for the natural daily fluctuations in excdess of 12 F, while daily temperature fluctuations less than 12 F are probably the result of a combination of factors. The range between the maximum and minimum recorded monthly temperatures was substantial. However, the average maximum and minimum average temperatures at different depths did not fluctuate greatly from year to year. The deeper stations consistently showed higher maximum andminimum average temperatures for the months of January through March. The shallower stations consistently showed higher maximum and minimum monthly average temperatures during the months of June through September. The similarity between the monthly average maximum and minimum lake-water temperatures at stations of different depths was interpreted as the result of frequent mixing of the waters in this portion of southeastern Lake Michigan. The data indicated that the natural lake-water temperatures vary over a large range on both a daily and monthly basis. Because the existing aquatic community maintains itself within this naturally wide temperature range, it's questionable whether or not the introduction of thermal effluents will markedly influence the aquatic system in this part of Lake Michigan. (Henley-ISWS)
W78-05391

SEASONAL COLOR-INFRARED PHOTOGRAPHS FOR MAPPING INLAND WETLANDS ON U.S. GEOLOGICAL SURVEY 7.5-MINUTE QUADRANGLES,
Geological Survey, Reston, VA. Water Resources Div.; and Geological Survey, Reston, VA. Topographic Div.
For primary bibliographic entry see Field 7B.
W78-05424

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70--PART 16. HAWAII AND OTHER PACIFIC AREAS.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-05431

BACTERIAL ANALYSIS IN THE WATER OF THE POOLS OF MOULIN-DE-VERT, VERBOIS-GENEVA, (IN FRENCH),
Geneva Univ. (Switzerland). General Microbiology Lab.
For primary bibliographic entry see Field 5A.
W78-05482

EVALUATION OF DATA FOR PONDS, LAKES AND RESERVOIRS IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W78-05483

A MATHEMATICAL MODEL OF ECOLOGICAL DISTURBANCES IN A WATER BASIN ORIGINATING UNDER THE INFLUENCE OF A SHORE POLLUTION SOURCE, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5B.
W78-05495

THE PRIMARY PRODUCTIVITY OF SUBMERGED MACROPHYTES IN WEST BLUE LAKE, MANITOBA,
Manitoba Univ., Winnepeg. Dept. of Botany.
R. J. R. Love, and G. G. C. Robinson.
Canadian Journal of Botany, Vol. 55, No. 2, p 118-127, 1977. 5 fig, 4 tab, 31 ref.

Descriptors: *Aquatic productivity, *Rooted aquatic plants, *Biomass, *Carbon radioisotopes, *Sampling, Productivity, Primary productivity, Plant growth, Submerged plants, Wetlands, Energy transfer, Littoral, Carbon dioxide, Depth, Aquatic environment, Energy gradient, Phytoplankton, Seasonal reliability, Pondweeds, Stratification, *Canada, *West Blue Lake, Manitoba(Canada), Radioactive carbon dioxide.

Submerged species of macrophytes, taken from the lake's littoral zone, were measured for seasonal productivity and the relative value of this energy input to the ecosystem. Measurements of changes in biomass and the assimilation of radioactive carbon dioxide in random and non-random samples throughout the 1973 growing season were used. Changes in biomass of Potamogeton Richardsonii, Myriophyllum alterniflorum, Megalodonta Beckii, and Chara vulgaris determined from random samples compared favorably with those determined from non-random samples. Potamogeton pectinatus, because of limited occurrence, did not give the same results. Similarly, measurements of radioactive CO2 assimilation in random samples of P. Richardsonii, M. alterniflorum, and M. Beckii compared well with non-random samples. Productivity values derived from radioactive CO2 uptake were far in excess of those attained from biomass changes. Seasonal trends of production and the dpeth distribution on production are discussed, and macrophyte production compared to phytoplankton production. (Steiner-Mass)
W78-05513

A MULTIVARIATE ANALYSIS OF THE NICHES OF PLANT POPULATIONS IN RAISED BOGS. I. NICHE DIMENSIONS,
New Hampshire Univ., Durham. Dept. of Botany.
E. A. Johnson.
Canadian Journal of Botany, Vol 55 (9), p 1201-1210, 1977. 2 fig, 3 tab.

Descriptors: *Bogs, *Niches, *Plant populations, *Evaluation, *Ecological distribution, *Wetlands, Biological communities, Habitats, Nutrient requirements, Surface-groundwater relationships, Surface waters, Water quality, Maine, Peat, Analysis, Analytical techniques, Aquatic habitats, *Niche dimensions, Raised bogs, Multivariate analysis.

Principal component analysis is used as an empirical procedure for defining ecological niches in plant populations in raised bogs. The two niche dimensions identified within the raised bogs are related to mineral-ion concentration: (1) atmospheric input differences owing to proximity to the ocean and (2) mineral-soil groundwater influence. Both of these niche dimensions are related to the two important gradients in the surface water quality of the state of Maine. By comparing the principle component analysis study of the vegetation with the principal component analysis study of the physical environment (peat) using transformation analysis, their very similar but non-linear relationship is demonstrated. (Steiner-Mass)
W78-05517

DISTRIBUTION OF LEAD IN SPHAGNUM FUSCUM PROFILES IN FINLAND,
Helsinki Univ. (Finland). Dept. of Botany.
For primary bibliographic entry see Field 5B.
W78-05521

WINTER STANDING CROP AND NUTRIENT CONTENTS IN FIVE CENTRAL NEW YORK WETLANDS,
Ithaca Coll., Dept. of Biology.
J. M. Bernard, and F. A. Bernard.
Bulletin of the Torrey Botanical Club, Vol. 104, No. 1, p 57-59, January-March, 1977. 3 tab, 10 ref.

Descriptors: *Wetlands, *Cattails, *New York, Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, *Standing crops, *Overwintering biomass, *Nutrient content, *Sedges, Carex sp., Bur reed.

Five wetlands, each dominated by a different species, were sampled prior to April 1 using one ladder quadrat of five 25x25 cm or 50x50 cm plots depending on species. Samples were dug to a depth of 30 cm. All species had large overwintering standing crops ranging from 610 g/sq m for Carex lacustris to 1158 g/sq m for Typha glauca. C. lacustris and C. rostrata were characterized by a relatively large above-ground biomass; the others, C. lanuginosa, Sparganium curycarpum, and T. glauca had small aboveground, but massive belowground standing crops. Total nutrient content showed a similar trend. In almost every case, aboveground tissues had higher percentage nutrient concentrations than belowground tissues. (Stihler-Mass)
W78-05522

TRANSPLANTATION OF TYPA AND THE DISTRIBUTION OF VEGETATION AND ALGAE IN A RECLAIMED ESTUARINE MARSH,
Boyce Thompson Inst. for Plant Research, Yonkers, NY.
S. S. Ristich, S. W. Fredrick, and E. H. Buckley.
Bulletin of the Torrey Botanical Club, Vol. 103, No. 4, p 157-164, July-August, 1976. 2 fig, 4 tab, 10 ref.

Descriptors: *Vegetation establishment, *Tidal marshes, *Cattails, Algae, Aquatic plants, *New York, *Reclaimed estuarine marsh, Clone survival, Estuarine environment, Distribution.

Narrow-leaved cattail clones were transplanted into a reclaimed marsh at Camp Smith, Peekskill, New York, with best clone survival occurring in those transplanted between May and June. The clones produced vigorous shoots that fruited the third growing season. During the first and second years, 40 species of vascular plants invaded the reclaimed area via floating seeds and plant fragments or from buried seeds. Floral species were similar to those of the adjacent marsh. Algae of 63 genera invaded the area, and overall generic composition was similar to that of the main channel of the tidal stream bisecting the marsh. (Stihler-Mass)
W78-05526

LIMITATIONS ON MACROPHYTES IN A EUTROPHIC LAKE, LOCH LEVEN. II. WAVE ACTION, SEDIMENTS AND WATERFOWL GRAZING,
Saint Andrews Univ. (Scotland). Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-05527

THE STRATIGRAPHY AND GEOMORPHOLOGY OF THE HOFMANN FOREST POCOSIN,
Soil Conservation Service, Raleigh, NC. and North Carolina State Univ. at Raleigh. Dept. of Soil Science.
R. B. Daniels, E. E. Gamble, W. H. Wheeler, and C. S. Holzhey.
Soil Science Society of America Journal, Vol 41, No 6, p 1175-1180, November-December 1977. 4 fig, 5 tab, 33 ref.

Descriptors: *Swamps, *Forests, *Organic matter, *North Carolina, *Geomorphology, *Stratigraphy, Soils, Drainage, Stream, Overland flow, Precipitation(Atmospheric), Rainfall, Evapotranspiration, Aquicludes, Soil water, Groundwater, Water table, Hydrology, *Pocosins, Pocosin hydrology, Organic soils, Organic accumulation.

Hofmann Forest is a 34,000 ha pocosin (swamp-on-a-hill) that has about 25,000 ha of Histosols 0.4 to 2-m thick. The pocosin is about 17 m above sea level, and large organic areas are uncommon at these at altitudes in North Carolina. A stratigraphic and geomorphic study of Hofmann Forest was made to determine what factors were responsible for the accumulation of organic materials. The organic materials of the pocosin mantle a gentle undulating marine plain that was exposed to subaerial weathering about 220,000 years ago. Few streams drain the area, and the organic materials occupy the undissected interstream divides where the distance between streams is from approximately 0.5 to 8 km. Flux rates indicate that the very low hydraulic conductivity of the pre-Croatan formations and their closeness to the surface prevent significant removal of excess water through the permeable thin surficial beds to the adjacent streams. Rainfall exceeds evaportranspiration, and the excess must be removed primarily by overland flow to the streams. The shallow depth to the pre-Croatan aquicludes, the large distane between streams, and an excess of rainfall over evapotranspiration are the three major reasons why organic materials mantle a gently undulating plain about 17 m above sea level. The first two have remained nearly unchanged over the major part of the Hofmann Forest organic areas for the last 220,000 years. These conditions make the pocosin a potential area for organic accumulation. It is possible that organic deposits have been discontinuous during the last 220,000 years because of wide flucuations in temperature and, presumably, in rainfall. (Sims-ISWS)
W78-05577

2I. Water In Plants

DIFFUSION RESISTANCE AND XYLEM POTENTIAL IN STRESSED AND UNSTRESSED NORTHERN HARDWOOD TREES,
Northeastern Forest Experiment Station, Durham, NH.
C. A. Federer, and G. W. Gee.
Ecology 57, p 975-984, 1976. 6 fig, 3 tab, 33 ref.

Descriptors: *Moisture stress, *Stomata, Deciduous trees, Leaves, Physiological ecology, Soil-water-plant relationships, Leaf conductance, Leaf resistance, Plant-water potential, New Hampshire.

In a northern hardwood forest in central New Hampshire, daytime diffusion resistances of abaxial leaf surfaces were independent of light level above 250 microeinsteins/(sq m s), increased as vapor pressure deficit increased, and decreased as temperature increased. High vapor pressure deficit at midday caused slight stomatal closure, which appeared to be indipendent of leaf H20 potential. Low plant H20 potential may have produced additional closure at high atmospheric demand even though soil-water potential was > -0.2 bar. At an atmospheric demand of 250 W per sq m xylem potential averaged -16 bar for Betula alleghaniensis, -21 bar for Acer saccharum, and -23 bar for Fagus grandifolia, and decreased only sightly as demand increased further. Daytime diffusion resistance averaged 2.5 s/cm for B. alleghaniensis, 3.1 s/cm for A. saccharum, and 3.3 s/cm for F. grandifolia when light was adequate. The resistance difference implies the possibility of higher transpiration rates in B. alleghaniensis. Several trees were artificially stressed by trenching around them and covering the soil block with polyethylene. After 2-3 wk with rain excluded, soil-water potential ranged from -0.4 to -0.8 bar, and daytime diffusion resistance averaged 5 s/cm, indicating significant stomatal closure caused by H20 stress. However daytime xylem potentials on stressed trees were the same as or higher than those on unstressed trees. Stomatal control effectively prevented excessive H20 loss and prevented xylem potential from declining below its normal operating levels. (Forest Service)
W78-05246

DIFFERING DIFFUSIVE RESISTANCE AND LEAF DEVELOPMENT MAY CAUSE DIFFERING TRANSPIRATION AMONG HARDWOODS IN SPRING,
Northeastern Forest Experiment Station, Durham, NH.
For primary bibliographic entry see Field 2D.
W78-05247

NUTRIENTS: A MAJOR CONSIDERATION IN INTENSIVE FOREST MANAGEMENT,
Northeastern Forest Experiment Station, Durham, NH.
For primary bibliographic entry see Field 4A.
W78-05250

MACROPHYTE-EPIPHYTE BIOMASS AND PRODUCTIVITY IN AN EELGRASS (ZOSTERA MARINA L.) COMMUNITY,
North Carolina State Univ. at Raleigh.
For primary bibliographic entry see Field 2L.
W78-05512

THE PRIMARY PRODUCTIVITY OF SUBMERGED MACROPHYTES IN WEST BLUE LAKE, MANITOBA,
Manitoba Univ., Winnepeg. Dept. of Botany.
For primary bibliographic entry see Field 2H.
W78-05513

EARLY PLANT SUCCESSION ON A DREDGING SPOILS ISLAND IN THE SENECA RIVER OF UPSTATE NEW YORK,
Eisenhower Coll., Seneca Falls, NY. Div. of Science and Mathematics.
For primary bibliographic entry see Field 5G.
W78-05523

VEGETATION GRADIENTS IN THE STREAMSIDE FOREST OF HICKORY CREEK, WILL COUNTY, ILLINOIS,
Illinois Univ. at Urbana-Champaign. Dept. of Forestry.
D. T. Bell, and R. Moral.
Bulletin of the Torrey Botanical Club, Vol. 194, No. 2, p 127-135, April-June, 1977. 2 fig, 3 tab, 25 ref.

Descriptors: *Flood plains, *Deciduous trees, Succession, Wetlands, *Illinois, Streams, Flood frequency, Maple trees, Ash trees, *Vegetation gradients, *Streamside forests, Green ash, Sugar maple, Crataegus mollis, Species diversity, American basswood, Species richness, Flood stress, *Hickory Creek(Ill).

Mature upland forests are dominated by sugar maple with American basswood being the most common associate. Mature flood plain regions harbor a green ash-American basswood dominated complex. The first forest stage in both regions is dominated by Crataegus mollis. Stand structure was also influenced by the response of species to an elevational gradient associated with flood frequency. Species richness and species diversity tended to increase with increasing maturity and decreasing flood stress. (Steiner-Mass)
W78-05611

2J. Erosion and Sedimentation

PRESERVING THE ENVIRONMENT OF A SANDHILLS REGION CONCURRENT WITH INTENSIVE IRRIGATION DEVELOPMENT,
Nebraska Univ., Lincoln. Water Resources Center.
For primary bibliographic entry see Field 3F.
W78-05348

WATER-HOLDING CAPACITY FOR HYDROMULCH,
California State Dept. of Transportation, Sacramento. Transportation Lab.
For primary bibliographic entry see Field 4D.
W78-05363

SEDIMENTATION OF DISPERSED OIL IN SURFACE WATERS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. of Aquatic Sciences.
For primary bibliographic entry see Field 5B.
W78-05373

TRANSVERSE MIXING IN MEANDERING CHANNELS WITH VARYING BOTTOM TOPOGRAPHY,
Canada Centre for Inland Waters, Burlington (Ontario). Hydraulics Research Div.
For primary bibliographic entry see Field 5B.
W78-05390

AUTOMATED ATOMIC ABSORPTION SPECTROMETRIC DETERMINATION OF TOTAL ARSENIC IN WATER AND STREAMBED MATERIALS,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-05421

AN ANALYSIS OF SALINITY IN STREAMS OF THE GREEN RIVER BASIN, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-05439

TRANSVERSE BED SLOPES IN CURVED ALLUVIAL STREAMS,
Karlsruhe Univ. (West Germany). Inst. fuer Hydromechanik.
For primary bibliographic entry see Field 8B.
W78-05567

TEMPERATURE AND MISSOURI RIVER STAGES NEAR OMAHA,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-05569

HIGHWAYS IN THE RIVER ENVIRONMENT--HYDRAULIC AND ENVIRONMENTAL DESIGN CONSIDERATIONS, BASIC COURSE, INSTRUCTOR'S LESSON PLANS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-05585

MATHEMATICAL MODELING OF SHORELINE EVOLUTION,
Tetra Tech, Inc., Pasadena, CA.
For primary bibliographic entry see Field 2L.
W78-05626

OFFSHORE PERMAFROST STUDIES, BEAUFORT SEA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 2L.
W78-05635

AREAS OF FAULTING AND POTENTIALLY UNSTABLE SEDIMENTS IN THE ST. GEORGE BASIN REGION, SOUTHERN BERING SEA,
Geological Survey, Menlo Park, CA.
J. V. Gardner, and T. L. Vallier.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 17. Hazards, p 230-241, March 1977. 6 fig, 3 tab, 7 ref.

Descriptors: *Sediments, *Faults(Geologic), *Hazards, *Soil mechanics, Baseline studies, Resources development, Alaska, *Outer Continental Shelf, Bering Sea, Petroleum development, Offshore operations.

Preliminary analyses of seismic and sediment data collected during the 1976 field year in the St. George Basin region of the southern Bering Sea continental margin, indicate that the large submarine canyons in the region, the Pribilof and Bering Canyons, exert a profound influence on the sediment distribution and dynamics of the adjacent outer continental shelf region including St. George and Amak Basins. In addition data show that the upper continental slope and shelf break are areas of mass movement of sediment (creeping, slumping, and catastrophic movement as shown by steep scarps). The effects of the canyons on the distribution of sediment and the near-bottom dynamics must be known before man-made structures, whether they be offshore rigs, underwater completion systems, storage facilities, or pipelines, are placed in this area. An investigation of slumping along the continental margin should allow an estimate of the present rate of sediment flux over the outer continental shelf region and what it has been in the past. This study focuses on faulting and potential sediment instability by describing the types and distribution of faults and by outlining areas where potentially unstable sediment masses occur. (See also W78-05222) (Sinha-OEIS)
W78-05637

FAULTING, INSTABILITY, EROSION, AND DEPOSITION OF SHELF SEDIMENTS, EASTERN GULF OF ALASKA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 2L.
W78-05639

BENTHOS-SEDIMENTARY SUBSTRATE INTERACTIONS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W78-05643

SHALLOW FAULTING, BOTTOM INSTABILITY, AND MOVEMENT OF SEDIMENTS IN LOWER COOK INLET AND WESTERN GULF OF ALASKA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 2L.
W78-05644

FAULTING, SEDIMENT INSTABILITY, EROSION, AND DEPOSITION HAZARDS OF THE NORTON BASIN SEAFLOOR,
Geological Survey. Menlo Park, CA.
For primary bibliographic entry see Field 2L.
W78-05646

SEDIMENT TRANSPORT IN NORTON SOUND - NORTHERN BERING SEA, ALASKA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 2L.
W78-05647

COASTAL PROCESSES AND MORPHOLOGY OF THE BERING SEA COAST OF ALASKA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 2L.
W78-05648

2K. Chemical Processes

STUDY ON THE STATE OF WATER IN DISPERSIONS OF H+, MG2+ AND FE3+ MONTMORILLONITES BY HIGH-RESOLUTION NMR, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics; and Moscow State Univ. (USSR). Dept. of Soil Melioration.
V. F. Babanin, A. D. Voronin, and Yu. E. Malinovskii.
Vestn Mosk Univ Ser Vi Biol Pochvoved 31(4), p 94-98, 1976.

Descriptors: Cations, *Hydrogen ions, *Iron ions, *Magnesium ions, Minerals, Montmorillonites, Surface waters, *Ion transport, Neutron magnetic resonance.

Two forms of water were discovered that are distinguished by the degree of mobility in the force field of the mineral surface. The type of cation has an influence on the size of the boundary zones.--Copyright 1977, Biological Abstracts, Inc.
W78-05238

SEASONAL PATTERNS IN ACIDITY OF PRECIPITATION AND THEIR IMPLICATIONS FOR FOREST STREAM ECOSYSTEMS,
Northeastern Forest Experiment Station, Durham, NH.
J. W. Hornbeck, G. E. Likens, and J. S. Eaton.
In: L. S. Dochinger and T. A. Seliga (editors), Proceedings of First International Symposium on Acid Precipitation and the Forest Ecosystem. USDA Forest Service General Technical Report NE-23, p. 597-603, 1976, 5 fig, 1 tab, 13 ref.

Descriptors: *Chemistry of precipitation, *Forests, *Acidity, Snowpack, Streamflow, Ion exchange, *Seasonal patterns, New Hampshire, Hubbard Brook Experimental Forest(NH), H ion exchange, *Precipitation acidity, Throughfall chemistry.

Data collected since 1965 at a network of nine stations in the northeastern United States show that precipitation is most acid in the growing season (May-September) and least acid in winter (December-February). For the Hubbard Brook station in New Hampshire, where the mean hydrogen ion content of precipitation ranges between 46 micro eq/l in winter and 102 micro eq/l in summer, the seasonal pattern in acidity correlates closely with seasonal differences in S deposition from the atmosphere. As summer precipitation passes through the forest canopy, H ion concentrations are lowered by an average of 90%, primarily as a result of exchange with other cations. In winter the H ion content of incident precipitation is lowered from a mean of 50 micro eq/l to a mean of 25 micro eq/l during storage in the snowpack. (Forest Service)
W78-05244

NUTRIENTS: A MAJOR CONSIDERATION IN INTENSIVE FOREST MANAGEMENT,
Northeastern Forest Experiment Station, Durham, NH.
For primary bibliographic entry see Field 4A.
W78-05250

ANNUAL REPORT ON THE DEVELOPMENT OF SENSORS AND TECHNIQUES FOR IN SITU WATER QUALITY MONITORING,
Pittsburgh Univ., PA. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 5A.
W78-05362

MICROPROBE ANALYSIS OF PROJECT DUSTORM HAILSTONE SAMPLES,
National Center for Atmospheric Research, Boulder, CO.
S. N. Gitlin.
Journal of Applied Meteorology, Vol 17, No 1, p 64-72, January 1978. 10 fig, 4 tab, 3 ref.

Descriptors: *Hail, *Soils, *Dust storms, X-ray analysis, Wind erosion, Chemical analysis, Chemicals, Aluminum, Potassium, Calcium, Sodium, Chlorine, Silica, Cloud physics, Meteorology, Hailstones.

Electron microprobe X-ray analysis was used to determine the origin and composition of particulate matter found in hailstones produced during severe storms in the midwestern and central United States. Ratios of aluminum, potassium, calcium, sodium, and chlorine X-ray counts to silicon counts were measured for soil samples collected on the ground and compared with ratios for aerosols collected by aircraft and for the particles found in hailstones. Hailstones had higher ratios of K/Si and Ca/Si and lower ratios of Al/Si than the ratios found in soils. Chlorine (absent in dry soil particles) and sodium were found in the hailstones, suggesting that these elements may belong to a compound that is marine in origin. (Sims-ISWS)
W78-05381

AUTOMATED ATOMIC ABSORPTION SPECTROMETRIC DETERMINATION OF TOTAL ARSENIC IN WATER AND STREAMBED MATERIALS,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-05421

AN ANALYSIS OF SALINITY IN STREAMS OF THE GREEN RIVER BASIN, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-05439

GROUND WATER IN THE KOEHN LAKE AREA, KERN COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-05442

DEVELOPMENT OF A SYSTEM FOR CONDUCTING INTERLABORATORY TESTS FOR WATER QUALITY AND EFFLUENT MEASUREMENTS,
FMC Corp., San Jose, CA. Advanced Products Div.
For primary bibliographic entry see Field 5A.
W78-05534

RELIABLE ANALYSES OF WATER BY INDUCTIVELY COUPLED PLASMA EMISSION SPECTROSCOPY,
Environmental Research Lab., Athens, GA.
For primary bibliographic entry see Field 5A.
W78-05542

THE INFLUENCE OF CATION EXCHANGE AND GYPSUM SOLUBILITY ON THE TRANSPORT OF SODIUM, CALCIUM AND SULPHATE THROUGH SOILS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soils and Fertilizers.
For primary bibliographic entry see Field 2G.
W78-05576

2L. Estuaries

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME I. RECEPTORS--MAMMALS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05206

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME II. RECEPTORS--BIRDS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05207

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME III. RECEPTORS--BIRDS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05208

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME IV. RECEPTORS--BIRDS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05209

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME V. RECEPTORS--BIRDS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05210

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME VI. RECEPTORS--FISH, LITTORAL, BENTHOS,
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05211

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME VII. RECEPTORS--FISH, LITTORAL, BENTHOS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05212

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME VIII. RECEPTORS--FISH, LITTORAL, BENTHOS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05213

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME IX. RECEPTORS--FISH, LITTORAL, BENTHOS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05214

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME X. RECEPTORS--FISH, LITTORAL, BENTHOS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05215

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XI. RECEPTORS--MICROBIOLOGY.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05216

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XII. EFFECTS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05217

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF VOLUME XIII. CONTAMINANT BASELINES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05218

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XIV. TRANSPORT.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05219

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XV. TRANSPORT.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05220

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XVI. HAZARDS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05221

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XVII. HAZARDS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05222

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XVIII. HAZARDS, DATA MANAGEMENT.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05223

PROCESSES OF CARBON DIOXIDE FLUX IN THE FANNING ISLAND LAGOON,
Hawaii Inst. of Marine Biology, Honolulu.
For primary bibliographic entry see Field 5B.
W78-05229

ELECTROMAGNETIC WATER CURRENT METER WITH SYNTHETIC DIRECTION FIELD,
For primary bibliographic entry see Field 7B.
W78-05234

PROCEEDINGS OF THE CONFERENCE ON ASSESSING THE EFFECTS OF POWER-PLANT-INDUCED MORTALITY ON FISH POPULATIONS.
Energy Research and Development Administration, Oak Ridge, TN.; and Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5C.
W78-05251

SOME FACTORS REGULATING THE STRIPED BASS POPULATION IN THE SACRAMENTO-SAN JOAQUIN ESTUARY, CALIFORNIA,
California State Dept. of Fish and Game, Stockton.
For primary bibliographic entry see Field 5C.
W78-05253

ESTIMATING THE SIZE OF JUVENILE FISH POPULATIONS IN SOUTHEASTERN COASTAL-PLAIN ESTUARIES,
National Marine Fisheries Service, Beaufort, NC. Beaufort Lab.
For primary bibliographic entry see Field 5C.
W78-05256

STRIPED BASS (MORONE SAXATILIS) MONITORING TECHNIQUES IN THE SACRAMENTO-SAN JOAQUIN ESTUARY,
California State Dept. of Fish and Game, Stockton.
For primary bibliographic entry see Field 5C.
W78-05257

BIOLOGICAL ASSESSMENT OF THE SOLUBLE FRACTION OF THE STANDARD ELUTRIATE TEST,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5A.
W78-05366

SEDIMENT STUDIES IN BACK RIVER ESTUARY, BALTIMORE, MARYLAND.
National Enforcement Investigations Center, Denver, CO.
For primary bibliographic entry see Field 5B.
W78-05369

THE APPLICATION OF A TWO-LAYER TIME-DEPENDENT MODEL TO POLLUTION ASSESSMENT AND CONTROL IN A SHORT STRATIFIED ESTUARY,
Sydney Univ. (Australia). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W78-05375

PRELIMINARY DESIGN OF OCEAN OUTFALL AT SYDNEY: PROTECTION OF BATHING WATERS,
Caldwell Connell Engineers, Melbourne (Australia).
For primary bibliographic entry see Field 5B.
W78-05377

STATE GUIDELINES FOR LOCAL PLANNING IN THE COASTAL AREA UNDER THE COASTAL AREA MANAGEMENT ACT OF 1974.
North Carolina Coastal Resources Commission, Raleigh.
For primary bibliographic entry see Field 6E.
W78-05399

POTENTIAL FOR LAND SUBSIDENCE DUE TO REDUCTION OF ARTESIAN HEAD IN THE ATLANTIC COASTAL PLAIN,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-05422

A MATHEMATICAL MODEL OF ECOLOGICAL DISTURBANCES IN A WATER BASIN ORIGINATING UNDER THE INFLUENCE OF A SHORE POLLUTION SOURCE, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
For primary bibliographic entry see Field 5B.
W78-05495

ANALYSIS OF ORGANIC MATTERS IN KRAFT PULP MILL EFFLUENT IN HIRO BAY (HIROWAN KURAFUTO PARUPU KOJO HAISUIKO FUKIN NO YUKIBUTSU NO BUNSEKI),
Government Industrial Research Inst., Hirohata (Japan).
For primary bibliographic entry see Field 5A.
W78-05502

PHYTOPLANKTON IN A TEMPERATE-ZONE SALT MARSH: NET PRODUCTION AND EXCHANGES WITH COASTAL WATERS,
State Univ. of New York at Stony Brook. Dept. of Ecology and Evolution.
For primary bibliographic entry see Field 5C.
W78-05511

MACROPHYTE-EPIPHYTE BIOMASS AND PRODUCTIVITY IN AN EELGRASS (ZOSTERA MARINA L.) COMMUNITY,
North Carolina State Univ. at Raleigh.
P. A. Penhale.
Journal of Experimental Marine Biology and Ecology, Vol. 26, p 211-224, 1977. 7 fig, 1 tab, 28 ref.

Descriptors: *Rooted aquatic plants, *Environmental effects, *Biomass, *Productivity, *Estuaries, Epiphytology, Aquatic plants, Aquatic algae, Marine plants, Light intensity, Water temperature, Wetlands, Aquatic habitats, Seasonal, Tides, Photosynthesis, North Carolina, *Eelgrass, *Epiphytes, Macrophytes.

The biomass, productivity, and photosynthetic response to light and temperature of eelgrass, Zostera marina, and its epiphytes was measured in a shallow estuarine system. The maximum of the above-ground biomass was measured in Marsh; this was followed by a general decline throughout the rest of the year. Eelgrass and epiphyte productivity was low during the spring and early summer, gave a maximum during later summer and fall, and declined during the winter; this progression was probably due to environmental factors associated with tidal heights. On an areal basis, the average annual productivity was 0.9 g carbon/sq m/day for eelgrass and 0.2 g carbon/sq m/day for the epiphytes. Rates of photosynthesis of both eelgrass and epiphytes increased with increasing temperature to an asymptotic value at which the systm was light saturated. Both eelgrass and epiphytes had a temperature optimum of 29 degrees C. A negative response to higher temperatures was also reflected in biomass measurements which showed the destruction of eelgrass with increasing summer temperatures. The data suggest that the primary productivity cycles of macrophytes and epiphytes are closely interrelated. (Steiner-Mass)
W78-05512

FLAX POND ECOSYSTEM STUDY: EXCHANGES OF PHOSPHORUS BETWEEN A SALT MARSH AND THE COASTAL WATERS OF LONG ISLAND SOUND,
Marine Biological Lab., Woods Hole, MA.
For primary bibliographic entry see Field 5C.
W78-05514

HETEROTROPHIC ACTIVITY ASSOCIATED WITH PARTICULATE SIZE FRACTIONS IN A SPARTINA ALTERNIFLORA SALT-MARSH ESTUARY, SAPELO ISLAND, GEORGIA, USA, AND THE CONTINENTAL SHELF WATERS,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 5C.
W78-05515

INCREASE IN ABUNDANCE OF SOLIDAGO SEMPERVIRENS ON A DIKED SALT MARSH IN SOUTHWESTERN CONNECTICUT,
Fairfield Univ., CT. Dept. of Biology.
For primary bibliographic entry see Field 2G.
W78-05518

EFFECTS OF SALINITY AND INUNDATION ON THE GROWTH OF AGROSTIS STOLONIFERA AND JUNCUS GERARDII,
Vrije Univ., Amsterdam (Netherlands). Biological Lab.
For primary bibliographic entry see Field 5C.
W78-05519

RESPONSE OF WEST COAST BEACH TAXA TO SALT SPRAY, SEAWATER INUNDATION, AND SOIL SALINITY,
California Univ., Davis. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-05520

AQUATIC METABOLISM OF THE COMMUNITIES ASSOCIATED WITH ATTACHED DEAD SHOOTS OF SALT MARSH PLANTS,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 5C.
W78-05524

OBSERVATIONS ON ICE DEPOSITED BY WAVES ON ALASKAN ARCTIC BEACHES,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2C.
W78-05595

MANAGEMENT: SOUTHEAST CONTINENTAL SHELF STUDIES,
Skidaway Inst. of Oceanography, Savannah, GA.
For primary bibliographic entry see Field 6E.

W78-05625

MATHEMATICAL MODELING OF SHORELINE EVOLUTION,
Tetra Tech, Inc., Pasadena, CA.
B. Le Mehaute, and M. Soldate.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-047 641, Price codes: A04 in paper copy, A01 in microfiche. Army Corps of Engineers, Coastal Engineering Research Center Miscellaneous Report No 77-10, October 1977. 56 p, 21 fig, 2 tab, 33 ref. DACW72-7T-C-0002.

Descriptors: *Mathematical models, *Resources development, *Coastal engineering, Shores, Slope stability, Beach erosion, Environmental effects, *Outer Continental Shelf, Shorelines.

A critical literature survey on mathematical modeling of shoreline evolution is presented. The emphasis is on long-term evolution rather than seasonal or evolution taking place during a storm. The one-line theory of Pelnard-Considere (1956) is developed along with a number of applications. Refinements to the theory are introduced by considering changes of beach slope, wave diffraction effects, wave variation, and variation of sea level. The case of hooked bays is also reviewed. It is concluded that a finite-difference mathematical scheme could be developed for engineering purposes for a small wave angle. For the large wave angle, shoreline instability does not permit use of a reliable mathematical model at this time. (Sinha-OEIS)
W78-05626

TRANSPORT AND TRANSFER RATES IN THE WATERS OF THE CONTINENTAL SHELF,
Lamont-Doherty Geological Observatory, Palisades, NY.
For primary bibliographic entry see Field 5B.
W78-05627

COASTAL MORPHOLOGY, SEDIMENTATION AND OIL SPILL VULNERABILITY,
South Carolina Univ., Columbia. Div. of Coastal Research.
For primary bibliographic entry see Field 5G.
W78-05628

THE ENVIRONMENTAL GEOLOGY AND GEOMORPHOLOGY OF THE GULF OF ALASKA COASTAL PLAIN AND THE COASTAL ZONE OF KOTZEBUE SOUND,
Alaska Univ., College. Dept. of Solid Earth Science.
P. J. Cannon.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 16. Hazards, p 333-345, March 1977. 4 fig, 2 ref. 03-5-022-56.

Descriptors: *Geomorphology, *Coasts, *Baseline studies, *Cold regions, Climatology, Resources development, Water pollution, Hazards, *Outer Continental Shelf, Gulf of Alaska, Kotzebue Sound, Petroleum development, Offshore operations.

Due to the retarding effect of the Arctic climate some geomorphic features (such as old shorelines and deltas) have been uniquely preserved. The delineation of past shorelines and deltas will perhaps indicate potential archaeological sites. The coastal zone exhibits a large range of geomorphic features and within the coastal zone the interaction of major geomorphic processes is complex. Due to this complexity, consideration of environmental problems and potential developments within the coastal zone will have to be done on a location by location basis. Environmental assessments must be made by geomorphic divisions with special attention being given to specific features within the divisions. (See also W78-05221) (Sinha-OEIS)
W78-05632

THE ENVIRONMENTAL GEOLOGY AND GEOMORPHOLOGY OF THE GULF OF ALASKA COASTAL PLAIN,
Alaska Univ., College. Div. of Geoscience.
P. J. Cannon.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 16. Hazards, p 346-384, March 1977. 9 fig, 5 tab, 7 ref, 5 maps.

Descriptors: *Geomorphology, *Hazards, *Baseline studies, Resources development, *Outer Continental Shelf, *Radar imagery, *Geologic hazards, Gulf of Alaska, Petroleum development, Offshore operations.

Information which can be used in an environmental assessment of the coastal plain of the Gulf of Alaska is presented as well as an evaluation of radar imagery as a major information source for environmental geological mapping. The radar imagery of the Gulf of Alaska coastal plain indicates that severe environmental geologic hazards, such as earthquakes, surface movements along active faults, and outburst floods, have occurred recently and will continue to occur with a relatively high frequency. Natural processes are modifying parts of the coastal plain at a relatively rapid rate. These processes include the formation of large lakes by glacial ablation and the erosion of headlands due to changes in the sediment supply from glaciers. It is necessary to emphasize that the changes are natural and not the result of man's activities. In an area like the Gulf of Alaska, radar imagery is the only tool which can be used to adequately monitor the results of natural processes. (See also W78-05221) (Sinha-OEIS)
W78-05633

DELINEATION AND ENGINEERING CHARACTERISTICS OF PERMAFROST BENEATH THE BEAUFORT SEA,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-05634

OFFSHORE PERMAFROST STUDIES, BEAUFORT SEA,
Geological Survey, Menlo Park, CA.
D. M. Hopkins.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 16. Hazards, p 396-518, March 1977.

Descriptors: *Permafrost, *Sediments, *Geologic history, *Cold regions, Baseline studies, Hazards, Ice, Alaska, *Outer Continental Shelf, *Subsea permafrost, Geologic hazards, Petroleum development, Offshore operations, Beaufort Sea, Prudhoe Bay.

This study is designed to obtain direct knowledge of offshore permafrost, based on thermally instrumented boreholes in the Prudhoe Bay area. Three boreholes were drilled during spring 1976, and additional boreholes will be placed during spring 1977. The 1976 boreholes, combined with boreholes placed by the Univ. of Alaska in 1975 and a single borehole placed on Reindeer Island by Humble Oil Company some years earlier, show that the subsea sediments are below 0C throughout the Beaufort Sea shelf at least as far as 13 km offshore and suggest that sub-zero temperatures are found to the edge of the shelf. In shallow water areas where winter ice rests on the bottom, the subsea sediments are ice-bonded beginning at a depth of a few meters and extending to depths of several hundred meters. Further offshore, the subsea sediments are soaked with liquid brine to depths of 50 m or more, but relict ice-bonded permafrost is commonly present at greater depths on those parts of the shelf that lie landward of the 20-m isobath. The report presents detailed data on paleomagnetic character and fossil content of the sediments and an extensive discussion of the thermal data. (See also W78-05221) (Sinha-OEIS)
W78-05635

MARINE ENVIRONMENTAL PROBLEMS IN THE ICE COVERED BEAUFORT SEA SHELF AND COASTAL REGIONS,
Geological Survey, Menlo Park, CA.
P. Barnes, E. Reimnitz, and D. Drake.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 17. Hazards, p 1-229, March 1977.

Descriptors: *Sea ice, *Permafrost, *Hazards, *Geomorphology, Sediments, Scour, Pipelines, Foundations, Water resources, Environmental effects, Alaska, *Outer Continental Shelf, Engineering properties, Offshore operations, Beaufort Sea.

The character of the Arctic continental shelf and coastal area, with its year round and seasonal sea ice and with its permafrost, faces the developer with many special problems. The interaction of the Arctic shelf with the Arctic pack ice takes the form of ice gouging and the formation of a large stamukhi zone each winter. Oil drilling and production during the next several years will probably not extend into the stamukhi zone seaward of the seasonal fast-ice zone. Of critical concern are the ice gouge and strudel scour effects on structures and pipelines. Any structure which is to be mated with the ocean floor requires data concerning the strength and character of the ocean floor. Furthermore, foundation materials in the form of gravels will be needed for work pads offshore. In addition, the offshore drilling operation may encounter permafrost which could be substantially altered during the process of pumping hot oil up to the sea floor or along the sea floor in gathering and transportation pipelines. (See also W78-05222) (Sinha-OEIS)
W78-05636

AREAS OF FAULTING AND POTENTIALLY UNSTABLE SEDIMENTS IN THE ST. GEORGE BASIN REGION, SOUTHERN BERING SEA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 2J.
W78-05637

EARTHQUAKE ACTIVITY AND GROUND SHAKING IN AND ALONG THE EASTERN GULF OF ALASKA,
Geological Survey, Menlo Park, CA. Office of Earthquake Studies.
C. D. Stephens, and J. C. Lahr.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 17. Hazards, p 242-275, March 1977. 12 fig, 18 ref, 4 append.

Descriptors: *Earthquakes, *Baseline studies, *Hazards, Resources development, Alaska, *Outer Continental Shelf, Gulf of Alaska, Epicenters, Petroleum development.

The objective of this research is to evaluate the hazards associated with earthquake activity in the eastern Gulf of Alaska and adjacent onshore areas. These hazards may pose a threat to the safety of petroleum development. Preliminary earthquake epicenters in the eastern Gulf of Alaska region were plotted and a catalog of the events listed. The pattern of seismic activity with close spatial and temporal clustering of earthquakes, appears to be characteristic of the low-magnitude activity in the eastern Gulf of Alaska. In the first quarter of 1976, a number of earthquakes occurred in the Prince William Sound

area southwest of Valdez. These events suggest a linear northwest trend that closely parallels other structures and faults near this area, although there are no mapped or inferred faults clearly associated with the activity. Over the past two years the Icy Bay area has been almost continually active. A well-defined, northeast trend in the epicenters of the earthquakes which have occurred since September of 1974 closely parallels the strike of both an offshore anticline and an inferred onshore thrust. (See also W78-05222) (Sinha-OEIS)
W78-05638

FAULTING, INSTABILITY, EROSION, AND DEPOSITION OF SHELF SEDIMENTS, EASTERN GULF OF ALASKA,
Geological Survey, Menlo Park, CA.
P. I. P. R. Carlson, and B. F. Molnia.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 17. Hazards, p 276-317, March 1977. 17 fig, 51 ref.

Descriptors: *Earthquakes, *Hazards, *Baseline studies, Erosion, Sedimentation, Resources development, Alaska, *Outer Continental Shelf, *Gulf of Alaska, Petroleum development.

The northeastern Gulf of Alaska OCS is a region of frequent earthquakes, violent storms, and rapid accumulation of unconsolidated sediment. These phenomena create significant seafloor environmental hazards chief of which are: (1) surface and near-surface faulting, (2) rapid deposition and erosion, and (3) instability of the seafloor. Surface and near-surface faults thus far detected are in four main parts of the OCS area: (1) south of Cape Yakataga, (2) on or adjacent to the Kayak Island platform (3) on Tarr Bank and (4) near Middleton Island. Most of the faults cut Tertiary strata that either crop out at the seafloor or are covered by a thin veneer of Holocene sediment. Very few faults have been found that unequivocally cut Holocene sediments. The areas of most rapid accumulation of Holocene unconsolidated sediments are the nearshore zones seaward of the Copper River and seaward of the Malaspina and Bering Glaciers. (See also W78-05222) (Sinha-OEIS)
W78-05639

SEISMIC AND VOLCANIC RISK STUDIES - WESTERN GULF OF ALASKA,
Alaska Univ., College. Geophysical Inst.
H. Pulpan, and J. Kienle.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 17. Hazards, p 318-423, March 1977. 13 fig, 4 append. 03-5-022-55.

Descriptors: *Volcanoes, *Earthquakes, *Baseline studies, Hazards, Alaska, Resources development, *Outer Continental Shelf, Gulf of Alaska, Petroleum development.

The purpose of this research was to determine the seismicity of the Lower Cook Inlet, Kidiak Island, and Alaska Peninsula areas and the associated seismic risk to onshore and offshore developments. It was also the purpose to monitor the earthquake activity of two recently active volcanoes and evaluate their eruption potential and associated risk. The seismic network layout is given with remarks on their operations and failures due to the weather and poor quality of transmission. The higher density of earthquake hypocenters in the lower Cool Inlet seem to be a reflection of the higher reliability of that network and the higher station density. However until a sufficiently long period of reliable operation has been achieved, no comparison of the seismicity level between the different areas can be made. Augustine Volcano was visited two more times after the emergency field operations in late January and February 1976 following the initial vent clearing eruptions of January 22-25, 1976, and the extrusion of a new lava dome in early February 1976. A narrative of the 1976 eruption is given. (See also S78-05222) (Sinha-OEIS)
W78-05640

OFFSHORE PERMAFROST - DRILLING, BOUNDARY CONDITIONS, PROPERTIES, PROCESSES AND MODELS. DELINEATION OF MOST PROBABLE AREAS FOR SUBSEA PERMAFROST IN THE CHUKCHI SEA FROM EXISTING DATA. SUBSEA PERMAFROST: PROBING, THERMAL REGIME AND DATA ANALYSIS,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W78-05641

BEAUFORT SEACOAST PERMAFROST STUDIES,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W78-05642

SHALLOW FAULTING, BOTTOM INSTABILITY, AND MOVEMENT OF SEDIMENTS IN LOWER COOK INLET AND WESTERN GULF OF ALASKA,
Geological Survey, Menlo Park, CA.
M. A. Hampton, and A. H. Bouma.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 17. Hazards, p 519-626, March 1977. 2 tab, 8 ref, 5 append.

Descriptors: *Sediments, *Seismology, *Baseline studies, Resources development, Hazards, Alaska, *Outer Continental Shelf, *Submarine slides, *Offshore operations, Gulf of Alaska, Environmental conditions, Petroleum development.

Geological investigations in lower Cook Inlet and the western Gulf of Alaska (Kodiak Shelf) were conducted in 1976 aboard the R/V SEA SOUNDER during a period of 6 weeks. Seismic profiling and sampling of bottom sediments were the prime activities, but also limited side-scan sonar and bottom television observations were made. The prime objectives were the identification of active faults and sediment instability as part of an assessment of environmental geologic hazards, and to obtain information about sediment types and their distribution. Both the influence of seismicity, and the sweeping clean of the bank tops and concentrating finer materials in the troughs, pose certain difficulties in OCS oil and gas development. The relationship between physiography and sediment type shows the influence of the current regime and determines the distribution of benthic biota. (See also W78-05222) (Sinha-OEIS)
W78-05644

SEISMICITY OF THE BEAUFORT SEA, BERING SEA AND GULF OF ALASKA,
National Geophysical and Solar Terrestrial Data Center, Boulder CO.
H. Meyers.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 17. Hazards, p 627-629, March 1977.

Descriptors: *Seismology, *Hazards, *Baseline studies, Resources development, Alaska, *Outer Continental Shelf, Offshore operations, Petroleum development, Beaufort Sea, Bering Sea, Gulf of Alaska.

The Alaskan region is one of the most seismic regions in the world. The location and design of drilling platforms, pipelines, storage and support facilities will have to take this factor into consideration. The objective of this research is to compile a historical file of earthquake data and present it in a fashion which would permit independent assessment of the seismic risk for various localities in Alaska. Three publications have been produced to date: 'A Historical Summary of Earthquake Epicenters in and Near Alaska', April 1976, NOAA Technical Memorandum EDS. NGSDC-1; 'Catalog of Tsunamis in Alaska, Revised 1976', March 1976, Preport SE-1; and 'An Analysis of Earthquake Intensities and Recurrence Rates in and Near Alaska', October 1976, NOAA Technical Memorandum EDS NGSDC-3. (See also W78-05222) (Sinha-OEIS)
W78-05645

FAULTING, SEDIMENT INSTABILITY, EROSION, AND DEPOSITION HAZARDS OF THE NORTON BASIN SEAFLOOR,
Geological Survey. Menlo Park, CA.
H. Nelson.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 18. Hazards, Data Management, p 1-129, March 1977.

Descriptors: *Hazards, *Faults(Geologic), *Erosion, *Seepage, Baseline studies, Alaska, Scour, Storm surge, Resources development, *Outer Continental Shelf, Norton Sound, Bering Strait, Petroleum development, Environmental conditions.

Preliminary assessment has been made on potential geological hazards of faulting, ice gouging, gas cratering of surface sediments, storm surge activity, and strong bottom currents. Present knowledge suggests that the Yukon delta and eastern Bering Strait areas have the combination of the most severe geologic hazards. Faulting and current scour are most intense in Bering Strait. Ice gouge, bottom current and storm surge activity are all intense in the extensive, shallow area off the modern Yukon subdelta. The severity and areal extent of gas cratering cannot yet be assessed, but it may well be the greatest problem of any in Norton Basin. The recent discovery of an apparent major petrogenic seep is likely to cause a quantum jump in interest and development schedule for Norton Basin. This points to the urgent need for a continued strong program of environmental research in this OCS area. (See also W78-05222) (Sinha-OEIS)
W78-05646

SEDIMENT TRANSPORT IN NORTON SOUND - NORTHERN BERING SEA, ALASKA,
Geological Survey, Menlo Park, CA.
D. A. Cacchione, and D. E. Drake.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 18. Hazards, Data Management, p 130-158, March 1977. 10 fig, 3 tab, 15 ref.

Descriptors: *Hazards, *Sediment transport, *Erosion, *Baseline studies, Pipelines, Structures, Alaska, Storms, Resources development, *Outer Continental Shelf, Norton Sound(AK), Petroleum development, Environmental conditions.

Both standard and novel methods of obtaining data on sediment transport in Norton Sound and other parts of the Northern Bering Sea were employed during the field program. Water samples, light transmission and current profiles taken at shipboard stations on R/V SEA SOUNDER during this period showed that the pattern of suspended sediment distribution in the surface and near-bottom layers reflect the high source area of the Yukon River. The comparison of the measured speed data, converted to a bottom stress using standard boundary layer analysis, with the measured sediment sizes at the GEOPROBE site suggests that current speeds in excess of 15-20 cm/sec will produce significant amounts of sediment resuspension. This computation, although only taken to be indicative and not definitive, warns

that rapid, local erosion during storms could be a hazard to bottom structures and pipelines. Two specific aspects of this research relate directly to the problem of oil spills at sea: first, excessive erosion can cause collapse of seafloor pipelines; second, the transport of oil near and along the sea floor will be controlled by those processes that also control the transport of sediments. (See also W78-05223) (Sinha-OEIS)
W78-05647

COASTAL PROCESSES AND MORPHOLOGY OF THE BERING SEA COAST OF ALASKA,
Geological Survey, Menlo Park, CA.
A. H. Sallenger, Jr., R. Hunter, and J. R. Dingler.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 18. Hazards, Data Management, p 159-225, March 1977. 23 fig, 8 tab, 44 ref.

Descriptors: *Hazards, *Storms, *Geomorphology, Baseline studies, Sediment transport, Alaska, Resources development, *Outer Continental Shelf, *Coastal processes, Bering Sea, Petroleum development, Environmental conditions.

Storms pose major hazards to coastal developments along the Alaskan Bering Sea coast. Shallow offshore depths that characterize much of the eastern Bering Sea shelf (particularly the northeast Bering Sea) make coastal areas susceptible to storm surges of large magnitude. Debris-line elevations resulting from a storm of November 1974, were measured and provided a combined measure of sea-level rise due primarily to wind stress, drop in barometric pressure, wave set-up and runup. Potential consequences of storms in this environment pose hazards to coastal developments in addition to hazards resulting from flooding and wave activity alone. (See also W78-05223) (Sinha-OEIS)
W78-05648

SEISMIC AND TECTONIC HAZARDS IN THE HOPE BASIN AND BEAUFORT SHELF,
Geological Survey, Menlo Park, CA.
S. Eittreim, and A. Grantz.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 18. Hazards, Data Management, p 226-268, March 1977. 11 fig, 1 tab, 14 ref.

Descriptors: *Hazards, *Seismic studies, *Baseline studies, Faults(Geologic), Alaska, Resources development, *Outer Continental Shelf, *Tectonics, Beaufort Sea, Hope Basin, Petroleum development, Slump features, Environmental conditions.

The Hope Basin and the Beaufort Shelf, both areas of considerable petroleum potential, contain what appear to be active tectonic features which may pose hazards to petroleum development. Hope Basin is composed of an intensely faulted section of young sediments in a trough appearing to be of Tertiary age. The present activity of these faults is uncertain, although they appear to rise to the surface in most places, cutting sediment which is within meters of the surface. The Beaufort Shelf has what appear to be active slump features on its outermost edge, both on the shelf and on the continental slope beyond. On the eastern Beaufort Shelf near Barter Island a zone of high seismicity exists which is as yet unexplained, tectonically, although it appears to be associated with a zone of young compressional folds. In general, the Beaufort Shelf is composed of prograding Tertiary sediments which in many places are cut by down-to-the-basin gravity faults (See also W78-05223) (Sinha-OEIS)
W78-05649

SEISMICITY STUDIES: (A) NORTHEAST ALASKA AND (B) NORTON AND KOTZEBUE SOUNDS,
Alaska Univ., College. Geophysical Inst.
N. N. Biswas, L. Gedney, and P. Huang.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 18. Hazards, Data Management, p 269-315, March 1977. 14 fig, 5 tab, 10 ref, append.

Descriptors: *Seismic studies, *Hazards, *Baseline studies, *Sea ice, Alaska, Resources development, *Outer Continental Shelf, *Icequakes, *Ice mechanics, Norton Sound, Kotzebue Sound, Petroleum development, Environmental conditions.

This report describes the seismicity studies of two widely separated areas in Alaska: (1) seismic zone on the south of Barter Island in the Beaufort Sea and (2) seismic zone around Norton and Kotzebue Sounds. Results of the study suggest that the central Alaskan seismic zone continues uninterruptedly across the Brooks Range which previously appeared aseismic. Although the earthquakes detected are of small magnitude, their frequency of occurrence indicates that northeast Alaska is tectonically quite active. In the second area, three distinct swarms of icequakes were recorded by one station (Kotzebue) of the network in addition to earthquakes. Examination of the satellite imagery indicated a large scale ice flow from the Chukchi Sea to the Bering Sea during the swarms of icequakes. The study of Arctic ice mechanics has important implications in the offshore developments of the natural resources. (See also W78-05223) (Sinha-OEIS)
W78-05650

DATA MANAGEMENT.
Environmental Research Labs., Boulder, CO.
For primary bibliographic entry see Field 7C.
W78-05651

FINAL REPORT AND RECOMMENDATIONS FOR THE BIG CYPRESS AREA OF CRITICAL STATE CONCERN TO THE STATE OF FLORIDA ADMINISTRATION COMMISSION.
Florida State Dept. of Administration, Tallahassee. Div. of State Planning.
For primary bibliographic entry see Field 5G.
W78-05654

HAWAII COASTAL ZONE MANAGEMENT PROGRAM: TECHNICAL SUPPLEMENT 1. HAWAIIAN COASTAL WATER ECOSYSTEMS: AN ELEMENT PAPER FOR THE HAWAII COASTAL ZONE MANAGEMENT STUDY.
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 6G.
W78-05658

HAWAII COASTAL ZONE MANAGEMENT PROGRAM, TECHNICAL SUPPLEMENT 2. MANAGEMENT OF HAWAII'S COASTAL ZONE FOR WATER QUALITY OBJECTIVES,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 6G.
W78-05659

HAWAII COASTAL ZONE MANAGEMENT PROGRAM, TECHNICAL SUPPLEMENT 4. BEACHES: A COMPONENT OF THE COASTAL ZONE,
Hawaii Inst. of Geophysics, Honolulu.
For primary bibliographic entry see Field 6G.
W78-05660

HAWAII COASTAL ZONE MANAGEMENT PROGRAM: INUNDATIONS AND FORCES CAUSED BY TSUNAMIS FOR THE STATE OF HAWAII, OBSERVATIONS AND STATISTICAL PREDICTIONS. TECHNICAL SUPPLEMENT NO. 5,
Hawaii Univ., Honolulu.
C. L. Bretschneider, and P. G. Wybro.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 340, Price codes: A05 in paper copy, A01 in microfiche. Prepared for Pacific Urban Studies and Planning Program, University of Hawaii, May 1975, 88 p, 24 fig, 18 tab, 77 ref, append.

Descriptors: *Tsunamis, *Waves(Water), *Hawaii, *Coastal engineering, *Management, Earthquakes, Seismic waves, Shores, Flood profiles, Coastal structures, *Tsunami surges, *Coastal zone management, Wave force, Seismic detection.

Engineering evaluation was made of tsunami effects for the state of Hawaii. The most destructive tsunami on record in Hawaii is the one which inundated the shoreline in April 1946. Scientific data and theory are used as far as practical to obtain an engineering solution to the problem of tsunami-protection design. Techniques are studied and evaluated to determine the potential of tsunami run-up for Hawaii. Literature and observation reviews are included to set the data base for prediction of possible future run-up. The study concluded that tsunami inundation can be determined given the following information: the wave elevation at the coastline; the wave character; and the average value of the roughness of the terrain over which the wave might travel. (Zayac-NC)
W78-05661

HAWAII COASTAL ZONE MANAGEMENT PROGRAM: ENHANCEMENT OF COASTAL ZONE RECREATIONAL OPPORTUNITIES: A DESCRIPTION OF PRESENT COASTAL RECREATIONAL USAGE, CONSTRAINTS, DATA AND RESEARCH POSSIBILITIES IN THE STATE OF HAWAII. TECHNICAL SUPPLEMENT NO. 6,
Hawaii Univ., Honolulu. Dept. of Geography.
For primary bibliographic entry see Field 6B.
W78-05662

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

APPARATUS FOR EXTRACTING WATER FROM THE ATMOSPHERE,
Firma Technico Development and Financing S.A., Fribourg (Switzerland). (Assignee).
For primary bibliographic entry see Field 8C.
W78-05233

APPLICATION OF HIGH-TEMPERATURE HYPERFILTRATION TO UNIT TEXTILE PROCESSES FOR DIRECT RECYCLE,
Clemson Univ., SC. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5D.
W78-05505

NATIONAL WATER SUPPLY AND IMPROVEMENT ASSOCIATION (NWSIA): WATER REUSE AND DESALINATION FOR THE FUTURE.
National Water Supply and Improvement Association, Ipswich, MA.
National Water Supply and Improvement Association Journal, Vol. 4, No. 1, 47 p, January 1977. 19 fig, 20 tab, 35 ref.

Descriptors: *Solar distillation, *Desalination, *Desalination plants, *Treatment facilities,

*Desalination processes, *Reclaimed water, *Water purification, *Potable water, *Water shortage, Impaired water use, Water resources development, Municipal wastes, Water management(Applied), Wastewater treatment, Imported water, Artificial recharge, Groundwater recharge, Water supply, Water utilization, Conservation, Heat transfer, Heat exchangers, California, Colorado, Virgin Islands, Energy requirements, Sea water distillation, Direct power and fuel consumption, Water reuse, Wastewater reclamation, Desalting sea water, Surface water importation, Groundwater pumping, Municipal wastewater, Yuma(AR), St. Croix.

Four articles are included in this journal issue. The first examines total energy requirements for a number of alternatives for water supply to California, including groundwater pumping, surface water importation, seawater desalting, and reclamation and reuse of wastewater. Total energy requirements include direct power and fuel consumption, and energy for construction of facilities, for supplying any chemicals used, for blending to modify the salt content of the water supply, and for treatment of municipal wastewater to meet current discharge regulations. The second paper presents the preliminary design for a solar assisted sea water distillation plant; the wiped-film rotating-disk evaporator equipment design is described. Data on rates of heat transfer and electrical energy required are presented. Estimates of the capital and operating costs indicate that distilled water could be produced more cheaply by the proposed plant than by conventional solar distillation using basin-type distilers. The third article presents a status report of the Colorado River Basin Salinity Control Project. A feasibility design of the Yuma Desalting Plant has been completed and negotiated desalting equipment contracts are awarded. The plant is scheduled to be fully operational in 1981. The fourth paper describes the efforts on the island of St. Croix in the Virgin Islands to desalinize seawater in water-short coastal areas to produce potable water. Programs coordinating the use of desalinized water with conservation measures such as wastewater reclamation, water reuse, and artificial groundwater recharge are described. (Seip-IPA)
W78-05532

PROCESS FOR THE PURIFICATION OF WATER,
Battelle Memorial Inst. (Switzerland). (Assignee).
For primary bibliographic entry see Field 5F.
W78-05607

EVALUATION OF SINGLE PASS SEAWATER REVERSE OSMOSIS MODULES AND PRETREATMENT TECHNIQUES,
David W. Taylor Naval Ship Research and Development Center, Annapolis, MD.
J. F. Pizzino.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 635, Price codes: A03 in paper copy, A01 in microfiche. Report No. 76-0121, October, 1976. 23 p, 10 fig, 4 ref, 2 append. NAVSEA Task 17709, Task Area SSL 30002, Work Unit 2761-106.

Descriptors: *Reverse osmosis, *Desalination processes, Evaluation, Ships, Filtration, Separation techniques, Dissolved solids, Sea water, Potable water, Water supply, Water quality, Chlorination, Ultrafiltration, Pretreatment(Water).

Four reverse osmosis desalination modules were evaluated on natural sea water at Wrightsville Beach, North Carolina. Three of the modules were run on chlorinated and cartridge filtered sea water, and all showed permeate rate declines greater than 30 percent/1,000 hours. The fourth module, run on chlorinated, ultrafiltered sea water feed, showed an average permeate rate decline of 4.7 percent/1,000 hours operation after 3,800 total operating hours. Permeate total dissolved solids for all modules were consistently less than 500 parts per million. A high degree of filtration was necessary for the successful operation of such modules. The use of electrolytically generated chlorine to prevent membrane biological attack (and/or fouling) and to produce chlorinated potable water without the use of any chlorine compounds was considered successful. Principal advantages of reverse o smosis desalination are energy saving compared to conventional shipboard distillation systems, reduced weight and volume, lower maintenance requirements, safer operation, and the ability to provide chlorinated potable water without using dangerous chlorine compounds. (Wares-IPA)
W78-05620

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALINATION PLANTS. PART I, FLUME STUDY OF THE MIXING CHARACTERISTICS OF DENSE JETS DISCHARGED INTO A FLOWING FLUID, VOL I, MAIN TEXT. APPENDIX A: NOTATION. APPENDIX B: CONDUCTIVITY PROBE CALIBRATION AND DATA REDUCTION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5B.
W78-05689

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALINATION PLANTS, PART II. TESTS OF EFFLUENT DISPERSION IN SELECTED ESTUARY MODELS, VOLUME I. MAIN TEXT,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5B.
W78-05690

MODIFICATIONS OF ORNL'S COMPUTER PROGRAMS MSF-21 AND VTE-21 FOR THE EVALUATION AND RAPID OPTIMIZATION OF MULTISTAGE FLASH AND VERTICAL TUBE EVAPORATORS,
Oak Ridge National Lab., TN.
P. Glueckstern, J. V. Wilson, and S. A. Reed.
Available from the National Technial Information Service, Springfield, VA 22161 as ORNL/TM-5230, Price codes: A05 in paper copy, A01 in microfiche. Report No ORNL/TM-5230, June, 1976. 99 p, 3 tab, 6 ref, 15 append. W-7405-eng-26.

Descriptors: *Desalination plants, *Computer programs, *Operating costs, *Capital costs, *Cost analysis, Design, Technology, *Multistage flash(MSF) desalination process, *Vertical tube evaporator(VTE) desalination process, *ORNL, Subroutines, Cost updating, Input variables.

Design and cost modifications were made to ORNL's Computer Programs MSF-21 and VTE-21, originally developed for the rapid calculation and design optimization of multistage flash (MSF) and multieffect vertical tube evaporator (VTE) desalination plants. The modifications include additional design options which will make possible the evaluation of desalting plants based on current technology (i.e., the original programs were based on conceptual designs applying advanced and not yet proven technological developments and design features) and new materials and equipment costs updated to mid-1975. Subroutine changes are presented in appendices. (Seip-IPA)
W78-05692

3B. Water Yield Improvement

SUPPRESSION OF ICE FOG FROM COOLING PONDS,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2D.
W78-05359

RAINFALL FIELDS IN ISRAEL AND JORDAN AND THE EFFECT OF CLOUDING SEEDING ON THEM,
Hebrew Univ., Jerusalem (Israel). Inst. of Earth Sciences.
D. Sharon.
Journal of Applied Meteorology, Vol. 17, No. 1, p 40-48, January 1978. 9 fig, 16 ref.

Descriptors: *Weather modification, *Cloud seeding, *Rainfall, *Spatial distribution, Analytical techniques, Correlation analysis, Precipitation(Atmospheric), Arid lands, Storms, Foreign countries, Foreign research, Water resources, Nucleation, Effects, Variability, Meteorology, *Israel, *Jordan.

Spatial correlation functions of daily rainfall were derived separately for various parts of the study area and for unseeded and seeded days. The structure of respective rainfall fields was studied by means of the relationship between the geometry of iso-correlation contours of daily rainfall and the average geometry and/or kinematics of cloud systems that produce the rainfall. Results were obtained on (1) the prevalent direction of storm movement over the study area, and (2) the change in size of rainfall areas under varying conditions. Evidence was presented of an average increase of about 10 km in the dimensions of rainfall areas on seeded days. It was suggested that expanded rainfall areas have a twofold effect on the augmentation of the total yield of individual storms: (1) an increase of point rainfall resulting from prolonged exposure to moving cloud systems, and (2) an increase in the area thus affected. Consequently, the increase in water yield over the entire area covered by a storm may not be represented fully by point measurements. In the regional context, a contraction of storm areas was found in the transition to the arid zone. It was suggested that the size of rainfall areas is one of the fundamental factors controlling regional variations of rainfall as well as variations resulting from cloud seeding. (Sims-ISWS)
W78-05379

THE PRACTICABILITY OF DRY ICE FOR ON-TOP SEEDING OF CONVECTIVE CLOUDS,
Bureau of Reclamation, Miles City, MT.
E. W. Holroyd, III, A. B. Super, and B. A. Silverman.
Journal of Applied Meteorology, Vol 17, No 1, p 49-63, January 1978. 7 fig, 5 tab, 20 ref.

Descriptors: *Cloud seeding, *Crystallization, *Cloud physics, Weather modification, Clouds, Aircraft, Temperature, Air temperature, Crystals, Measurement, Data processing, Meteorology, *Dry ice seeding, Cumulonimbus clouds, Dry ice effectiveness.

Dry ice was shown to be an attractive agent for on-top seeding of convective clouds. A modest payload of small dry ice pellets can effectively seed dozens of clouds, depending on cloud volume encountered and on crystal concentrations desired. A dry ice pellet size of about 7 mm diameter was suggested for efficient use of seeding agent when dropped from the -10C level. Supercooled convective clouds that were seeded on-top with dry ice were investigated to determine empirical nucleation effectiveness values. The clouds were penetrated repeatedly to measure the resulting ice crystal concentrations. The experiments gave conservative effectivess values of 2 to 5 X 10 to the 11th power crystals per gram of dry ice, but with possible error bars extending an order of magnitude to each side of those values. A well-documented experiment giving effectiveness values twice as large was discussed in detail. (Sims-ISWS)
W78-05380

BIBLIOGRAPHY OF STATISTICAL AND METEOROLOGICAL METHODOLOGY IN WEATHER MODIFICATION,
Florida State Univ., Tallahassee. Dept. of Statistics.
M. A. Hanson, C. L. Bach, and E. A. Cooley.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A032 729, Price codes: A07 in paper copy, A01 in microfiche. FSU Statistics Report No. M388, ONR Technical Report No. 110, September 1976. 145 p. ONR N00014-76-C-0394.

Descriptors: *Weather modification, *Bibliographies, *Methodology, Meteorology, Weather, Weather forecasting, Forecasting, Statistics, Reviews, Publications.

This collection of abstracts was compiled within the Departments of Statistics and Meteorology at Florida State University for use in research in weather modification. It is envisaged that the bibliography will be of wide general use. The compilation involved a systematic search of all available relevant meteorological and statistical journals, report os symposia, cross checks of references in the sources, and the use of excellent reference material from selected texts on the subjects of meteorological methodology and weather modification. (Froehlich-ISWS)
W78-05591

PROJECT SKYWATER 1973-74 BIENNIAL REPORT.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 952, Price codes: A23 in paper copy, A01 in microfiche. Report REC-ERC-76-21, December 1976. 551 p, 70 fig, 69 tab, 1 append.

Descriptors: *Weather modification, *Cloud seeding, *Precipitation(Atmospheric), *Colorado River Basin, *Great Plains, Rainfall, Snowfall, Cloud physics, Projects, Instrumentation, Radar, Model studies, Mathematical models, Statistical analysis, Rainfall-runoff relationships, Hydrology, Climatology, Environmental effects, Water resources, Water resources development, Social aspects, Social impact, Meteorology, *Project Skywater, Research contracts.

This report summarized atmospheric and environmental research conducted under the Bureau of Reclamation's precipitation management program in fiscal years 1973 and 1974. Chapter 1 outlined the project, its goals, and depth. The next three chapters consisted of summaries of the reports submitted by contractors who participated in the winter-orographic and summer-convective experiments and pilot programs of Project Skywater during the biennuim. The effects of weather modification on natural resources and processes and on socioeconomic and cultural patterns were the emphasis of numerous Skywater studies during the fiscal years 1973-1974. Summaries of these investigations were given in chapter 5. Chapters 6 and 7 described laboratory studies and in-house programs in support of Project Skywater. In a few cases, the contractors' reports covered a period longer than fiscal years 1973 and 1974. This was necessary to present a clear picture of the research activities and accomplishments. (Sims-ISWS)
W78-05594

3C. Use Of Water Of Impaired Quality

GROUND WATER IN THE KOEHN LAKE AREA, KERN COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-05442

WATER RESEARCH: SOLVING COLORADO'S WATER PROBLEMS,
Colorado State Univ Fort Collins. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W78-05481

PESTICIDE MODES OF ENTRANCE AND CONTENT IN WATER SUPPLIES, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W78-05516

NATIONAL WATER SUPPLY AND IMPROVEMENT ASSOCIATION (NWSIA): WATER REUSE AND DESALINATION FOR THE FUTURE.
National Water Supply and Improvement Association, Ipswich, MA.
For primary bibliographic entry see Field 3A.
W78-05532

METHOD AND APPARATUS INTEGRATING WATER TREATMENT AND ELECTRICAL POWER PRODUCTION,
For primary bibliographic entry see Field 5F.
W78-05604

WASTEWATER: IS MUSKEGON COUNTY'S SOLUTION YOUR SOLUTION,
Environmental Protection Agency, Chicago, IL. Office of Research and Development.
For primary bibliographic entry see Field 5D.
W78-05687

3D. Conservation In Domestic and Municipal Use

WATER REQUIREMENTS AND APPLICATION RATES FOR LAWNS,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
L. O. Pochop, J. Borrelli, J. R. Barnes, and P. K. O'Neill.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 808, Price codes: A03 in paper copy, A01 in microfiche. Wyoming Water Resources Research Institute, Laramie, Water Resources Series No. 71. February, 1978. 37 p, 3 fig, 10 tab, 14 ref, append. OWRT A-022-WYO(2), 14-34-0001-6053,7108.

Descriptors: *Water requirements, *Application rates, *Lawns, Irrigation efficiency, Water conservation, Consumptive use, Evapotranspiration, Municipal water, Water consumption, Water utilization, Cities, *Wyoming, Water demand, *Residential water use, *Summer vs. winter household use, Urban areas(Wyoming).

Lawn water application rates were measured for 55 homes in Laramie and Wheatland, Wyoming, during 1975 and 1976. In addition, evapotranspiration rates were measured at both cities during 1976. Lawn water application rates in 1976 were 122 percent of the average seasonal potential evapotranspiration rates in Laramie and 156 percent in Wheatland. The lowest application rates were near the consumptive use requirements of lawn grasses. The lawns were rated on the basis of appearance and according to the percentage of total lawn area that appeared to be stressed from visual inspection. There was no significant correlation between lawn water application rates and the appearance or stress ratings. Factors such as fertilizer, overall lawn maintenance habits, and uniformity of water application apparently exert strong influences on lawn appearance and stress. Overwatering amounted to 0.0085 acre-feet per day per acre of lawn in Wheatland while in Laramie it amounted to 0.004 acre-feet per day per acre of lawn. The average lawn size was 0.16 acres per home.
W78-05201

3E. Conservation In Industry

REGENERATION OF SPENT SULFURIC ACID (REGENERATION VON ABFALLSCHWEFELSAEURE),
Hoechst A. G., Frankfurt am Main (West Germany).
For primary bibliographic entry see Field 5D.
W78-05279

TOXIC WASTE TREATED BY WASTE RECOVERS USABLE CHEMICALS.
For primary bibliographic entry see Field 5D.
W78-05282

PROCESS FOR TREATMENT OF WASTE WATER EXHAUSTED FROM WATER-WASH SPRAY BOOTH USING WATER-SOLUBLE PAINT,
Nippon Paint Co. Ltd., Tokyo (Japan). (Assignee).
For primary bibliographic entry see Field 5D.
W78-05283

MECHANICAL PLATING,
Cadmium Association, London (England).
For primary bibliographic entry see Field 5D.
W78-05301

PLATING SYSTEM CUTS POLLUTION WOES.
For primary bibliographic entry see Field 5D.
W78-05309

RUSSIAN CLOSED-CYCLE CHEMICAL WORKS,
For primary bibliographic entry see Field 5D.
W78-05311

THE INTEGRATED STEELWORKS OF SOLMER AT FOS-SUR-MER.
For primary bibliographic entry see Field 5G.
W78-05312

SHOCK BACKWASH FILTER CUTS WASH WATER WASTE,
For primary bibliographic entry see Field 5D.
W78-05314

THE PRODUCTION OF CHEMICALS FROM PULPING WASTE,
Swedish Forest Products Research Lab., Stockholm.
For primary bibliographic entry see Field 5E.
W78-05316

POSSIBILITIES AND MEASURES TAKEN BY THE PULP INDUSTRY FOR THE PROTECTION OF THE ENVIRONMENT (MOEGLICHKEITEN UND MASSNAHMEN DER ZELLSTOFFINDUSTRIE IM INTERESSE DES UMWELTSCHUTZES).
For primary bibliographic entry see Field 5G.
W78-05318

METSA-BOTNIA'S KRAFT MILL COMES ON STREAM,
For primary bibliographic entry see Field 5D.
W78-05319

PULP AND PAPER RESEARCH AT UQTR--RELIEF FOR AN EMBATTLED INDUSTRY,
For primary bibliographic entry see Field 5E.
W78-05321

IS CHEAP RECOVERY IN SIGHT FOR SULFITE.
For primary bibliographic entry see Field 5E.

W78-05322

PULP INDUSTRY AND PROTECTION OF SURFACE WATERS (ZELLSTOFF-INDUSTRIE UND GEWAESSERSCHUTZ),
For primary bibliographic entry see Field 5G.
W78-05323

ECOLOGICAL ASPECTS OF WATER USAGE IN THE TEXTILE INDUSTRY,
CIBA-GEIGY Ltd., Basle (Switzerland).
For primary bibliographic entry see Field 5D.
W78-05325

EFFLUENT TREATMENT IN THE TEXTILE INDUSTRY,
Shirley Inst., Manchester (England).
For primary bibliographic entry see Field 5G.
W78-05327

MINI-SYMPOSIUM ON EFFLUENT CONTROL 'UPDATE 1976--GROUP IV',
Waste Water Engineers, Inc., Nashville, TN.
For primary bibliographic entry see Field 5D.
W78-05329

CUTTING (WATER) CONSUMPTION BY 95 PERCENT BY RECYCLING,
L. Freeman.
Paper Technology and Industry, Vol. 18, No. 4, p 118-120, April, 1977.

Descriptors: *Water conservation, *Pulp and paper industry, *Water reuse, Foreign countries, Europe, Water pollution control, *Recycling, Turbines, Filters, Settling basins, Drainage systems, Water pollution sources, England.

Water conservation measures (viz., replacing pass-out turbines with back-pressure turbines, recycling, and reducing city water consumption by installing filter plants and a settling pond to process river water) introduced at Wiggins Teape Ltd.'s Ely Paper Mills in Cardiff, South Wales (United Kingdom), have reduced total consumption from 9.7 to 5 million gal/day. New recycling and drainage schemes are being developed to cut water consumption to 0.5 million gal/day. (Swichtenberg-IPC)
W78-05445

EFFLUENT RECYCLE PRACTICES IN GROUNDWOOD/NEWSPRINT OPERATIONS,
Envirocon Ltd., Vancouver (British Columbia).
H. G. Burke, and D. R. Manolescu.
In: Canadian Pulp and Paper Association, Environment Improvement Conference, November 1-3, 1977, Moncton, New Brunswick, Preprints (CPPA Technical Section, Montreal), p 59-64. 2 fig, 2 tab.

Descriptors: *Pulp and paper industry, *Water reuse, *Water conservation, Water pollution control, Water pollution sources, North America, Foreign countries, Suspended solids, Biochemical oxygen demand, Recycling, Water pollution control, Recirculated water, Cooling water, Industrial water, Waste water(Pollution), Effluents, Pumps, Groundwood mills, Newsprint mills, Scandinavia, White water(Paper machines), Savealls.

A survey of groundwood newsprint mills in North America and Scandinavia indicates that present effluent discharges average 14,000 gal with 25-lb BOD and 52-lb suspended solids per ton of newsprint. Suggestions to reduce effluent losses include reuse of press water, a reduction in rejects from centrifugal cleaners, adequate broke and white water storage capacities, use of only white water for grinder cooling and machine showers, use of white water savealls, and a reduction in the amount of water use to seal vacuum pumps. An effluent discharge of 4,000 gal with 20-lb BOD and 20-lb suspended solids per ton of newsprint is an achievable goal using existing technology. (Swichtenberg-IPC)
W78-05468

REDUCTION OF SOLIDS AND FIVE-DAY BOD LOSSES THROUGH PROCESS MODIFICATION AND PHYSICO-CHEMICAL PRIMARY TREATMENT AT FRASER PAPER LTD,
Fraser Companies Ltd., Edmundston (New Brunswick).
For primary bibliographic entry see Field 5D.
W78-05469

EFFECT OF STEAM PURITY ON PERFORMANCE, RELIABILITY AND MAINTENANCE OF INDUSTRIAL STEAM TURBINES,
General Electric Co., Lynn, MA.
For primary bibliographic entry see Field 8G.
W78-05476

PAPER MILL WASTE PURIFICATION--BY PASSING THROUGH FILTRATION MATERIAL CONTAINING POSITIVELY CHARGED PERLITE PARTICLES.
For primary bibliographic entry see Field 5D.
W78-05501

HYGIENIC ASSESSMENT OF THE USE OF PURIFIED WASTE-WATERS IN CLOSED WATER CYCLES IN CARDBOARD FACTORIES (SANITARNOGIGIENICHESKAIA OTSENKA ISPOL'ZOVANIIA OCHISHCHENNYKH STOCHNYKH VOD V ZAMKNUTYKH TSIKLAKH VODOSNABZHENIIA KARTONOVYKH FABRIK),
For primary bibliographic entry see Field 5D.
W78-05503

APPLICATION OF HIGH-TEMPERATURE HYPERFILTRATION TO UNIT TEXTILE PROCESSES FOR DIRECT RECYCLE,
Clemson Univ., SC. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 5D.
W78-05505

POLLUTION CONTROL IN TEXTILE DYEING INDUSTRY (SENSHOKU HAISUI ODOKU BOSHI GIJUTSU NI KANSURU KENKYU),
For primary bibliographic entry see Field 5D.
W78-05509

DEVELOPMENT STATUS AND ENVIRONMENTAL HAZARDS OF SEVERAL CANDIDATE ADVANCED ENERGY SYSTEMS,
Lockheed Missiles and Space Co., Inc., Huntsville, AL. Huntsville Research and Engineering Center.
For primary bibliographic entry see Field 5G.
W78-05538

INDUSTRY-SPECIFIC GROSS OUTPUT MULTIPLIERS FOR BEA ECONOMIC AREAS.
Department of Commerce, Washington, DC. Div. of Regional Economic Analysis.
For primary bibliographic entry see Field 6A.
W78-05655

3F. Conservation In Agriculture

PRESERVING THE ENVIRONMENT OF A SANDHILLS REGION CONCURRENT WITH INTENSIVE IRRIGATION DEVELOPMENT,
Nebraska Univ., Lincoln. Water Resources Center.
R. A. Olson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 038, Price codes: A06 in paper copy, A01 in microfiche. Completion Report, August 30, 1976. 45 p, 6 fig, 54 tab. OWRT C-5046(No. 4225)(1).

Descriptors: *Nitrogen compounds, *Fertilizers, *Cultivation, Harvesting, *Crop production, *Corn(Field), *Soil management, *Soil stabilization, *Irrigation practice, *Erosion control, *Nebraska, Wind erosion, Organic matter, Herbicide, Post-emergents, Pre-emergents, Pesticides, Insect control, Bromegrass, Orchardgrass, Tillage techniques, N efficiency, *N-15 tracer techniques, Fertilizer management, *Sandy soil management, Leafhopper control, Sandbur, Organic matter maintenance, Butylate, Atrazine, EPTC herbicide, Methoxyclor.

The long-term influence of nitrogen rate (N-rate), tillage, and harvest practice on soil properties including organic matter, the influence of dry matter accumulation, and N utilization by corns was also investigated in McPherson County, Nebraska. Tracer techniques with N-15 depleted fertilizer materials indicated that appreciable quantities of fertilizer N were immobilized in the soil's organic content. Conventional N carriers effected higher yields of corn and bromegrass and caused a greater reduction in soil pH than equivalent rates of slow-release N carrier materials. No measurable changes in soil organic matter content resulted from tillage method, harvest procedure or N-rate; disk tillage afforded higher grain yields and greater N uptake than did sod-plant tillage. Total herbage yields of orchardgrass increased with increasing N-rate. Herbage yield increased with an increased number of clippings (simulated grazing) at low N rate, but decreased at higher N rates, attributable to stand loss in the orchardgrass. Investigation of methods of planting corn into grass sod with the objective of maintaining a continuous ground cover for controlling wind erosion revealed equivalent yields when the grass sod was destroyed by cultivation or was retarded in growth by appropriate herbicide treatment. Small amounts of fertilizer N greatly increased leafhopper populations; additional amounts had no further effect. Methoxychlor treatment prored effective for suppressing leafhoppers. Field sandburs are very competitive with irrigated corn grown under center-pivot irrigation on sandy soils, requiring 6 weeks of weed control after planting to eliminate corn yield losses. Required concentrations of butylate, atrazine, EPTC for effective sandbur control are presented. (Seip-IPA)
W78-05348

ECONOMIC EFFECT ON AGRICULTURAL PRODUCTION OF ALTERNATIVE ENERGY INPUT PRICES: TEXAS HIGH PLAINS,
Texas A and M Univ., College Station. Water Resources Inst.
B. M. Adams, R. D. Lacewell, and G. D. Condra.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 039, Price codes: A07 in paper copy, A01 in microfiche. Technical Report No. 73, June, 1976. 138 p, 5 fig, 45 tab, 38 ref, 5 append. OWRT A-033-TEX(1).

Descriptors: *Linear programming, *Mathematical models, Energy, *Prices, Crops, Agriculture, *Crop production, *Productivity, *Net profit, Natural gas, Water rates, Economic impact, Mathematical studies, Texas, *Energy prices, *Agricultural production, *Commodity prices, Diesel prices, Nitrogen prices, Water prices, Natural gas prices, *Texas High Plains.

Short-run effects of rising energy prices on agricultural production were evaluated through mathematical linear programming; results are measured by demand schedules, net revenue adjustments, cropping pattern shifts, and changes in agricultural output. Only variable costs were used in constructing the objective function. Demand schedules were estimated and crop enterprise

budgets were adapted. The completed model was applied to 16 imput/product price combinations feasible in the short-run future. Diesel consumption would change very little unless commodity prices decline below the lowest prices since 1971 or unless diesel price approaches $2.00/gal. Under average commodity prices, natural gas consumption would not decline until the price rose about $4.00/1000 cu ft (mcf) and would remain stable as long as the price was below $1.28/mcf. Nitrogen use would be immediately affected by a price increase to above $0.40/lb. Less than 4% reduction in consumption would result from a water price change from zero to $22/acre ft. At a wate price of $71.71/acre ft, consumption would drop to zero. rising input prices cause acreage shifts from irrigated to dryland; however, with average commodity prices, these shifts do not occur until: (1) diesel reaches $2.69/gal; (2) natural gas reaches $1.92/mcf; (3) nitrogen is $0.41/lg; or (4) water reaches $14.69/acre ft. Rising energy prices significantly impact net revenue to the farmer, whose net income above variable cost approaches $500 million at present diesel prices of $0.40. Diesel prices of $0.81 and $1.86/gal would cost $79 million and $254 million, respectively in farmer net revenue. Increased costs of natural gas, nigrogen, and water directly reduce net revenue. Commodity prices affect agricultural production more than energy input prices. (Seip-IPA)
W78-05350

MEANS AND METHOD OF IRRIGATION CONTROL,
D. L. Caldwell.
U.S. Patent No. 4,040,436, 8 p, 10 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 961, No 2, p 588, August 9, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation efficiency, Irrigation effects, Soil-water-plant relationships, Soil properties, Control, Water requirements.

A means and method of irrigation control is described where a porous sensor is placed in the root zone in moisture transfer relation with the soil, and is supplied with air at a pressure sufficient to cause progressively increasing seepage of air through the sensor as soil moisture is lessened. Means for detecting the rate of seepage of air is utilized to indicate moisture content of the soil for manually or automatically activing a timer for the irrigation system. The irrigation control includes the use of several sensors placed at different soil levels, as wel as a warning sensor adapted to be activated should the soil start to become drier than its normal relatively moist condition. Another embodiment utilizes one or more selected plants with corresponding sensors as a means of detecting sudden weather changes to anticipate changes in ground moisture. A further embodiment utilizes an evaporation measuring means designed to detect incipient change in humidity indicative of sudden weather change. (Sinha - OEIS)
W78-05598

WATER CONDUCTING AND EMITTING DEVICE,
G. Gilead.
U.S. Patent No. 4,053,109, 6 p, 11 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 963, No 2, p 527, October 11, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation efficiency, Irrigation practices, Application equipment, Drip irrigation.

Two continuous hose like elements for use as a supply conduit of irrigation water extending within one another form a conduit for water between the outer wall of the inner and the inner wall of the outer hose. Openings are provided in the wall of the inner element establishing communication between the inner hose leading from the conduit into the open. The outer hose element is of slightly larger diameter than that of the inner one - the difference being in the range of 2-6 millimeters; the outer hose is spirally grooved and the inwardly extending ridges of the helix contact are immediately fused to the inner ungrooved hose. In that way a helical path of very small cross sectional area is formed. (Sinha-OEIS)
W78-05605

APPARATUS FOR REMOVING PARTICLES FROM WATER FOR SPRINKLERS AND THE LIKE,
J. M. Miller.
U.S. Patent No. 4,053,413, 10 p, 12 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 963, No 2, p 626, October 11, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Irrigation efficiency, Irrigation practices, Screens, Filters, Equipment.

A fine mesh, cylindrical screen is mounted on a cylindrical support lengthwise of a ditch and rotated about its axis. The screen is over half submerged, leaving 30% of its area above the normal water level. The rotating screen, at its downstream end, abuts the pipe through which the water flows to a pump for supplying the sprinklers. As the screen rides up out of the water, the sediment clings to it. At the downstream end is a nozzle which discharges a jet of water to move the sediment longitudinally and to a position of engagement with a jet of water from a second nozzle spaced both longitudinally and circumferentially from the first nozzle. These nozzles are included in a series of nozzles which are similarly spaced to the upstream end, with the jet from the last nozzle moving the collected sediment to a position where it can be engaged by a suction nozzle just before the screen reenters the water. (Sinha-OEIS)
W78-05610

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

NUTRIENTS: A MAJOR CONSIDERATION IN INTENSIVE FOREST MANAGEMENT,
Northeastern Forest Experiment Station, Durham, NH.
J. W. Hornbeck.
Available from the USDA Forest Service, 370 Reed Rd., Broomall, Pa. 19008. In: Proceedings of the Symposium on Intensive Culture of Northern Forest Types. USDA Forest Service General Technical Report NE-29, p. 241-250, 1977. 3 tab, 19 ref.

Descriptors: Forest management, *Nutrients, *Nitrogen, Calcium, Streamflow, *Clearcutting, Whole-tree-harvesting, Stem-only-harvesting, Leaching losses, *Nutrient cycling.

Estimates of nutrient losses are compared for a stem-only harvest versus a whole-tree harvest of a clearcut northern hardwood stand. Combined nutrient losses due to increased leaching to streamflow and removal of vegetation after stem-only harvesting are estimated to be 334 kg/ha for nitrogen. For a whole-tree harvest, combined losses are estimated at 537 kg/ha for calcium and 486 kg/ha for nitrogen. (Forest Service)
W78-05250

ANALYSIS OF THE SEASONAL STREAMFLOW VARIATION FOR THE PRIMARY UNREGULATED WATER COURSES IN SOUTH DAKOTA,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-05356

WATER AVAILABLE FOR RUNOFF FOR 4 TO 15 DAYS DURATION IN THE SNAKE RIVER BASIN IN IDAHO,
National Oceanic and Atmospheric Administration, Silver Spring, MD. Office of Hydrology.
R. H. Frederick, and R. J. Tracey
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 427, Price codes: A03 in paper copy, A01 in microfiche. NOAA Technical Memorandum NWS HYDRO-29, June 1976. 39 p, 14 fig, 8 tab, 13 ref.

Descriptors: *Idaho, *Runoff forecasting, *Snowmelt, *Frequency analysis, *Water balance, Runoff, Flow duration, Precipitation(Atmospheric), Watersheds(Basins), Climates, Ablation, *Snake River Basin(Idaho), Melt factor.

Through adaptation of the National Weather Service Forecast System (NWSRFS) Snow Accumulation and Ablation model, this study estimated the frequency of water available for runoff (WAR) from snowmelt and precipitation over the agricultural areas of Idaho's Snake River Basin. The report outlined the adaptation, testing, and use of the NWSRFS model, presented maps of 4- and 15-day WAR values at return periods of 2 and 100 years, and discussed seasonal variation of WAR and differences between WAR-frequency and precipitation-frequency values. (Lardner-ISWS)
W78-05365

AUTORUN ANALYSIS OF HYDROLOGIC TIME SERIES,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power.
For primary bibliographic entry see Field 2E.
W78-05386

A GUIDE TO ENVIRONMENTAL PLANNING AND DEVELOPMENT, (LEHIGH-NORTHAMPTON COUNTIES JOINT PLANNING COMMISSION),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, PA.
For primary bibliographic entry see Field 6B.
W78-05394

REGIONAL STORM DRAINAGE PLAN, (LEHIGH-NORTHAMPTON JOINT PLANNING COMMISSION).
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, PA.
For primary bibliographic entry see Field 6F.
W78-05397

REGIONAL STORM DRAINAGE PLAN-1977 SUPPLEMENT, (LEHIGH-NORTHAMPTON JOINT PLANNING COMMISSION),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, PA.
For primary bibliographic entry see Field 6F.
W78-05398

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT: MAIN REPORT.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05400

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT: APPENDIX B - FOUNDATION FOR LEGAL ANALYSIS.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05401

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT. APPENDIX C - FEDERAL AND STATE AGENCY PROFILES.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05402

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT. APPENDIX D; VOLUME I - CASE STUDIES D.1.1 TO D.5.1.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05403

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT, APPENDIX D, VOLUME II, CASE STUDIES D.6.1 TO D.13.1.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05404

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT, APPENDIX D, VOLUME III, CASE STUDIES D.14.1 TO D.22.1.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05405

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT, APPENDIX D, VOLUME IV, CASE STUDIES D.23.1 TO D.29.1.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05406

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT: APPENDIX E--CONSOLIDATED BIBLIOGRAPHY.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05407

THE EVALUATION OF WATER AND RELATED LAND RESOURCE PROJECTS: A PROCEDURAL TEST.
Oklahoma Univ., Norman. Dept. of Civil Engineering and Environmental Science.
For primary bibliographic entry see Field 6B.
W78-05408

FLOOD PLAIN INFORMATION: MILL CREEK, RIPLEY, WEST VIRGINIA, AND VICINITY.
Army Engineer District, Huntington, WV.
Prepared for State of West Virginia, Department of Natural Resources, Division of Water Resources, June 1971. 33 p, 8 fig, 9 plates, 8 tab.

Descriptors: *West Virginia, *Streamflow forecasting, *Flood profiles, *Historic floods, *Flood data, Floods, Flood flow, Indirect flood measurement, Flood forecasting, Storms, Flood stages, Peak discharge, Stage-discharge relations, Flood damage, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, *Mill Creek(WV), Ripley(WV), Intermediate Regional Flood.

The study area includes Mill Creek and its flood plain in the vicinity of Ripley, West Virginia. The flood plain contains some residential and commercial land uses that have been flooded an average of once every three years. Flood data were obtained from topographic maps, field studies, historical sources, floodcrest records, and hydrologic data from similar watersheds in the region. Stream gage records for the study area were not available. The main flood season occurs from late winter to early spring and results from heavy general rainfall. Intense local thunderstorms may cause flooding at other times. The worst known flood occurred on March 7, 1967, cresting 22.5 feet above flood stage. Damages from this flood were valued between $100,000 and $200,000. At the same location, the Intermediate Regional Flood would crest 26 feet above flood stage and would discharge 12,100 cubic feet per second (cfs), while the Standard Project Flood would crest 36 feet above flood stage and would discharge 40,500 cfs. Several bridges in the study area would impede these flood flows. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-05409

FLOOD PLAIN INFORMATION: OHIO RIVER, POPE AND HARDIN COUNTIES, ILLINOIS.
Army Engineer District, Louisville, KY.
Prepared for Pope and Hardin County Commissioners, IL, June 1976. 20 p, 10 fig, 22 plates, 4 tab.

Descriptors: *Illinois, *Flood forecasting, *Flood data, *Stage-discharge relations, Floods, Flood flow, Design flood, Flood profiles, Storms, Historic floods, Flood stages, Flood plains, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Levee, Floodwalls, *Ohio River(IL), Pope County(IL), Hardin County(IL), Elizabethtown(IL), Rosiclare(IL), Golconda(IL), Intermediate Regional Flood, Project design flood.

The study area involves the portions of Pope and Hardin counties, Illinois that are subject to flooding from the Ohio River. Included are the communities of Elizabethtown, Rosiclare and Golconda. The flood plain is mostly undeveloped with a sprinkling of industrial and residential land uses. Golconda and Rosiclare are protected from Ohio River flooding by a series of floodwalls and levees constructed after the 1937 flood, which provide protection to 3 feet above the 1937 flood height. Similar flood control projects have been authorized for Elizabethtown and Cave-in-Rock but have not been constructed. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs from January through April and results from heavy general rainfall combined with snowmelt. The worst flood recorded in the study area at Lock and Dam 51 occurred in January 1937, cresting at 356.7 feet mean sea level (msl). At the same location, the Intermediate Regional Flood would crest at 350.6 feet msl. The only manmade obstructions to flood flows that cross the river are Lock and Dams 50 and 51. Neither structure has substantial effect on flood magnitudes. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-05410

FLOOD PLAIN INFORMATION: OHIO RIVER AND MASSAC CREEK, CITY OF METROPOLIS AND MASSAC COUNTY, ILLINOIS.
Army Engineer District, Louisville, KY.
Prepared for City of Metropolis and Massac County, July 1975. 28 p, 14 fig, 18 plates, 9 tab.

Descriptors: *Illinois, *Flood forecasting, *Flood data, Floods, Flood flow, Design flood, Flood profiles, Historic floods, Flood stages, Peak discharge, Stage-discharge relations, Flood plains, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Levee, Floodwalls, *Ohio River(IL), *Massac Creek(IL), Massac County(IL), Metropolis(IL), Brookport(IL), Intermediate Regional Flood, Project design flood.

The study area involves the portions of Massac County, Illinois that are subject to flooding from the Ohio River and Massac Creek. Included are the towns of Brookport and Metropolis. The flood plain is mostly undeveloped in rural areas. Brookport is protected by a levee constructed following the devastating 1937 flood on the Ohio River. It consists of concrete wall and rolled earth levee and affords protection to the height of the 1937 flood plus 3 feet. Flood protection projects have been authorized for the city of Metropolis but have not yet been constructed. Commercial and residential developments in Metropolis occupy the flood plain. Flood data were obtained from topographic maps, field studies, historical sources, and gage records on the Ohio River. The main flood season occurs from January through April and results from prolonged heavy rainfall combined with snowmelt. Backwater flooding on Massac Creek may result from high stages on the Ohio River. The worst flood recorded at Metropolis occurred in February 1937, discharging 1,850,000 cubic feet per second (cfs) and cresting at 342.9 feet mean sea level (msl). At the same location, the Intermediate Regional Flood (IRF) would discharge 1,270,000 cfs, cresting at 334 feet msl. Historic and future flood profiles are presented for the entire study area. This report is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-05411

FLOOD PLAIN INFORMATION: EMBARRAS RIVER AND TRIBUTARIES, CHARLESTON, ILLINOIS.
Army Engineer District, Louisville, KY.
Prepared for City of Charleston, IL, January 1976, 32 p, 16 fig, 35 plates, 5 tab.

Descriptors: *Illinois, *Flood forecasting, *Flood profiles, *Flood data, *Flood stages, Floods, Flood flow, Streamflow forecasting, Historic floods, Peak discharge, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Flood plain insurance, Warning systems, Land use, Planning, Control structures, *Embarras River(IL), Charleston(IL), Coles County(IL), Intermediate Regional Flood.

The study area includes the portions of Coles County and the City of Charleston, Illinois that are subject to flooding by the Embarras River and its tributaries. The flood plain is mostly undeveloped except in Charleston, where residential and commercial land uses predominate. With continuing urban expansion the flood plains will come under increasing pressure for development. Flood data were obtained from topographic maps, historical sources, stream and bridge cross sections, and field studies. Stream gage and flood elevation records were not available. The main flood season occurs during winter and spring, resulting from intense local thunderstorms or heavy general rainfall. The worst flood recorded at the U.S. Geological Survey gage located 70 miles downstream from the study limit occurred in June 1957. The Intermediate Regional Flood on the Embarras River, upstream from its confluence with Kickapoo Creek, would discharge 36,200 cubic feet per second (cfs), while the Standard Project Flood would discharge 72,000 cfs. Past flood elevation records were unsatisfactory for comparison with projected floods. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-05412

FLOOD PLAIN INFORMATION: SUSSEX COUNTY, VIRGINIA, NOTTOWAY RIVER, VIRGINIA.
Army Engineer District, Norfolk, VA.
Prepared for Sussex County, VA, March 1976, 28 p, 8 fig, 40 plates, 8 tab.

Descriptors: *Virginia, *Flood forecasting, *Flood profiles, *Historic floods, *Flood data, Floods, Flood flow, Indirect flood measurement, Storms, Flood stages, Peak discharge, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Building codes, Land use, Planning, Control structures, *Nottoway River(VA), Sussex County(VA), Stony Creek(VA), Intermediate Regional Flood.

The study area includes the portions of Sussex County, Virginia that are subject to flooding by the Nottoway River and Stony Creek. The flood plain is mostly undeveloped or agricultural except in the town of Stony Creek, where some development of the flood plain has taken place. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. Flooding may occur at any time of year and is caused by intense local rainfall or tropical disturbances. The worst flood recorded at the U.S. Geological Survey gage on the Nottoway River near Stony Creek occurred on August 17, 1940, discharging 25,200 cubic feet per second (cfs) and cresting 82.08 feet mean sea level (msl). Another large flood, in October 1972, discharged 20,800 cfs at the same location, cresting at 80.1 feet msl. At the same location, the Intermediate Regional Flood would discharge 26,000 cfs and would crest at 82.9 feet msl, while the Standard Project Flood would discharge 39,000 cfs and would crest at 84.5 feet msl. Historic flood damages have not severely affected residential land uses, but agricultural losses have been critical. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-05413

FLOOD PLAIN INFORMATION: YELLOWSTONE RIVER, LIVINGSTON, MONTANA.
Army Engineer District, NE.
Prepared for Park County, Montana, and Montana Department of Natural Resources, Helena, November 1974. 34 p, 16 fig, 11 plates, 3 tab.

Descriptors: *Montana, *Streamflow forecasting, *Flood forecasting, *Flood profiles, *Flood data, Floods, Flood flow, Indirect flood measurement, Storms, Historic floods, Flood stages, Peak discharge, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Levee, Livingston(MT), *Yellowstone River(MT), Intermediate Regional Flood.

The study area includes the Yellowstone River and its flood plain for approximately six miles upstream and six miles downstream from Livingston, Montana. The flood plain contains commercial, residential, public utility, and industrial land uses, with some land either undeveloped or reserved for open space. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs in May and June, resulting from snowmelt supplemented by rainfall. Intense local rainfall at other times on small watersheds tributary to the Yelowstone River may also cause flooding at Livingston. Existing structural flood control measures afford protection from small floods. The worst flood recorded at the U.S. Geological Survey gage south of Livingston occurred on June 19, 1974, discharging 35,300 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood (IRF) would discharge 43,000 cfs, while the Standard Project Flood (SPF) would discharge 60,000 cfs. Three bridges in the study area would be overtopped by the SPF. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-05414

FLOOD PLAIN INFORMATION: GREAT FALLS, MONTANA, VOLUME II, MISSOURI RIVER.
Army Engineer District, Omaha, NE.
Prepared for City of Great Falls, Cascade County, Montana, June 1974. 30 p, 13 fig, 6 plates, 2 tab.

Descriptors: *Montana, *Streamflow forecasting, *Flood profiles, *Flood data, Floods, Flood flow, Indirect flood measurement, Storms, Historic floods, Flood stages, Peak discharge, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Warning systems, Land use, Planning, Control structures, Dams, Great Falls(MT), *Missouri River(MT), Cascade County(MT), Intermediate Regional Flood.

The study area includes the Missouri River and its flood plain from the Black Eagle Dam to a point 3.5 miles upstream from Great Falls, Montana. Development on the flood plain consists of residential, agricultural, recreational, and industrial land uses. Flood data were obtained from topographic maps, field studies, historical sources and stream gage records. The main flood season occurs during May and June, resulting from heavy rain combined with snowmelt. Canyon Ferry Reservoir has been used for flood control storage since 1966. The worst flood recorded at Black Eagle Dam occurred on June 7, 1908, and discharged 120,000 cubic feet per second (cfs). Great Falls experienced more extensive damage from the 76,000 cfs discharge of the June 10, 1964 flood due to greater flood plain development. Another large flood, discharging 62,000 cfs, occurred in 1953. At Great Falls, the Intermediate Regional Flood will discharge 49,000 cfs, while the Standard Project Flood would discharge 100,000 cfs. These floods would be more serious if existing structural flood controls had not been constructed. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. Volume I of this report identified flood characteristics for the Sun River, which joins the Missouri River at Great Falls. (Nessa-NC)
W78-05415

FLOOD PLAIN INFORMATION: BEAVERHEAD RIVER, DILLON, MONTANA.
Army Engineer District, Omaha, NE.
Prepared for Beaverhead County, Montana, June 1975, 27 fig, 8 plates, 7 tab.

Descriptors: *Montana, *Streamflow forecasting, *Flood profiles, *Flood data, *Flood recurrence interval, Floods, Flood flow, Indirect flood measurement, Historic floods, Flood stages, Peak discharge, Stage-discharge relations, Flood plains, Ice jams, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Beaverhead County(MT), *Beaverhead River(MT), Dillon(MT), Intermediate Regional Flood.

The study area includes the Beaverhead River and its flood plain from approximately 4 miles upstream to 4 miles downstream from Dillon, Montana. The flood plain in Dillon contains residential and commercial land uses. Outside of Dillon, the flood plain contains undeveloped or agricultural lands. Flood data were obtained from topographic maps, historical sources, field studies and stream gage records. The main flood season occurs in mid to late winter and mid to late spring. Ice jam flooding occurs during the winter, and snowmelt flooding occurs in the spring. Flooding may occur from January through September. The worst flood recorded at Dillon occurred on June 21, 1964, discharging 1,740 cubic feet per second (cfs) and cresting 6.63 feet above flood stage. At the downstream limit of the study area, the Intermediate Regional Flood will discharge 3,400 cfs, while the Standard Project Flood will discharge 5,900 cfs. Bridges in the study area will have only a small effect on these floods, causing an increase in flood heights of one foot or less. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-05416

FLOOD HAZARD ANALYSES REPORT: HOCKING RIVER WITH RUSH CREEK, PLEASANT RUN, BLUE VALLEY, BALDWIN RUN, FETTERS RUN, EWING RUN AND TARHE RUN, FAIRFIELD COUNTY, OHIO.
Soil Conservation Service, Columbus, OH.
April 1977, 26 p, 8 ref, 4 fig, 5 tab, append, 4 exhibits, glossary.

Descriptors: *Flood control, *Flood profiles, *Flood plains, *River basin development, *Ohio, Flood damage, Building codes, Flood frequency, Flood data, Flood plain insurance, Flood plain zoning, Warning systems, Flood protection, Non-structural alternatives, Regulation, Floodproofing, Management, Legal aspects, Floods, Control structures, *Hocking River(OH), *Fairfield County(OH), *Flood plain management, Rush Creek(OH), Pleasant Run(OH), Blue Valley(OH), Baldwin Run(OH), Fetters Run(OH), Ewing Run(OH), Tarhe Run(OH).

Fairfield County is subject to growing flood damages due to existing and increasing urbanization in its flood plain areas. The most severe flood occurred in July 1948, discharging 11,200 cubic feet per second (cfs) at the mouth of Hunters Run, with over $1,000,000 in damages. Local citizens and officials have expressed a desire to prevent further development which would receive similar damages from future floods. This report is intended to serve as the technical base from which local flood plain management decisions can be made. After a survey of flood history and projected flood potential, the regulatory floodplain was divided into two districts: the floodway--the floodplain borders reached by a 0.5 foot rise in water surface; and the floodway fringe--that area between the floodway and the boundaries of the 100-year flood. These two districts are to be used in conjunction with the recommendations to regulate floodplain development and achieve wise floodplain use. Recommendations include: increasing efforts for public participation; floodplain acquisition where zoning regulations are not enacted; analyzing the need for structural measures; providing for the enforcement of existing regulations through the Fairfield County Regional Planning Commission; identifying on-site flood boundaries and floodways within the county; and a continuing effort for regional administration, regulation and information use. (Zayac-NC)
W78-05417

UNITED STATES GEOLOGICAL SURVEY YEARBOOK, FISCAL YEAR 1977.
Geological Survey, Reston, VA.
For primary bibliographic entry see Field 9D.
W78-05419

THE INFLUENCE OF CLIMATE ON FLOODS IN SMALL BASINS, AS DEFINED BY RAINFALL-RUNOFF MODELING,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-05423

DRAINAGE AREAS FOR JEFFERSON COUNTY, ALABAMA,
Geological Survey, Montgomery, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-05427

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1977--VOLUME 1. CENTRAL AND NORTHERN LOUISIANA.
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-05428

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1977--VOLUME 2. SOUTHERN LOUISIANA.
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-05429

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1977--VOLUME 3. COASTAL LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-05430

TECHNIQUES FOR ESTIMATING FLOOD-DEPTH FREQUENCY RELATIONS ON NATURAL STREAMS IN GEORGIA,
Geological Survey, Doraville, GA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-05443

WATER RESEARCH: SOLVING COLORADO'S WATER PROBLEMS,
Colorado State Univ Fort Collins. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W78-05481

MULTIOBJECTIVE ANALYSIS IN THE MAUMEE RIVER BASIN: A CASE STUDY ON LEVEL-B PLANNING,
Case Western Reserve Univ., Cleveland, OH. Dept. of Systems Engineering.
For primary bibliographic entry see Field 6A.
W78-05484

THEORETICAL ESTIMATIONS OF FLOOD ROUTING PARAMETERS,
Northeastern Univ., Boston, MA. Dept. of Civil Engineers.
For primary bibliographic entry see Field 8B.
W78-05572

CHARACTERIZATION AND IMPACT OF STORMWATER RUNOFF FROM VARIOUS LAND COVER TYPES,
Wiggins-Rimer and Associates, Durham, NC.
For primary bibliographic entry see Field 5B.
W78-05580

DAM IN THE VILYUY HYDRAULIC POWER SYSTEM,
For primary bibliographic entry see Field 8D.
W78-05589

CALCULATION OF FLOOD DISCHARGES AND FLOOD HYDROGRAPHS IN KANSAS,
Kansas Univ./Center for Research, Inc., Lawrence.
For primary bibliographic entry see Field 2E.
W78-05592

FLOOD PLAIN INFORMATION: SALT CREEK, KICKAPOO CREEK, BRAINARD BRANCH, AND SALT SPRING BRANCH, LOGAN COUNTY, ILLINOIS.
Army Engineer District, Chicago, IL.
Prepared for Logan County Regional Planning Commission, May 1976, 38 p, 16 fig, 42 plates, 9 tab.

Descriptors: *Illinois, *Flood forecasting, *Flood data, *Stage-discharge relations, Floods, Flood flow, Flood profiles, Historic floods, Flood stages, Flood peak, Flood plains, Flood protection, Non-structural alternative, Land use, Planning, Control structures, Logan County(IL), *Salt Creek(IL), *Kickapoo Creek(IL), *Brainard Branch(IL), *Salt Spring Branch(IL), 100-year flood, 500-year flood.

The study area includes portions of Logan County, Illinois that are subject to flooding from Salt Creek, Kickapoo Creek, Brainard Branch and Salt Spring Branch. The flood plain is mostly agricultural of undeveloped, with some residential and commercial land uses. Flood data were obtained from topographic maps, field studies, historical sources and stream gage records. The main flood season occurs in April and May and results from heavy general rainfall. Winter flooding may occur when frozen ground prevents rainfall absorption. Culverts and bridges in the study area frequently obstruct flood flow. The worst flood recorded on Salt Creek t the Rocky Ford bridge occurred on May 19, 1943, cresting at 545.6 feet mean sea level (msl). At the same location, the 100-year flood would crest at 550.6 feet msl and would discharge 42,000 cubic feet per second (cfs), while the 500-year flood would crest at 553.3 feet msl and would discharge 61,000 cfs. Historic and future flood profiles are presented for the entire study area. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-05663

FLOOD PLAIN INFORMATION: MUSKINGHAM DRAW, ODESSA, TEXAS.
Army Engineer District, Fort Worth, TX.
Prepared for City of Odessa, Texas, October 1977, 33 p, 9 fig, 17 plates, 6 tab.

Descriptors: *Texas, *Indirect flood measurement, *Streamflow forecasting, *Flood profiles, *Flood data, Floods, Flood stages, Peak discharge, Stage-discharge relations, Flood protection, Non-structural alternatives, Flood plain zoning, Warning systems, Land use, Planning, Zoning, Control structure, Floodproofing, Odessa(TX), *Muskingham Draw(TX), *Flood plain management, 100-year flood, 500-year flood.

The study area includes Muskingham Draw and its flood plain in the vicinity of Odessa, Texas. The flood plin in Odessa is extensively developed with residential and commercial land uses. This land use pattern is spreading into the sparsely developed rural limits of the study area. Flood data were obtained from topographic maps, field studies, historical sources, and hydrologic data from similar watersheds in the region. No stream gage records exist for the study area. The main flood season occurs in spring and early summer and results from heavy general rainfall. Intense local thundersotms may cause flooding at other times. Past floods are described but their magnitudes are not quantified. Maximum flood discharges for other streams in the region are presented. At the downstream study limit, the 100-year flood would discharge 3,100 cubic feet per second (cfs), while the 500-year flood would discharge 4,900 cfs. Guidelines for flood plain management are presented; structural and non-structural flood measures are described. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-05664

FLOOD PLAIN INFORMATION: LITTLE KANAWHA RIVER, GLENVILLE, WEST VIRGINIA.
Army Engineer District, Huntington, WV.
Prepared for State of West Virginia, Division of Water Resources, January 1970, 39 p, 9 fig, 10 plates, 8 tab.

Descriptors: *West Virginia, *Flood flow, *Flood forecasting, *Flood data, Floods, Streamflow forecasting, Flood profiles, Storms, Historic floods, Peak discharge, Stage-discharge relations, Standard Project Flood, Flood plains, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, *Little Kanawha River(WV), Glenville(WV), Intermediate Regional Flood.

The study area includes the Little Kanawha River and its flood plain in the vicinity of Glenville, West Virginia, covering a 3.3 mile stretch of the river. Developments in the flood plain consist of residential and commercial land uses in the urban area. Elsewhere, agricultural and recreation uses predominate. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs in late winter and early spring, resulting from heavy general rainfall. Intense local thunderstorms may cuase flooding at other times. The worst flood recorded at Glenville occurred on March 7, 1967. It crested at 732.3 feet mean sea level (msl), and discharged 21,500 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood (IRF) would crest at 732.7 feet msl and would discharge 23,500 cfs, while the Standard Project Flood (SPF) would crest at 747 feet msl and would discharge 75,000 cfs. Construction of the proposed Burnsville Lake Project approximately 20 miles upstream from Glenville would reduce the magnitude of the IRF and SPF. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-05665

FLOOD PLAIN INFORMATION: APPOMATTOX RIVER, CHESTERFIELD COUNTY - PETERSBURG, VIRGINIA.
Army Engineer District, Norfolk, VA.
Prepared for Virginia State Water Control Board, March 1975, 33 p, 9 fig, 13 plates, 8 tab.

Descriptors: *Virginia, *Streamflow forecasting, *Flood profiles, *Flood data, *Stage-discharge relations, Floods, Flood flow, Indirect flood measurement, Storms, Historic floods, Flood stages, Peak discharge, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Dikes, *Appomattox River(VA), Chesterfield County(VA), Petersburg(VA), Colonial Heights(VA), Intermediate Regional Flood.

The study area involves the Appomattox River and its flood plain in the vicinity of the cities of Colonial Heights and Petersburg, Virginia. Development on the flood plain varies from undeveloped to intensive commercial, residential, and industrial land uses. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The most serious flooding occurs from May through November and results from heavy rains associated with tropical disturbances. Flooding may occur at any time of year. The worst flood recorded near Petersburg occurred in October 1972. Its magnitude was equivalent to the Intermediate Regional Flood (IRF). It discharged 40,800 cubic feet per second (cfs) and crested at 18.4 feet mean sea level (msl). At the same location, the Standard Project Flood (SPF) would discharge 62,000 cfs and would crest at 24.3 feet msl. The IRF and SPF would cause substantial damage. A Corps of Engineers dike has provided flood protection to Petersburg, except for the floods of 1940 and 1972. In 1972, extensive damage was caused due to a break in the dike. An earth and concrete levee system was considered but was rejected as being uneconimical. This study is intended for use in making land use planning and

management decisions concerning flood plain utilization. (NessaeNC)
W78-05666

SPECIAL FLOOD HAZARD INFORMATION REPORT: SOUTH PLATTE RIVER, VOLUME 1, WELD COUNTY, COLORADO.
Army Engineer District, Omaha, NB.
Prepared for Weld County, Colorado, April 1977, 26 p, 35 plates, 9 tab.

Descriptors: *Colorado, *Flood flow, *Streamflow forecasting, *Flood profiles, *Flood data, Floods, Indirect flood measurement, Historic floods, Flood frequency, Flood recurrence interval, Flood stages, Flood peak, Stage-discharge relations, Flood plains, Flood protection, Non-structural alternatives, Land use, Planning, Weld County(CO), *South Platte River(CO), 100 year flood, 500 year flood.

The study area includes the South Platte River and its flood plain in Weld County, Colorado. A large proportion of the flood plain contains agricultural land uses. Dense development patterns exist in the proximity of larger incorporated areas. Flood data were obtained from topographic maps, field studies, historical sources and stream gage records. The main flood season occurs from May through August, and results from heavy general rainfall or intense local thunderstorms, either of which may be augmented by snowmelt. The worst flood recorded at the Kersey gage occurred on May 8, 1973. The flood discharged 31,500 cubic feet per second (cfs), and crested at 4586.3 feet mean sea level (msl). This flood is equivalent to the 100 year flood. At the same location, the 500 year flood would discharge 63,000 cfs and would crest at 4,588 feet msl. These floods would primarily affect public utilities, public roadways, and agricultural properties and associated developments. This study is intended for use in making land use planning and management decisions regarding flood plain utilization. (Nessa-NC)
W78-05667

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, MCKEAN COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for McKean County, PA, December 1976, 40 p, 11 plates, 7 tab.

Descriptors: *Pennsylvania, *Flood forecasting, *Flood profiles, *Flood data, *Peak discharge, *Stage-discharge relations, Floods, Flood flow, Indirect flood measurement, Streamflow forecasting, Storms, Historic floods, Flood stages, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Dikes, McKean County(PA), *Allegheny River(PA), Eldred(PA), Port Allegany(PA), Lillibridge Creek(PA), 100-year flood, 500-year flood.

The study area involves the portions of McKean County, Pennsylvania that are affected by flooding from the Allegheny River. The flood plain consists primarily of undeveloped or agricultural land uses, except in the urban areas of Eldred and Port Allegany where residential, commercial, industrial and transportation land uses predominate. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs from December through April and results from heavy general rainfall combined wit snowmelt. Intense local thunderstorms may cause flooding at other times. An earth dike along the right bank of both the Allegheny River and Lillibridge Creek in Port Allegany affords some protection against moderately high floods but not against extremely high floods such as the one of June 1972. The worst flood recorded at Port Allegany occurred in July 1942, discharging 30,000 cubic feet per second (cfs). At the Eldred gage the worst recorded flood occurred on June 23, 1972, cresting 29.05 feet above flood stage and discharging 35,500 cfs. At the same location, the 100-year flood would crest 28.8 feet above flood stage and would discharge 35,000 cfs, while the 500-year flood would crest 32.9 feet above flood stage and would discharge 52,800 cfs. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-05668

4B. Groundwater Management

MULTIPLE-COMPLETION GEOTHERMAL ENERGY PRODUCTION SYSTEMS,
For primary bibliographic entry see Field 8C.
W78-05240

TECHNICAL REQUIREMENTS AND ANALYSIS METHODS FOR EVALUATING THE ENVIRONMENTAL CONSEQUENCES OF GROUNDWATER CONTAMINATION,
BCS., Inc., Richland, WA.
For primary bibliographic entry see Field 5B.
W78-05372

PILOT PLANT INVESTIGATION OF THE EVOLUTION OF VARIOUS POLLUTANTS DURING ARTIFICIAL RECHARGE OF AN AQUIFER BY A BASIN,
Societe Lyonnaise des Eaux et de l'Eclairage (France).
For primary bibliographic entry see Field 5B.
W78-05374

HYDROCHEMICAL EFFECTS OF WASTE PERCOLATION OF GROUNDWATER IN BASALT NEAR FOOTSCRAY, VICTORIA, AUSTRALIA,
Geological Survey of Victoria (Australia).
For primary bibliographic entry see Field 5B.
W78-05376

MODELLING OF LARGE MULTILAYERED AQUIFER SYSTEMS: THEORY AND APPLICATIONS,
Ecole National Superieure des Mines de Paris, Fontainebleau (France). Center for Geological Information.
For primary bibliographic entry see Field 2F.
W78-05384

DETERMINATION OF AQUIFER PARAMETERS BY A TWO-WELL PULSED METHOD USING RADIOACTIVE TRACERS,
UKAEA Hydrology and Coastal Sediment Group, Harwell (England).
For primary bibliographic entry see Field 2F.
W78-05385

DRAINAGE BY RECHARGE WELLS IN A LEAKY AQUIFER,
Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W78-05387

FLOW TOWARD A PARTIALLY PENETRATING WELL IN A BOUNDED ARTESIAN AQUIFER,
Indian Inst. of Tech., Madras (India). Hydraulic Engineering Lab.
For primary bibliographic entry see Field 2F.
W78-05388

NON-DARCY FLOW AND ITS IMPLICATIONS TO SEEPAGE PROBLEMS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-05392

TRENDS OF SELECTED GROUND-WATER CONSTITUENTS FROM INFILTRATION GALLERIES, SOUTHEAST NASSAU COUNTY, NEW YORK,
Geological Survey, Mineola, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-05420

AVAILABILITY OF GROUND WATER IN SEMINOLE COUNTY AND VICINITY, FLORIDA,
Geological Survey, Orlando, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-05426

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1977--VOLUME 1. CENTRAL AND NORTHERN LOUISIANA.
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-05428

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1977--VOLUME 2. SOUTHERN LOUISIANA.
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-05429

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1977--VOLUME 3. COASTAL LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-05430

SUMMARY GROUND-WATER RESOURCES OF LANCASTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
C. W. Poth.
Pennsylvania Geological Survey, Harrisburg, Fourth Series, Water Resources Report 43, 1977. 80 p, 5 fig, 1 plate, 7 tab, 26 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Water yield, Water quality, *Pennsylvania, Well data, Water levels, Petrology, Drawdown, Groundwater recharge, Water analysis, Water wells, Surface-groundwater relationships, Lancaster County(Penn).

Lancaster County, Pennsylvania, lies in the Piedmont physiographic province. The northern 10 percent of the county is underlain by sandstone and shale, and intruded by a diabase. Water in these rocks is soft to moderately hard and median well yields are a little over 10 gpm (gallons per minute). The central half of the county is underlain dominantly by limstone and dolomite, and to a lesser extent by shale, quartzite, and phyllite. The water ranges from soft in the quartzite to very hard in some of the carbonate rocks. The best well yields are obtained in the carbonate rock unit; and one of them, the Ledger Formation, has a median specific capacity of 2.5 gpm per foot of drawdown. The southern part of the county is underlain by schist, part of which contains interbeds of quartzite. The water in these rocks is soft and the median yield from wells is about 10 gpm. (Woodward-USGS)
W78-05432

GROUND-WATER LEVELS IN THE UNITED STATES, 1974. SOUTHEASTERN STATES.
Geological Survey, Reston, VA. Water Resources Div.

For primary bibliographic entry see Field 2F.
W78-05433

GROUND-WATER LEVELS IN THE UNITED STATES, 1971-74. NORTHWESTERN STATES.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-05434

GROUND-WATER RESOURCES OF CAMBODIA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-05435

EVALUATION OF A POTENTIAL WELL FIELD NEAR CHURCH ROCK AS A WATER SUPPLY FOR GALLUP, NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
G. A. Hearne.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 713, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-98, September 1977. 21 p, 3 fig, 7 tab, 14 ref.

Descriptors: *Model studies, *Groundwater potential, *Aquifer characteristics, *Groundwater availability, *New Mexico, Mathematical models, Water supply, Projections, Computer models, Gallup(N Mex), San Juan Basin, Morrison Formation, Westwater Canyon Member.

A digital model is used to evaluate the Westwater Canyon Member of the Upper Jurassic Morrison Formation near Church Rock, N. Mex., as the source for a potential well field to supply water to Gallup, N. Mex. The estimated values of the aquifer parameters are transmissivity, 300 feet squared per day; coefficient of confined storage, 0.0002; coefficient of unconfined storage, 0.10; and leakance, 10 to the minus 7th power per day. The model indicated that the ability of the potential well field to meet the projected needs of the city of Gallup depends on the future withdrawals of water from uranium mines in the area. (Woodard-USGS)
W78-05436

RECONNAISSANCE OF GROUND-WATER RESOURCES IN THE MOUNTAIN HOME PLATEAU AREA, SOUTHWEST IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
H. W. Young.
Water-Resources Investigations 77-108 (open-file report), December 1977. 40 p, 11 fig, 4 tab, 17 ref.

Descriptors: *Groundwater resources, *Surveys, *Water supply, *Irrigation, *Idaho, Hydrologic data, Aquifer characteristics, Water wells, Water yield, Water quality, Chemical analysis, Hydrogeology, Groundwater recharge, Groundwater availability, Evaluation, *Mountain Home plateau area(Idaho).

The Mountain Home plateau area occupies approximately 1,220 sq mi in southwestern Idaho. The plateau has long been recognized as a potential area for increased agricultural development. However, plans for increased development are limited by the availability of water. Potential sources of additional water for irrigation are importation of water from the Boise River drainage basin, diversion of Snake River water, and increased pumping from aquifers underlying the plateau. This report includes (1) descriptions of aquifer systems, (2) documentation of changes in groundwater storage caused by water-supply development, (3) mapping of the water-table and perched-water zones and determination of direction of ground-water flow, and (4) definition of ground-water recharge and discharge areas. Work accomplished during this 1-year investigation included an inventory of 260 wells and 14 springs; monthly water-level measurements at 27 wells; collection of water samples for chemical analyses from 37 wells and 10 springs; collection of water samples for isotopic analyses from 15 wells and springs; and collection of borehole geophysical logs from 5 wells. In addition, geologic and hydrologic data from previous studies were used. (Woodard-USGS)
W78-05438

STREAM SIMULATION IN AN ANALOG MODEL OF THE GROUND-WATER SYSTEM ON LONG ISLAND, NEW YORK,
Geological Survey, Mineola, NY. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-05440

APPLICATION OF THERMAL IMAGERY AND AERIAL PHOTOGRAPHY TO HYDROLOGIC STUDIES OF KARST TERRANE IN MISSOURI,
Geological Survey, Rolla, MO. Water Resources Div.; and Missouri Dept. of Natural Resources, Rolla. Div. of Geology and Land Survey.
For primary bibliographic entry see Field 5G.
W78-05441

GROUND WATER IN THE KOEHN LAKE AREA, KERN COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. H. Koehler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 252, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-66, December 1977. 24 p, 8 fig, 2 ref.

Descriptors: *Groundwater resources, *Overdraft, *Hydrogeology, *Projections, *Saline water intrusion, *California, Aquifer characteristics, Pumping, Water supply, Water storage, Water demand, Drawdown, Groundwater recharge, Water quality, Water yield, Evaluation, Kern County(Calif), *Koehn Lake area(Calif).

Hydrologic characteristics of the koehn Lake area in Kern County, Calif., were investigated to determine the effects of external stresses on the system. Unconsolidated deposits are more than 900 feet thick in the central part of the basin. Cantil Valley fault, in the central part of the basin, acts as a barrier to the flow of ground water. Average annual recharge to aquifers from percolation of surface water and from underflow, between 1958 and 1976, was 10,200 acre-feet. Average annual consumptive use, between 1960 and 1976, was 32,000 acre-feet, 21,800 acre-feet more than the recharge, implying that average annual withdrawal from storage is about 22,000 acre-feet. Storage depletion in 1976 was 50,000 acre-feet, considerably higher than the average. The cumulative storage depletion has caused a decline in water levels and a pumping depression about 5 miles southwest of Koehn Lake. Ground water in storage in 1976 was about 4 million acre-feet, and ground water in storage above the 500-foot depth excluding the saline water under Koehn Lake was about 2 million acre-feet. Water samples were collected from 24 wells for chemical analysis. Comparison of analyses made during this study with historical water-quality analyses indicated no significant change. A recent reversal in ground-water gradient southwest of Koehn Lake may allow the saline water below Koehn Lake to invade the freshwater aquifer. (Woodard-USGS)
W78-05442

NATIONAL WATER SUPPLY AND IMPROVEMENT ASSOCIATION (NWSIA): WATER REUSE AND DESALINATION FOR THE FUTURE.
National Water Supply and Improvement Association, Ipswich, MA.
For primary bibliographic entry see Field 3A.
W78-05532

SITE SPECIFIC BURIAL OF UNFIXATED FLUE GAS SLUDGE,
Research-Cottrell, Inc., Bound Brook, NJ.
For primary bibliographic entry see Field 5E.
W78-05555

DISPERSIVE SOURCES IN UNIFORM GROUND-WATER FLOW,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-05571

SALT WATER INTRUSION IN THE UNITED STATES,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5B.
W78-05613

4C. Effects On Water Of Man's Non-Water Activities

FORESTS AND WATER QUALITY,
Northeastern Forest Experiment Station, Durham, NH.
For primary bibliographic entry see Field 5B.
W78-05245

WHEN SKI TRAILS ARE CUT THROUGH FOREST LAND, WHAT HAPPENS TO STREAMFLOW,
Northeastern Forest Experiment Station, Durham, NH.
J. Hornbeck, and G. Stuart.
Ski Area Management 15(4), p 34-36, 47, 1976. 3 fig.

Descriptors: Streamflow, *Forests, *Sedimentation, *Temperature, Water quality, Nutrients, Snowmelt, New Hampshire, Clear-cutting, Hubbard Brook Experimental Forest(NH), *Ski trails, *Forest cutting(Trails).

Based on gaged watershed studies, converting of forests to ski trails in New England will increase total summer streamflow by an estimated one to two inches. The increase will be greatest immeidately after clearing the trails and will gradually disappear in three to four years as a healthy new cover of grasses and herbaceous plants becomes established. Common sense practices can minimize the problems of sedimentation and leaching of chemical ions to streams. (Forest Service)
W78-05249

ECOSYSTEM IMPACTS OF URBANIZATION ASSESSMENT METHODOLOGY.
Corvallis Environmental Research Lab., OH.
For primary bibliographic entry see Field 6G.
W78-05533

HIGHWAYS IN THE RIVER ENVIRONMENT--HYDRAULIC AND ENVIRONMENTAL DESIGN CONSIDERATIONS, BASIC COURSE, INSTRUCTOR'S LESSON PLANS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-05585

EVALUATION OF FLOOD RISK FACTORS IN THE DESIGN OF HIGHWAY STREAM CROSSINGS. VOL III. FINITE ELEMENT MODEL FOR BRIDGE BACKWATER COMPUTATION,
Water Resources Engineers, Springfield, VA.
For primary bibliographic entry see Field 8B.
W78-05596

4D. Watershed Protection

FORESTS AND WATER QUALITY,
Northeastern Forest Experiment Station, Durham, NH.
For primary bibliographic entry see Field 5B.
W78-05245

WATER-HOLDING CAPACITY FOR HYDROMULCH,
California State Dept. of Transportation, Sacramento. Transportation Lab.
T. P. Hoover.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 646, Price codes: A02 in paper copy, A01 in microfiche. Final Report No. CA-DOT-TL-2167-1-76-36, June 1976. 17 p, 9 append.

Descriptors: *Laboratory tests, *Mulching, *Erosion control, *Moisture content, Drying, Sampling, Statistics, Mathematical studies, *Hydromulch, *Water-holding capacity, Fibers, Ground cover, Seeding.

A proposed test procedure to evaluate the water-holding capacities of various hydromulch fibers was presented. This procedure is a refinement of a preliminary procedure based on methods used by three producers or testers of hydromulch fibers. The testing program used to determine the significant steps and the most reliable procedure was given. (Adams-ISWS)
W78-05363

DEVELOPMENT OF PROCEDURES FOR COST-SHARING AND REPAYMENT ANALYSIS,
New York State Coll. of Agriculture and Life Sciences, Ithaca.
For primary bibliographic entry see Field 6B.
W78-05485

ONSITE CONTROL OF SEDIMENTATION UTILIZING THE MODIFIED BLOCK-CUT METHOD OF SURFACE MINING.
Kentucky Dept. of Natural Resources and Environmental Protection, Frankfort.
For primary bibliographic entry see Field 5G.
W78-05536

ADSORPTION LOSSES AND PERFORMANCE OF 51CR-EDTA AND 198AU IN TRACING OF FLOOD RUNOFF,
New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-05573

A MULTIDIMENSIONAL ANALYSIS OF THE RESULTS OF THE FRENCH 1971 SURFACE WATER QUALITY NETWORK CONTROL IN THE RIVER BASIN 'SEINE-NORMANDIE',
Ecole Nationale Superieure des Mines de Paris, Fontainebleau (France). Center for Geological Information.
For primary bibliographic entry see Field 5A.
W78-05581

EXPERIMENTAL INVESTIGATION OF WATERSHED SURFACE RUNOFF A CONTRIBUTION TO THE INTERNATIONAL HYDROLOGICAL DECADE,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W78-05587

CALCULATION OF FLOOD DISCHARGES AND FLOOD HYDROGRAPHS IN KANSAS,
Kansas Univ./Center for Research, Inc., Lawrence.
For primary bibliographic entry see Field 2E.
W78-05592

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

MNO2 DEPOSITION IN FEEDLOT WATER LINES IN SOUTH DAKOTA,
South Dakota State Univ., Brookings. Dept. of Chemistry.
H. Gehrke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 809, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, Report for Phase I and Phase II, January 1978. 31 p, 6 tab. OWRT A-048-SDAK(1) and A-058-SDAK(1), 14-31-0001-5042, 14-34-0001-7087.

Descriptors: Hyphomicrobium, Manganese oxidation, Manganese oxides, *Manganese oxide deposits, *South Dakota, Farm wastes, Feed lots, Oxides, Chemical analysis, Water analysis, Pollutant identification, Water pollution sources, Distribution systems, Pipelines, Oxalic acid, Sulfuric acid, Chemical degradation.

The objectives were to determine the causes for the deposition of MnO2 in water lines in eastern South Dakota and to determine methods to clean buried water lines containing MnO2. Chemical analysis of water at a number of sites suggests that factors such as total hardness and Mn to the 2+ power, HCO3 to the 1- power, SO4 to the 2- power and dissolved oxygen concentrations may be related to the increased deposition of MnO2 in affected systems. Microorganisms have been implicated in at least some of the systems with the identification of Hyphomicrobium. Analysis of all factors suggests that MnO2 deposition is a combination of physico chemical and biological phenomena. MnO2 deposits have been found in plastic, iron and copper water lines; no logical pattern relating MnO2 to a specific type of pipe or to the chemical constituents of the water has been elucidated. Using water from the farm where Hyphomicrobium was isolated, a method was developed to continuously remove Mn to the 2+ power from the water. Thus a laboratory model for the MnO2 deposition has been attained and work can proceed in an attempt to alleviate the problem. Copper has shown promise in preventing MnO2 deposition. Laboratory tests indicate that a combination of oxalic acid and sulfuric acid was most effective at dissolving MnO2 deposits in a reasonable length of time. Laboratory simulation of a clogged water line indicates that much of the cleaning action is mechanical rather than chemical. (Wiersma-So Dak St)
W78-05202

STUDY ON THE STATE OF WATER IN DISPERSIONS OF H+, MG2+ AND FE3+ MONTMORILLONITES BY HIGH-RESOLUTION NMR, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics; and Moscow State Univ. (USSR). Dept. of Soil Melioration
For primary bibliographic entry see Field 2K.
W78-05238

PROCEEDINGS OF THE CONFERENCE ON ASSESSING THE EFFECTS OF POWER-PLANT-INDUCED MORTALITY ON FISH POPULATIONS.
Energy Research and Development Administration, Oak Ridge, TN ; and Oak Ridge National Lab., TN
For primary bibliographic entry see Field 5C.
W78-05251

FACTORS TO CONSIDER IN MONITORING PROGRAMS SUGGESTED BY STATISTICAL ANALYSIS OF AVAILABLE DATA,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5C.
W78-05263

HIGH PERFORMANCE LIQUID CHROMATOGRAPHIC DETERMINATION OF UNREACTED ACRYLAMIDE EMULSION OR AQUEOUS HOMOPOLYMERS OR EMULSION COPOLYMERS,
Petrolite Corp., St. Louis, MO. Tretolite Div.
F. J. Ludwig, Jr., and M. F. Besand.
Analytical Chemistry, Vol. 50, No. 1, p 185-187, January, 1978. 1 fig, 4 tab, 6 ref.

Descriptors: *Chemical precipitation, *Aqueous solutions, *Anions, *Cations, *Chromatography, Industrial wastes, Waste water treatment, Water pollution sources, Emulsions, Oil industry, *Pollutant identification, Analytical techniques, Flocculation, Separation techniques.

Unreacted amounts of acrylamide, a toxic residual of waste water treatment and oil-field waterfloods, were measured by precipitation in acetone and methanol solutions. The rates within one hour of acrylamide solution polymerization or emulsion copolymerization were measured. The mean percentage of acrylamide in an anionic emulsion after addition to acetone was 0.41% after a 10-min stirring. The percentage did not significantly change for stirring times of 30 and 60 min. A cationic copolymer emulsion yielded a mean residual acrylamide percentage of 0.061% after addition of acrylamide to acetone. Again, there was no significant change in recovery for the three stirring times after the initial 10 minutes. The percentage of acrylamide recovered from spiked cationic emulsion copolymers was higher using acetone-precipitation; recovery rates from anionic emulsion copolymers were greater using methanol-precipitation. It was concluded that solvent extraction with acetone was better suited to cationic emulsion copolymers and aqueous polyacrylamides. Methanol-precipitation was considered more applicable to the recovery of residual acrylamide in anionic emulsion copolymers. (Lisk-FIRL)
W78-05270

MONITORING CONTINUOUSLY THE OXYGEN DEMAND OF INDUSTRIAL EFFLUENT AND SURFACE WATERS,
Philips Gloeilampenfabrieken N.B., Eindhoven (Netherlands). Application Lab.
G. Voorn, and J. Lee-Frampton.
Water and Waste Treatment, Vol 20, No 10, p 14-18, October, 1977. 10 fig, 1 tab, 7 ref.

Descriptors: *Dissolved oxygen analyzers, Equipment, *Monitoring, *Analytical techniques, *Industrial wastes, Water pollution control, Dissolved oxygen, Organic wastes, Food processing industry, Chemical oxygen demand, Waste water treatment.

Use of the Philips TOD meter is presented as an efficient method of continuously monitoring dissolved oxygen levels in industrial effluent and surface waters. Electro-chemical relationships utilized by the Philips meter include the Faraday Law and the Nernst Law. Monitoring of total dissolved oxygen is considered as an alternative to the COD method for assessing the organic load in a water

sample. Effluents from the meat preservation, pharmaceutical, and chemical industries were used to derive an equation relating the COD with the total dissolved oxygen content as measured by the Philips meter. This method is also applied to surface water samples obtained from the Naviglio Vecchio Canal near Milan, Italy. (Baker-FIRL)
W78-05298

QUALITATIVE AND QUANTITATIVE DETERMINATION CHLORINATED ORGANIC COMPOUNDS IN WASTE WATERS FROM BLEACHING WORKS BY GAS CHROMATOGRAPHY AND MASS SPECTROSCOPY (QUALITATIVE AND QUANTITATIVE BESTIMMUNG VON CHLORIERTEN ORGANISCHEN VERBINDUND IN BLEICHEREIABWAESSERM MITTELS GASCHROMATOGRAPHIE UND MASSENSPEKTROSKOPIE),
Swedish Forest Products Research Lab., Stockholm.
K. Lindstroem.
Das Papier, Vol 31, No 12, p 517-525, 1977. 15 fig.

Descriptors: Analytical techniques, *Chlorination, Pulp and paper industry, *Bleaching wastes, *Gas chromatography, *Pollutant identification, *Spectroscopy, Organic compounds, Solvent extraction, Laboratory tests, Phenols, Bioassay, Pulp wastes, Fish, Toxicity.

Qualitative and quantitiative analyses of the chlorinated organic compounds formed as a result of the oxidation of lignin during pulp bleaching are described. The lipophilic fractions were extracted for 48 hrs with diethylether and a continuous extraction apparatus. The phenols were extracted from the ether solution with NaOH and acidified. They ethylation with fresh diazoethene, the resulting phenol-ehters were analyzed by gas chromatography-mass spectroscopy. The toxicities and lethal limits of these compounds on fish were evaluated in experiments in which dilute bleaching plant waste water was continuously passed through aquaria. Analyses established that the chlorinated phenols were concentrated in the fish muscles and liver. These compounds were eliminated fairly quickly after the fish were returned to fresh water. Tetrachlorguaiacol was retained for the longest period after return to fresh water. (Tallert-FIRL)
W78-05320

ON-LINE INDUSTRIAL WATER POLLUTION MONITORS,
J. W. Javetski.
Power, Vol. 122, No. 1, p 29-36, January, 1978. 18 fig, 3 tab.

Descriptors: *Electrodes, *Colorimetry, *Photometry, *Pollutant identification, *Monitoring, Analytical techniques, Impaired water quality, Oil pollution, Pollutant, Effluents, Biochemical oxygen demand, Industrial wastes, Waste water treatment.

The National Pollutant Discharge Elimination System (NPDES) permit issued to each point-source polluter establishes limits for each pollutant likely to be discharged from the source, frequently including BOD, total suspended solids, and pH. To industrial environmentalists, some standard procedures appear too costly and time consuming for effluent monitoring. Ideally, both laboratory analysis and continuous on-line monitoring should be included in a pollution control program. Ion-selective electrodes (ISE) can include liquid-membrane-sensing, solid-state, and glass types. Ion-selective electrodes require: relatively constant sample temperature, interference, and sample flow; proper calibration and maintenance; and a sample ionic strength that does not vary by more than 30%. Combination systems for measuring more than one parameter of the effluent are available. In wet-chemical analyzers, a sample stream is reacted to produce a colored chemical species. The intensity of the color is measured colorimetrically to indicate the concentration of the chemical species as an indication of the degree of pollution. Photometric analyzers are based on the compound being monitored by ultraviolet absorption, molecular fluorescence, or infrared reflectance. (Snyder-FIRL)
W78-05332

ADSORPTION STUDIES USING GAS-LIQUID CHROMATOGRAPHY--II. COMPETITIVE ADSORPTION,
Birmingham Univ. (England). Dept. of Civil Engineering.
R. J. Martin, and K. S. Al-Bahrani.
Water Research, Vol. 11, No. 11, p 991-999, 1977. 19 fig, 2 tab, 8 ref.

Descriptors: *Activated carbon, *Organic compounds, *Adsorption, *Chromatography, Analytical techniques, Testing procedures, Waste water treatment, Water pollution, Industrial wastes, *Pollutant identification, *Gas chromatography.

Selective and competitive adsorpuion of low molecular weight, aromatic organic compounds onto activated carbon were detected with gas-liquid chromatography. The organic compounds analyzed in batch and column flow systems were: pyridine, 2-methyl-pyridine, o-cresol, 2-chlorophenol, nitrobenzene, o-methoxyphenol, and quinaldine. The adsorption capacity of activated carbon for each organic compound was compared to the competitive adsorption rates of multiple organic compound solutions. Adsorption rates for single solutes were adversely affected by the presence of other compounds in a multi-solute solution. Increased overall uptake rates for multi-compound solutions were attributed to the increased concentrations. Desorption of some compounds occurred in the column system when more effectively adsorbed compounds were introduced. Activated carbon's capacity for adsorption was not significantly affected by an increase in the number of compounds in solution during the batch system tests. Carbon capacity increased in column flow systems when solutes were increased. (Lisk-FIRL)
W78-05339

PESTICIDES IN IOWA SURFACE WATERS: SUMMARY OF A WORKSHOP HELD MARCH 1977.
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 5B.
W78-05349

NON-POINT SOURCES OF WATER POLLUTION.
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W78-05352

BIOGEOCHEMISTRY OF DEEP LAKES IN THE CENTRAL ALASKAN RANGE,
Alaska Univ., College. Inst. of Water Resources.
J. LaPerriere, and L. Casper.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 031, Price codes: A03 in paper copy, A01 in microfiche. Report No. IWR-68, February, 1976. 35 p, 14 fig, 1 tab, 17 ref. OWRT A-041-ALAS(1).

Descriptors: *Lake morphology, *Lake morphometry, *Lake basins, *Alaska, *Limnology, Primary productivity, Aquatic algae, Plankton chlorophyll, Pigments, Aquatic plants, Zooplankton, Nutrients, Dissolved oxygen, Water temperature, Temperature, Heat budget, Geothermal studies, Thermocline, Climatic data, Ice cover, Iced lakes, Light penetration, Analytical techniques, Biochemistry, *Wonder Lake(Alas), *Paxson Lake(Alas), Plant nutrients, Oxygen saturation, Phaeopigments, Vascular plants, Biogeochemistry.

Biogeochemical data of Wonder and Paxson Lakes were collected and analyzed. Data collected include: climatic conditions, basin morphology, algal primary productivity, alkalinity, light penetration, algal chlorophyll and phaeopigment content, vascular plant colonization and dry weights, plant nutrient (nitrate, nitrite, phosphorus) concentrations, zooplankton colonization and dry weights, dissolved oxygen, pH, and electrical conductivity. Data are presented in location and morphometric maps, hypsometric graphs, temperature profiles, dissolved oxygen profiles, oxygen saturation profiles, light penetration diagram, algal growth parameters (carbon fixed and chlorophyll a), selected plant nutrient concentration profiles. Vascular plant productivity is estimated and zooplankton species are identified. Summer heat budgets are calculated. Differences in data for the two lakes are discussed and interpreted; analytical and data collection techniques are outlined. (Seip-IPA)
W78-05358

ABATEMENT OF MALODORS AT CONFINED DREDGED MATERIAL DISPOSAL SITES,
Argonne National Lab., IL.; and Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
W. Harrison, A. Dravnieks, R. Zussman, and R. Goltz.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 597, Price codes: A08 in paper copy, A01 in microfiche. Contract Report D-76-9, August 1976. 145 p, 23 fig, 38 tab, 47 ref, 2 append. WESRF 75-104.

Descriptors: *Waste, *Dredging, Disposal, *Odor, Research and development, Environmental engineering, Air pollution, Air, Wastes, Gases, Volatility, *Pollutant identification, *Malodors, *Odor control, Confined dredged material, Disposal sites, Containment area operations, Research program, Environmental research, Dredged material disposal.

Samples of malodorous air and dredged material were collected during the period July-October 1975 at confined disposal sites at the following locations: Buffalo, New York; Milwaukee, Wisconsin; Mobile, Alabama; York Harbor, Maine; Houston, Texas; Detroit, Michigan; and Anacortes, Washington. Odorous compounds in the air samples were identified by gas chromatography/mass spectrometry. The detection threshold, intensity, and character of the various odors were determined by experienced odor panelists using Tedlar-bag collectors. Samples were collected in 18-l capacity bags and were placed in aluminum drums equipped with flanges and 0.75-in-thick Plexiglass end plates. Samples were evaluated within 24 hours after sampling. Previous work had shown that odors do not deteriorate significantly in storage of this duration. (Roberts-ISWS)
W78-05360

ANNUAL REPORT ON THE DEVELOPMENT OF SENSORS AND TECHNIQUES FOR IN SITU WATER QUALITY MONITORING,
Pittsburgh Univ., PA. Dept. of Petroleum Engineering.
C. C. Liu.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-26717, Price codes: A03 in paper copy, A01 in microfiche. Annual Report No. N76-26717, June 12, 1976. 40 p, 16 fig, 5 ref. NASA NSG-3002.

Descriptors: *Monitoring, *On-site tests, *Chemical analysis, *Instrumentation, *Water chemistry, *Analytical techniques, *Pollutant identification, Analysis, Chemistry, Testing procedures, Data collections, Water quality, Trace elements, Chemical properties, Phenols, Electrodes, Water analysis, *Water quality sensors, *Monitoring techniques, In situ instrumental analysis, Chloride ion electrode, Ammonium ion electrode.

A progress report described the experimental work underway on the development of sensors and techniques for in situ monitoring of chloride, nitrite, phenol, ammonium, and adolesine triphosphate (ATP) in water supplies. For practical reasoning, chloride ion electrode and phenol electrode are attractive. (Henley-ISWS)
W78-05362

BIOLOGICAL ASSESSMENT OF THE SOLUBLE FRACTION OF THE STANDARD ELUTRIATE TEST,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
P. J. Shuba, J. H. Carroll, and K. L. Wong.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 087, Price codes: A06 in paper copy, A01 in microfiche. Technical Report D-77-3, March 1977. 109 p, 35 fig, 14 tab, 32 ref, 3 append.

Descriptors: *Dredging, *Bioassay, *Water pollution, *Sediments, *Testing procedures, Desilting, Analytical techniques, Biology, Channel improvement, Water analysis, Water pollution sources, Chemical analysis, *Bioindicators, *Pollutant identification, Algae, Disposal.

Selected species of algae, bacteria, and protozoans were used as test organisms. Marine and freshwater species of each group were tested. Sediment samples were collected from 4 locations that are dredged periodically, and water samples were collected from their corresponding disposal sites. Sediment locations were Bridgeport Harbor, Bridgeport, Connecticut; Ashtabula River, Ashtabula, Ohio; Galveston Harbor, Galveston, Texas; and Arlington Channel of Mobile Bay, Mobile, Alabama. The corresponding disposal sites were Eatons Neck, Long Island Sound, New York; Lake Erie, near Ashtabula, Ohio; Gulf of Mexico, near Galveston, Texas; and an open water disposal site adjacent to Arlington Channel in Mobile Bay, Alabama. The results of algal bioassays indicated both stimulatory and inhibitory effects when growth in the elutriate was compared to growth in disposal site water. All sediments used to prepare standard elutriates released large quantities of ammonium-nitrogen. Growth studies were conducted using the marine alga Dunaliella tertiolecta exposed to the concentrates of ammonia found in the elutriates. The concentrations used were not toxic to the test organisms. The results were discussed in relation to water quality. Algal bioassays are one method of assisting the evaluation of the suitability of a particular dredged material for disposal. Bacteria and protozoans are important in the cycling of nutrients and toxicants, but they are not recommended as test organisms for water column effects. Additional research was suggested, particularly the development of bioassays using benthic organisms. (Henley-ISWS)
W78-05366

SEDIMENT STUDIES IN BACK RIVER ESTUARY, BALTIMORE, MARYLAND.
National Enforcement Investigations Center, Denver, CO.
For primary bibliographic entry see Field 5B.
W78-05369

HYDROCHEMICAL EFFECTS OF WASTE PERCOLATION OF GROUNDWATER IN BASALT NEAR FOOTSCRAY, VICTORIA, AUSTRALIA,
Geological Survey of Victoria (Australia).
For primary bibliographic entry see Field 5B.
W78-05376

MICROPROBE ANALYSIS OF PROJECT DUSTORM HAILSTONE SAMPLES,
National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 2K.
W78-05381

TRENDS OF SELECTED GROUND-WATER CONSTITUENTS FROM INFILTRATION GALLERIES, SOUTHEAST NASSAU COUNTY, NEW YORK,
Geological Survey, Mineola, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-05420

AUTOMATED ATOMIC ABSORPTION SPECTROMETRIC DETERMINATION OF TOTAL ARSENIC IN WATER AND STREAMBED MATERIALS,
Geological Survey, Denver, CO. Water Resources Div.
M. Fishman, and R. Spencer.
Analytical Chemistry, Vol 49, p 1599-1602, September 1977. 2 fig, 6 tab, 8 ref.

Descriptors: *Pollutant identification, *Arsenic compounds, *Water analysis, *Sediments, *Chemical analysis, *Analytical techniques, Trace elements, Organic compounds, Inorganic compounds, Laboratory tests, Spectrometers, Methodology, *Atomic absorption spectrometer, *Arsenic.

An automated method to determine both inorganic and organic forms of arsenic in water, water-suspended mixtures, and streambed materials is described. Organic arsenic containing compounds are decomposed by either ultraviolet radiation or by sulfuric acid-potassium persulfate digestion. The arsenic liberated, with inorganic arsenic originally present, is reduced to arsine with sodium borohydride. The arsine is stripped from the solution with the aid of nitrogen and is then decomposed in a tube furnace heated to 800 deg C which is placed in the optical path of an atomic absorption spectrometer. Thirty samples per hour can be analyzed to levels of 1 microgram arsenic per liter. (Woodard-USGS)
W78-05421

DRAINAGE AREAS FOR JEFFERSON COUNTY, ALABAMA,
Geological Survey, Montgomery, AL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-05427

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1977--VOLUME 1. CENTRAL AND NORTHERN LOUISIANA.
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-05428

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1977--VOLUME 2. SOUTHERN LOUISIANA.
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-05429

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1977--VOLUME 3. COASTAL LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-05430

AN ANALYSIS OF SALINITY IN STREAMS OF THE GREEN RIVER BASIN, WYOMING,
Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 5B
W78-05439

THE USE OF 14C-LABELED PROTEIN HYDROLYSATE FOR DETERMINATION OF THE BACTERIAL DEVELOPMENT LIMIT IN NATURAL WATER DILUTIONS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.
V. I. Romanenko, N. A. Lapteva, and A. S Daukshta.
Gidrobiol Zh 12(5), p 81-83, 1976.

Descriptors: Waste dilution, *Bacteria, *Carbon-14 method, Protein hydrolysate, Water pollution, *Pollutant identification, Methodology.

A simpler method of counting bacteria was devised based on the titers in a 10-fold dilution of the test sample in natural sterile water. After incubation and before the experiment, a drop of 14C-labeled protein hydrolysate was added to the test tube. The boundary of bacterial development was then found by its radioactivity with high sensitivity and shortened analysis time. The results corresponded well to the results of direct bacterial counts after growth in bacteria-free water under the same conditions.--Copyright 1977, Biological Abstracts, Inc.
W78-05447

DETERMINATION OF RESINOUS SUBSTANCES IN EFFLUENTS FROM THE PRODUCTION OF WOOD ROSIN (OPREDELENIE SMOLISTYKH VESHCHESTV V STOKAKH KANIFOL'NO-EKSTRAKTSIONNOGO PROIZVODSTVA),
Tsentralnyi Nauchno-Issledovatelskii i Proektnyi Inst. Lesokhimicheskoi Promyshlennosti, Khimki (USSR).
G. A. Ishcherikova.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No. 5, p 6-7, 1977. 1 ref, 1 tab.

Descriptors: *Pollutant identification, *Resins, Wastes, Industrial wastes, Effluents, Chemical industry, Gravimetric analysis, Analytical techniques, Water pollution sources, Pollutants, Distillation, Chemical analysis, Water analysis, *Rosin, Terpin hydrate, Wood extraction, Terpineol.

In the gravimetric determination of resinous substances in effluents from wood rosin extraction, the results obtained are usually too high, because of the presence of terpin hydrate (TH) which interferes with the analysis. A modified method was developed, in which TH is removed from the effluent prior to its gravimetric analysis. Acidification of the sample converts the TH to terpineol, and the latter is removed by distillation. (Stapinski-IPC)
W78-05450

PROPERTIES OF LIGNOSULFONATES FROM SPENT LIQUORS, WASH WATERS, AND BLEACHING EFFLUENTS FROM SULFITE PULP MANUFACTURE (EINIGE EIGENSCHAFTEN VON LIGNISULFONATEN AUS ABLAUGEN, WASCHWAESSERN UND

BLEICHEREIABWAESSERN DER SULFITZELLSTOFFHERSTELLUNG),
Technische Hochschule, Darmstadt (West Germany). Inst. fuer Makromolekulare Chemie.
M. Gahin, and T. Krause.
Holzforschung, Vol. 31, No. 5, p 144-147, October, 1977. 7 fig, 6 ref, 2 tab, English Summary.

Descriptors: *Sulfite liquors, *Bleaching wastes, *Pulp wastes, *Pollutants, *Lignins, *Sulfonates, Wastes, Industrial wastes, Water pollution sources, Effluents, Pulp and paper industry, Chromatography, Organic compounds, Properties, Sulfur, Physical properties, Chemical properties, Wash water, Spruce trees(Abies), Beech trees(Fagus), Spent sulfite liquor, Molecular weight, Wash water, Sulfite pulp.

Lignosulfonates (LS) were isolated from spent liquors, wash waters, and bleaching effluents involved in the manufacture of sulfite pulp from beech and spruce. Their degree of sulfonation was determined via analysis of the sulfur content, their molecular weight distribution via gel permeation chromatography. The degree of sulfonation of wash-water LS was found to lie clearly below that of spent sulfite liquor LS and to be very uniform (differences probably due to differences in intensity of washing rather than differences in intensity of cooking). Much lower still was the degree of sulfonation of bleaching effluent LS. The gel-chromatographically determined molecular weight distribution was generally the same for all the LS samples studied, with one maximum in the high-molecular range and another in the low-molecular range. Differences in this distribution can be attributed to pulping conditions, wood species, and point of LS sampling. Since the extinction coefficients of the LS samples exhibited considerably different values in some cases, direct quantitative comparison of distribution curves was often not possible. (Speckhard-IPC)
W78-05454

RECIPIENT WATER AS SEEDING MATERIAL FOR DETERMINATION OF 7-DAY BOD IN PULP AND PAPER MILL EFFLUENT (LUONNONYMPPIEN KAYTTO METSATEOLLISUUDEN JATEVESIEN BOD(7)-MAARITYKSESSA),
Pulp and Paper Research Inst., Helsinki (Finland).
O. Seppovaara, and B. Starck.
Kemia-Kemi, Vol. 4, No. 5, p 193-195, 1977. 4 fig, 5 ref, 3 tab, English summary.

Descriptors: *Effluents, *Pulp wastes, *Biochemical oxygen demand, *Water analysis, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Microorganisms, Toxicity, Seasonal, Water properties, Water chemistry, Testing, Pollutant identification.

BOD determinations on pulp and paper effluents were examined with regard to the influence of seeding-material origin (seeding material from recipient water below the point of discharge or from the effluent of a municipal biological wastewater treatment plant). Also studied were the effect on BOD determination of variations in recipient-water seeding material with regard to physical-chemical characteristics, content of degrading organisms, and toxicity. Seasonal variations in seeding material were examined. A glucose-glutamine solution was used as control. The control solution demonstrated the equivalence of the recipient-water seeds. The effectiveness of a seed was not influenced by physical-chemical characteristics or content of degrading organisms. Seasonal variations were not significant. No detrimental effects were observed as the result of the presence of toxic substances. The studies indicate that recipient-water seeding material can be used in determining the BOD of pulp and paper mill effluents. In order to avoid possible toxic effects, it is recommended that the seed be taken 0.5-1 km below the point of discharge. (Speckhard-IPC)
W78-05456

CHROMATOGRAPHIC METHOD FOR ANALYSIS OF VANILLIN IN SULFITE MILL EFFLUENTS (CHROMATOGRAFICZNA METODA WANILINOWA ANALIZY CIECZY POPRODUKCYJNYCH Z CELULOZOWNI SIARCZYNOWYCH).
B. Pszonka.
Przeglad Papierniczy, Vol. 33, No. 7, p 245-250, July 1977. 4 fig, 27 ref, 8 tab. English summary.

Descriptors: *Pulp wastes, *Lignins, *Sulfite liquors, *Gas chromatography, *Pollutant identification, Bleaching wastes, Wastes, Industrial wastes, Water pollution sources, Colorimetry, Analytical techniques, Chemical analysis, Pulp and paper industry, Effluents, Water analysis, *Vanillin, *Lignosulfonates, Spent sulfite liquor, Sulfite pulp mills.

Hrutfiord's method of gas chromatographic determination of vanillin for the evaluation of the content of lignosulfonate in solutions was adapted to the analysis of sulfite mill effluents, viz., the overall mill effluent, bleach plant effluents, and digester room effluents (including pulp washing and screening). The calibration curve was obtained using the residual liquor from spent sulfite liquor fermentation from the same mill. A detailed description is given of the procedure, including the gas-liquid chromatography of vanillin solution in chloroform, extraction of vanillin, and hydrolysis of lignosulfonic acids. The results are compared with those obtained by the presently used Folin-Denis colorimetric method. The colorimetric method gave lignosulfonic acid contents 16-18% higher in the case of digester room and general effluent, and over 100% higher in the case of bleach plant effluent. This appears to confirm that during the bleaching process substances are formed affecting the results of analysis. Evidently, the colorimetric method is not specific for sulfonated lignin. In contrast, the vanillin method is specific for lignosulfonic acids, making possible their selective determination in the presence of other lignin compounds. The vanillin method also solves the problem of the standards for the preparation of calibration curves. (Stapinski-IPC)
W78-05460

CHEMICAL IDENTIFICATION OF CONSTITUENTS IN A TOXIC HARDBOARD PLANT EFFLUENT.
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
I. H. Rogers, H. W. Mahood, J. A. Servizi, and R. W. Gordon.
In: Canadian Pulp and Paper Association, Environment Improvement Conference, November 1-3, 1977, Moncton, New Brunswick, Preprints (CPPA Technical Section, Montreal), p 1-4 4 fig, 10 ref, 2 tab.

Descriptors: *Pulp wastes, *Toxicity, *Pollutant identification, Resins, Wastes, Industrial wastes, Water pollution sources, Douglas fir trees, Effluents, Gas chromatography, Mass spectrometry, Aromatic compounds, Fish, Sockeye salmon, Salmon, Aquatic animals, Acids, Water pollution effects, *Hardboard mills, Wood extractives, Resin acids.

Chemical fractionation of effluent from a hardboard mill (Pulping mainly douglas-fir) was used to locate the sources of toxicity to young sockeye salmon (Oncorhynchus nerka). Analysis of the two most toxic fractions (viz., those containing neutral compounds and resin acids) by gas chromatography/mass spectrometry resulted in the identification of 14 neutral compounds, 9 resin acids, and 9 other acids (including aromatic acids and compounds with insect juvenile hormone activity). Many of these compounds are unique to wood extractives of Douglas-fir. (Swichtenberg-IPC)
W78-05464

DYNAMICS OF MANGANESE, CADMIUM AND LEAD IN EXPERIMENTAL POWER PLANT PONDS,
Bradley Univ., Peoria, IL. Dept. of Chemistry; and Bradley Univ., Peoria, IL. Dept. of Biology.
B. J. Mathis, T. F. Cummings, M. Gower, M. Taylor, and C. King.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 032, Price codes: A04 in paper copy, A01 in microfiche. University of Illinois, Urbana, Water Resources Center, Research Report No. 125 June 1977. 62 p, 36 fig, 10 tab, 3 ref, append. S-055-Ill.

Descriptors: Water pollution sources, Heavy metals, Biota, *Manganese, *Cadmium, *Lead, Benthos, Aquatic environment, Limnology, Food chain, Lentic environment, Illinois, Spectrophotometry, *Powerplant ponds, *Illinois River(Ill), Atomic Absorption Spectrophotometry, Pollutant identification, Cooling water, *Thermal pollution, Water pollution effects.

This study was designed to determine the effect of heated power plant cooling water on the compartmentalization of manganese, lead and cadmium in experimental ponds. Caged channel catfish and green sunfish were kept in an experimental pond and a control pond. Periodically, whole fishes, gill, heart, kidney, liver and musculature were analyzed for the three metals. Concentrations of the three metals in fishes were not affected by the temperature differential maintained during the study. There was no correlation in concentrations of cadmium and lead with age (weight and length) of fishes but manganese concentrations declined slightly with age. The water component of the system contained the lowest concentration of the metals with sediments acting as a characteristic sink. Concentrations of the three metals in water and sediments of the ponds were not significant at the .05 level. Aquatic organisms such as snails, fingernail clams, leeches, tubificid annelids and dragonfly nymphs exhibited concentrations of cadmium higher than sediments while snails and duckweed more closely reflected concentrations of manganese in sediments. Tubificid worms and leeches more closely reflected lead concentrations in sediments while fingernail clams and snails exhibited higher concentrations.
W78-05480

BACTERIAL ANALYSIS IN THE WATER OF THE POOLS OF MOULIN-DE-VERT, VERBOIS-GENEVA, (IN FRENCH),
Geneva Univ. (Switzerland). General Microbiology Lab.
M. Boye, and E. Schorer.
Saussurea 6.

Descriptors: Pollutant identification, Bioindicators, Microorganisms, *Bacterial analysis, Coliforms, Geneva, *Moulin-de-Vert(Switz), Pools, Switzerland, Water pollution sources.

Bacterial analysis of the pools of Moulin-de-Vert, Verbois, Geneva, Switzerland, for total organisms and coliforms indicates a high degree of pollution throughout the year. A net increase in the microorganisms was noted during June 1970-June 1973, even though these regions are away from important sources of pollution except the animals which live in the reserve. Copyright 1977, Biological Abstracts, Inc.
W78-05482

EVALUATION OF DATA FOR PONDS, LAKES AND RESERVOIRS IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Water Resources Research Center.
J. C. Mawson, and R. J. Reed.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 142, Price codes: A02 in paper copy, A01 in microfiche. Publication No. 66, Termination Report, April, 1976. 20 p, 8 tab, 1 append. OWRT A-067-MASS(1).

Descriptors: *Ponds, *Lakes, *Reservoirs, *Massachusetts, *Data processing, *Data storage and retrieval, Computer programs, Limnology, Pollutant identification, Pond types, PONDI, Pond access, Pond vegetation, Pollutant concentration, FORTRAN program.

Raw data on Massachusetts ponds, lakes, and reservoirs published in foregoing reports are evaluated as a basis for the preparation of an expanded data base that will be directly responsive to the needs of public agencies in Massachusetts. Missing pond data are identified using a computer program, PONDI. Data are summarized by watershed, pond acreage, and number of bodies, and then are put in an accessible form. Ponds were classified and data are presented in tables according to six key types of information: pond type, access, limnological class, vegetation, pollution degree, and pollution type. Data evaluation revealed: (1) 63% of the water bodies (by acre) are either artificial or enhanced by man; (2) almost half the ponds are open to full public access; (3) around 40% of all ponds are eutrophic; and (4) 83% of the ponds in Massachusetts are not classified according to pollution type or degree. (Seip-IPA)
W78-05483

WASTEWATER SAMPLING, TRANSFER AND CONDITIONING SYSTEM,
Raytheon Co., Portsmouth, RI.
For primary bibliographic entry see Field 5D.
W78-05489

VIRUSES IN WASTE, RENOVATED, AND OTHER WATERS, 1975 LITERATURE ABSTRACTS.
Environmental Monitoring and Support Lab. Office of Research and Development.
For primary bibliographic entry see Field 5D.
W78-05490

HEAVY METAL ENRICHMENT IN MINE DRAINAGE: IV. THE ORANGE FREE STATE GOLDFIELD,
Pretoria Univ., (South Africa). Dept. of Chemistry.
G. T. W. Wittman, and U. Foerstner.
South African Journal of Science, Vol. 73, No. 12, p 374-378, December, 1977. 1 fig, 5 tab, 32 ref.

Descriptors: *Mine wastes, *Acid mine drainage, *Heavy metals, *Effluents, *Gold, Uranium, Leaching, Groundwater, Metals, Water analysis, Africa, Industrial wastes, Waste water disposal, Waste water treatment.

A sampling program has been conducted at the Orange Free State Goldfield along the southeastern periphery of the witwatersrand Basin in South Africa in an effort to determine critical sites of heavy metal enrichment in drainage from mining operations. Mining effluents and underground water are currently disposed of by pumping to evaporation dams of slime retention dams. Mine effluents and sediment samples were analyzed for Cl, SO4, Na, Mg, Ca, Mn, Fe, Cr, Co, Ni, Cu, Zn, Cd, and Pb. Analyses of 17 sediment and 14 corresponding water samples collected at various locations within the goldfield revealed that considerable quantities of valuable metals were being lost via mine drainage associated with gold and uranium recovery. Sediments from the Orange Free State Goldfield were enriched with respect to Co, Mn, Ni, Cu, Cd, Cr, and Zn. In general, lower metal concentrations were associated with basic conditions. (See also W77-11544 and W77-10199) (Schulz-FIRL)
W78-05491

ANALYSIS OF ORGANIC MATTERS IN KRAFT PULP MILL EFFLUENT IN HIRO BAY (HIROWAN KURAFUTO PARUPU KOJO HAISUIKO FUKIN NO YUKIBUTSU NO BUNSEKI),
Government Industrial Research Inst., Hirohata (Japan).
Y. Yamaoka, and T. Tanimoto.
Nihon Kagaku Kaishi, (Journal of the Chemical Society of Japan), No. 10, p 1554-1559, 1977. 10 fig, 3 tab, 21 ref.

Descriptors: Pulp and paper industry, *Gas chromatography, *Mass spectrometry, *Pollutant identification, *Industrial wastes, Sea water, Organic compounds, *Pulp wastes, Effluents, Waste water treatment, *Organic matter, *Organic wastes.

Various organic components were identified in seawater from a bay which received kraft pulp mill effluent. Seawater samples from Hiro Bay, Japan were collected at depths of 0-10 m and filtered. Chloroform, used to extract the seawater, was concentrated under low pressure and fractionated with a silica gel column. Aliphatic hydrocarbons in the first fraction were removed with hexane. Benzene was used to extract the oxygenated compounds from the second fraction. The concentrates were then subjected to gas chromatography and mass spectrometry analyses. Observed retention times were used as a means of identification of the components by comparison with published data. This comparison produced thirty identifiable components including: alpha and beta pinene, fenchone, comphor, borneol, alpha terpineol, longiforene, toluene, p-cymene, guaiacol, vanillin, 2,6-di-t-butyl-4-ethylphenol, fatty acids, aliphatic hydrocarbon, and dimethyl disulfide. (Lisk-FIRL)
W78-05502

SELF-MONITORING PROCEDURES: BASIC PARAMETERS FOR MUNICIPAL EFFLUENTS.
Environmental Protection Agency, Cincinnati, OH. Municipal Permits and Operations Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 876, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-430/1-74-015, September, 1974, C.E. Sponagle, Ed. 310 p, 41 fig, 7 tab, 24 ref.

Descriptors: *Pollutant identification, *Biochemical oxygen demands, *Dissolved oxygen analyzers, *Coliforms, *Bacteria, Open channel flow, Open channels, *Chlorine, *Suspended solids, *Monitoring, Filters, *Filtration, Weirs, *Polarographic analysis, Hydrogen ion concentration, *Venturi flumes, Chemical analysis, Data collections, Effluents, Flow measurement, Gages, Instrumentation, Laboratory tests, Municipal wastes, Sampling, Statistics, Water analysis, Geometric mean, Logarithms, Most probable number, Data handling.

Fifteen effluent monitoring procedures for wastewater analysis and flow measurement, to be used by treatment plant operators or technicians under a National Pollutant Discharge Permit, are delineated. Operating procedures, step sequences, operating goals, specifications and a training guide are presented in outline form. The outlined procedures include: (1) determination of 5-day biochemical oxygen demand, (2) Winkler determination of dissolved oxygen-azide modification, (3) determination of dissolved oxygen using a dissolved oxygen meter, (4) determination of dissolved oxygen in wastewater: polarographic probe method, (5) pH determination of wastewater and wastewater treatment plant effluents, (6) collection and handling of bacteriological samples from a wastewater treatment facility, (7) fecal coliform test by the multiple dilution tube method, (8) fecal coliform test by the membrane filter method, (9) calculations of the geometric mean of coliform counts by use of logarithms, (10) measurement of flow in an open channel by parshall flume, (11) measurement of flow in an open channel by sharp-crested weir, (12) amperometric determination of free and combined residual chlorine in water, (13) amperometric determination of total residual chlorine in wastewater, (14) determination of total suspended (non-filterable) solids, mg/l, and (15) reporting of self-monitoring data. (Seip-IPA)
W78-05528

THE USE OF THE ADSORPTION METHOD IN ACTIVATED CHARCOAL WITH EXTRACTION BY CHLOROFORM (CCE) TO EVALUATE THE CONTAMINATION OF RESERVOIRS BY ORGANIC MATERIALS (PRIMENENIYE METODA ADSORBTSII NA AKTIVIROVANNOM UGLE S EKSTRAKTSIEYA KHLOROFORMOM (CCE) DLYA OTSENKI ZAGRYAZNENIYA VODOYEMOV ORGANICHESKIMI VESHCHESTVAMI),
Permskii Politekhnicheskii Inst (USSR). Dept of Sanitary Engineering.
Ya. I. Vaysman, and S. Ya Barikhin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 725, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-HS-156, 1972, Translated from Gigiena i Sanitariya Vol. 38, No. 8, p 77-79, March 1972. 3 p, 2 ref.

Descriptors: *Water pollution sources, *Water quality standards, *Waste identification, *Pollutant identification, Activated carbon, Adsorption, Separation techniques, Organic matter, Reservoirs, On-site data collections, On-site investigations, Industrial wastes, Evaluation, *Activated charcoal, Chloroform, USSR.

A method for adsorbing organic contaminants in activated charcoal with subsequent chloroform extraction is described as a means of evaluating the contamination of reservoirs by organic materials. Efficacy of the method was evaluated in the Kama and Votkinsk reservoirs (Russia). Since international standards lack recommendations concerning detailed quantitative and qualitative testing of individual organic substances in this complex and do not completely describe construction of units to provide an even supply of water for a prolonged period, the test systems were developed under field conditions and evaluated in seven control ranges and in tap water. Results verified the possibility of using the charcoal-chloroform extraction method in sanitary practice for comparative evaluation of the levels of contamination in river water by organic components of industrial discharges. Based on the field evaluation, a program to study the quality of water in reservoirs by the charcoal-chloroform method was developed covering quantitative measurement of the contamination of reservoirs, separation of extracts into fractions, interpretation of fractions, and extraction of individual components, e.g., acid, neutral, phenol, amphoteric, and basic. (Wares-IPA)
W78-05531

DEVELOPMENT OF A SYSTEM FOR CONDUCTING INTERLABORATORY TESTS FOR WATER QUALITY AND EFFLUENT MEASUREMENTS,
FMC Corp., San Jose, CA. Advanced Products Div.
A. C. Green, and R. Naegele.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 274, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/4-77-031, June 1977. 131 p, 16 fig, 18 tab, 176 ref, 1 append. 68-03-2115.

Descriptors: *Water quality, *Water pollution, *Monitoring, *Sampling, Laboratories, Laboratory tests, *Pollutant identification, Quality control, Statistical methods, Reproducibility.

A system, developed for evaluating water pollution data and the laboratories that produce these data, consists of a plan for the design and implementation of an interlaboratory test proram, including a pilot test program to evaluate and verify

the complete program. Ongoing interlaboratory testing programs were investigated; dificiencies in their design and in the procedures by which they were conducted were identified. A literature review of previous interlaboratory tests and their methods for experimental design and test data analyses was conducted, and 18 EPA, State, and private water pollution research laboratories were visited to obtain their comments regarding difficulties and deficiencies in interlaboratory test programs. Conclusions indicated that collaborative tests for method development are well defined and are in wide use, whereas interlaboratory testing as a function of laboratory evaluation is under development and subject to different program objectives, design, and statistical evaluations. The recommended interlaboratory test design plan specifies analytical methods and statistical procedures for sample preparation, data analysis, and proficiency evaluation. Proficiency evaluation should be based on interlaboratory testing, utilizing representative samples, quality control procedures, complete statistical analyses, and provision for prompt feedback to participating laboratories. (Wares-IPA)
W78-05534

TRITIUM RETENTION BY COWS AND STEERS AND TRANSFER TO MILK,
Environmental Monitoring and Support Lab., Las Vegas, NV.
For primary bibliographic entry see Field 5C.
W78-05537

EXPERIMENTAL SIMULATION OF SINGLE AND MULTIPLE CELL COOLING TOWER PLUMES,
Corvalis Environmental Research Lab., OR.
L. R. Davis, M. A. Shirazi, and D. L. Slegel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 359, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/7-77-070, July 1977. 36 p, 10 fig, 2 tab, 19 ref, 1 append.

Descriptors: *Cooling towers, Air pollution effects, Waste dilution, Industrial plants, Entrainment, Distillation, Chemical precipitation, *Path of pollutants, *Plumes, Dissipation.

An experimental investigation investigated the dilution characteristics of single and multiple port buoyant discharges typical of modern natural and mechanical draft cooling towers. Simultaneous measurements of velocity and tracer concentration profiles were taken at various downstream locations in the three-dimensional plumes discharged into a stagnant ambient using a hot film anemometer and conductivity probe. The number of discharge ports was varied from one to seven. Discharge densimetric Froude numbers were varied from 1.5 to infinity. Numerical integration of the profiles gave dilution, tracer conservation, and momentum fluxes. The effect of reducing Froude number was to increase entrainment considerably. In multiple port discharges, the shape of the plume changed from an elongated configuration to nearly exisymmetric within the first 20 to 30 diameters of discharge. Experimental scatter in the results and the inability to accurately measure the low velocities in the tail of the velocity profiles preclude the drawing of firm conclusions at present. Continued measurement experiments using a different anemometer and including ambient velocity effects and discharge line orientation relative to the ambient current are recommended. The appendix contains measured data. (Wares-IPA)
W78-05539

129I IN ANIMAL THYROIDS FROM NEVADA AND OTHER WESTERN STATES,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring System Research and Development Div.
D. D. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 637, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-600/3-77-067, June 1977. 18 p, 7 tab, 7 ref, 2 append.

Descriptors: *Animal metabolism, *Iodine, *Pollutant identification, Nevada, Radioactivity, Colorado, Wyoming, Iodine radioisotopes, Cattle, Ecology, Animals, Thyroid gland, Exposure, Test sites, Iodine-127, Iodine-129, Nevada Test Site.

A study was conducted to measure the concentrations of Iodine-129 in the thyroid glands of animals that reside on and near the Nevada Test Site for nuclear devices; these data were then correlated with those from similar studies made near other nuclear facilities. The animals sampled included various species of wild animals and cattle from herds maintained on the site since 1957 as biological monitors as well as cattle and goats used for special research projects. Data from over 80 thyroids collected during 1973, 1974, and 1975 from animals residing on the Nevada Test Site indicate that Iodine-129 levels in these thyroids are near background levels. The median levels in the thyroids of animals living on the Nevada Test Site are slightly elevated from those found in northern Nevada, but are similar to those found near Denver, Colorado, and Rawlings, Wyoming. Statistical analyses of the Iodine-129/Iodine-127 ratios in cattle thyroids suggest that three populations were sampled: northern Nevada cattle considered as baseline population, corralled Nevada Test Site Cattle with intermediate ratios, and free-grazing cattle from Nevada Test Site and Rocky Flats, Colorado, with the highest ratios reported. It was concluded that the Nevada Test Site is not a significant source of Iodine-129. The appendices describe thyroid sample and analysis procedures. (Ware-IPA)
W78-05541

RELIABLE ANALYSES OF WATER BY INDUCTIVELY COUPLED PLASMA EMISSION SPECTROSCOPY,
Environmental Research Lab., Athens, GA.
C. E. Taylor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 644, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/2-77-113, June 1977. 32 p, 21 tab, 4 ref.

Descriptors: *Spectroscopy, *Trace elements, *Water analysis, Pollutants, *Pollutant identification, Chemical analysis, Sampling, Monitoring, Analytical techniques, Inductively coupled plasma emission spectroscopy, Multielement water analysis, Atomic spectroscopy.

An evaluation of an instrument, the inductively coupled plasma emission spectrometer (ICPES), for the rapid multielement analysis of water samples, was conducted. ICPES data were compared with spark source mass spectrometer data following analysis of cross-check solutions from plating plants. When major differences were detected between data sets, further evaluation attributed these differences to stray light from calcium and magnesium lines in the ICPES. Steps taken to improve the instrument's performance, including calcium and magnesium correction procedures, are described. Surfaces in the secondary optical system were painted to prevent light scatter and the aperture at the primary lens was reduced; interference corrections were reduced by more than one order of magnitude. Reduced interferences and improved corrections have improved the accuracy of the multielement analysis system. Observed background changes caused by the presence of magnesium were compensated for by adding matrix elements to calibration standards. Alcohol was added to standards, reagent blanks, and samples to overcome problems of background change during analysis of samples of unknown organic content such as municipal sewage. Comparison of data from the improved ICPES with those of other analytical instruments in characterizing the same water samples indicated that the ICPES has great reliability as a technique for the multielemental analysis of water. (Wares-IPA)
W78-05542

THE STATUS OF THE EPA LABORATORY AUTOMATION PROJECT,
Environmental Monitoring and Support Lab., Cincinnati, OH. Physical and Chemical Methods Branch.
For primary bibliographic entry see Field 5G.
W78-05547

DETECTION AND INACTIVATION OF ENTERIC VIRUSES IN WASTEWATER,
Hebrew Univ., Jerusalem (Israel). Environmental Health Lab.
For primary bibliographic entry see Field 5D.
W78-05548

COMPREHENSIVE SUMMARY OF SLUDGE DISPOSAL RECYCLING HISTORY,
Metropolitan Denver Sewage Disposal District No. 1, Commerce City, CO.
For primary bibliographic entry see Field 5E.
W78-05550

INVESTIGATION OF A HONEYWELL DISSOLVED OXYGEN PARAMETRIC SYSTEM,
Environmental Monitoring and Support Lab., Cincinnati, OH. Instrumentation Development Branch.
For primary bibliographic entry see Field 5D.
W78-05552

ANILINES: SELECTIVE TOXICITY TO BLUE-GREEN ALGAE,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 5C.
W78-05556

TRITIUM OXIDE UPTAKE BY ALGAE: AN INDEPENDENT MEASURE OF PHYTOPLANKTON PHOTOSYNTHESIS,
Michigan State Univ., Hickory Corners. W.K. Kellogg Biological Station.
K. R. McKinley.
Limnology and Oceanography, Vol 22, No 2, March 1977, p 377-380, 1 tab, 15 ref. NSF (GB-40172 and BMS-75-20322, ERDA (E-11-1599, COO-1599-102).

Descriptors: *Productivity, *Phytoplankton, *Photosynthesis, Algae, Analytical technique, Adsorption, Tritium, Measurement, *Absorption, *Pollutant identification.

A new method is presented for estimating algal productivity using tritium oxide. Close agreement is seen between this method and the traditional method of measuring C14-C02 uptake and 02 evolution. The method shows low error and has the advantage of being useful under conditions wher conventional methods are not appropriate. Disadvantages of the method include the large isotopic discrimination factor, the relatively more difficult preparation and counting procedures necessary, and the relatively high specific activities necessary to achieve an isotopic abundance of even 2% of that used in C14 isotope studies. (Chilton-ORNL)
W78-05559

CHARACTERIZATION AND IMPACT OF STORMWATER RUNOFF FROM VARIOUS LAND COVER TYPES,
Wiggins-Rimer and Associates, Durham, NC.
For primary bibliographic entry see Field 5B.
W78-05580

A MULTIDIMENSIONAL ANALYSIS OF THE RESULTS OF THE FRENCH 1971 SURFACE WATER QUALITY NETWORK CONTROL IN THE RIVER BASIN 'SEINE-NORMANDIE',
Ecole Nationale Superieure des Mines de Paris, Fontainebleau (France). Center for Geological Information.
Y. LeFoll, R. Pinoit, and A. Lesouef.
Progress in Water Technology, Vol. 9, No. 1, p 98-102, 1977. 12 fig, 2 ref.

Descriptors: *Surface waters, *Watersheds(Basins), *Water quality, Rivers, Europe, Sampling, Foreign countries, Surveys, Foreign research, Data processing, Temperature, Water temperature, Biochemical oxygen demand, Chemical oxygen demand, Hydrogen ion concentration, Conductivity, Dissolved oxygen, Ions, Phosphates, Bacteria, Anions, Nitrates, Metals, Water pollution sources, *France, *Seine River(France).

During 1971 a systematic program to sample surface waters in France was established. For the river basin 'Seine-Normandie,' the program resulted in approximately 1,800 water samples and 50,000 items of data on existing water quality within the basin. A series of computerized methods were used to analyze the results: (1) Thirteen types of water were identified and characterized according to their composition, taking into account analytical results on about 40 water quality parameters. A map was prepared to show their geographical distribution. (2) By comparing analytical results to water quality standards, the parameters responsible for quality downgrading of each sample were identified. A single quality grade then was assigned to the sample according to the concentration of the limiting parameters. A cluster analysis regrouped all the samples into ten groups according to pollution intensity and the nature of the limiting parameters. A map of nuisance areas was drawn, and a tabulation of parameters most frequently responsible for quality downgrading was made. (3) The most important seasonal effects were identified; the effects of flow and temperature variations were shown to be important mainly on dissolved oxygen, nitrate content and salinity. (4) Practical conclusions were drawn in order to aid surface water quality management in the river basin 'Seine-Normandie'. (Sims-ISWS)
W78-05581

METHOD AND APPARATUS FOR SAMPLING IMPURE WATER,
Hach Chemical Co., Ames, IA. (Assignee).
C. C. Hach, and M. D. Buck.
U.S. Patent No. 4,053,282, 4 p, 1 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 963, No 2, p 587, October 11, 1977.

Descriptors: *Patents, *Sampling, *Water sampling, Analysis, Analytical techniques, Monitoring, Water analysis, Water pollution, *Pollutant identification.

An object of the invention is to provide a method and apparatus for sampling impure water that keeps the sample intake line clear and open for long periods of operations. An addition such a method and apparatus that avoids adverse affects of air or other gas bubbles in the system is provided. The colorimetric liquid analyzer includes a glass tube cell, a plunger mounted for reciprocation in the cell, and a long liquid sample supply tube running from the body of water to be tested to the plunger passage. A 'T' connector is provided in the tube and a pair of on-off valves which together with the plunger, act to pump fixed volumes of fluid into and out of the cell. Means are also provided to pump substantial air bubbles into the tube near its intake end, and the air bubbles are separated from the liquid through a vertical section of the T-connector so that only liquid is pumped into the cell. (Sinha-OEIS)
W78-05606

EVALUATION OF THE NATIONAL ENVIRONMENTAL SPECIMEN BANK SURVEY,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
D. A. Becker, and E. J. Maienthal.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 823, Price codes: A13 in paper copy, A01 in microfiche. Report No. EPA-600/1-77-015, February 1977. 28 p, 198 ref, 4 append. 1AA601, IAG-D4-0568.

Descriptors: *Evaluation, *Basic data collections, Information exchange, Monitoring, Sampling, Networks, Surveys, Environmental effects, Information retrieval, Storage, Analytical techniques, *National Environmental Specimen Bank(NESB), Environmental Surveys, Specimens.

A joint survey program was performed by Oak Ridge National Laboratory in an attempt to identify and obtain information from organizations and individuals presently collecting and storing environmental specimens to be used by EPA in establishing a National Environmental Specimen Bank (NESB). The evaluation was concerned with storage and sampling and analytical methodology. The survey obtained information on 663 existing specimen and data collections in the United States. Evaluation of apparent usefulness has indicated that few, if any, of these presently existing collections have sufficient documented information indicating they had been sampled, processed, and stored under the exacting conditions required for retrospective chemical analysis of various trace substances. Additional contacts with the custodians of potentially useful collections are encouraged, and it is also recommended that guidelines currently being established by NBS for container and implement cleaning, sampling, processing, and short- and long-term storage should be widely disseminated in order to upgrade these methodologies for those organizations and/or individuals who are interested in future retrospective capabilities. The appendices contain literature surveyed on sampling, sample handling, and storage for the NESB, the NESB survey form, evaluation criteria for existing environmental specimen collections, and evaluation of individual survey replies. (Wares-IPA)
W78-05617

FIELD MEASUREMENT OF DENITRIFICATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
D. E. Rolston, and F. E. Broadbent.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 998, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/2-77-233, November, 1977. 75 p, 40 fig, 15 tab, 13 ref. IHB617, R-804259.

Descriptors: *Denitrification, *Soil moisture, *Vegetation effects, Irrigation, Nitrates, Nitrites, Nitrogen compounds, Soil environment, Soil management, Gases, Nitrogen cycle, Nutrient removal, Fertilizers, Soil treatment, *Gas flux, Nitrogen isotopes, Nitrogen oxide, Yolo soil, Crop root system.

Denitrification from a Yolo loam field profile was studied in relation to the influence of soil-water content, organic carbon source, and temperature. Field plots were instrumented with soil atmosphere samplers, soil solution samplers, and tensiometers. The two soil-water pressure treatments were applied in topsoil. Three levels of soil carbon were studied by evaluating plots cropped with ryegrass, uncropped plots, and plots amended with manure. Experiments were conducted at soil temperatures of 8 and 23C. Fertilizer was applied as KN03 enriched with N15. The flux of volatile gases at the soil surface was measured from the accumulation of N20 and nitrogen gas isotopes beneath an airtight cover placed over the soil surface. Denitrification at 23C ranged from 73% of the fertilizer nitrogen for the manure treatment to 1% for the uncropped treatment. At 8C, denitrification ranged from 11% for the manure treatment to zero for uncropped plots. The nitrite flux at the soil surface varied between 5 and 26% of total denitrification. The results demonstrated that denitrification of soil can occur at high rates (highest soon after application of NO3(-) fertilizer to wet soil), and that the presence of a crop root system has a large positive influence on denitrification. (Wares-IPA)
W78-05619

DRINKING WATER SYSTEMS FOR THE TRAVELING PUBLIC: A STATUS REPORT.
Environmental Protection Agency, Washington, DC. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W78-05623

WATER QUALITY DATA STORAGE AND RETRIEVAL,
Environmental Health Lab. Kelly AFB, TX.
R. A. Virost.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-030 106, Price codes: A05 in paper copy, A01 in microfiche. Report No EHL(K)-76-4, July 1976. 7 p, 2 fig, 10 tab, 4 append. 74-19.

Descriptors: *Computer programs, *Computer systems, *Data collections, *Data storage and retrieval, Monitoring, *Pollutant identification, Instrumentation, Water quality, Analytical techniques, *Water quality data, AFR 19-1, AFR 19-7, EPA STORET, AFLC CREATE, USGS NAWDEX, USGS WASTORE, Environmental monitoring, Master Data Repository.

Several computer systems designed to convert data generated by Air Force Medical Service monitoring of environmental water quality (as mandated by AFR 19-1 and AFR 19-7) into usable information are investigated. Such information is to be used for (1) documenting present pollution levels, (2) determining the effectiveness of corrective measures, (3) appraising the character of unique Air Force waste discharges, and (4) monitoring the effects of Air Force operations on the water environment. The possible computer systems evaluated were AFLC CREATE system, USGS NAWDEX and WATSTORE systems, and EPA STORET system. Study results indicate that the Air Force should develop its own water quality data storage and retrieval computer program using a data identification system that is compatable with EPA STORET; until such a computer system is developed, EPA STORET should be used. The eventual Air Force water data system will be part of a Master Data Repository for all types of Air Force environmental monitoring. Modifications in current site identification and sample submission procedures of AFR 19-7 will be required in order to include water sample analysis data in the Repository. These modifications are discussed, and recommended new procedures are presented in the appendices. (Seip-IPA)
W78-05676

EVALUATION OF TWO METHYLENE BLUE METHODS FOR ANALYZING MBAS CONCENTRATIONS IN AQUEOUS SOLUTIONS,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troly, NY. Dept. of Environmental Engineering.
L. K. Wang, W. N. Shuster, and P. J. Panzardi.
Journal American Water Works Association, Vol 67, No 4, p 182-184, April, 1975. 1 fig, 6 tab, 4 ref. RPI IBN 25.

Descriptors: *Detergents, *Spectrophotometric, Linear alkylate sulfonate(LAS), Mathematical models, Equations, *Analytical techniques, *Colorimetry, Color reactions, *Pollutant identification, Measurement, Testing, *Methylene blue

test, Modified methylene blue test, Anionic surfactants, Anionic detergents, Spectrophotometric analysis, Methyelene blue active substances(MBAS), Calibration curve.

The precision, accuracy, and reproductivity of two methylene blue spectrophotometric methods (the standard time and step-consuming procedure, and a modified and purportedly simplified, improved process), of determining anionic detergent concentration in water were tested using linear alkylate sulfonate (LAS) as standard anionic surfactant. Both colorimetric methods yielded similar but not identical LAS calibration curves; the modified method yielded a more feasible measurement at low LAS levels and required only 8 minutes per test (as compared with 60 minutes for the standard test). The analytical methods were evaluated for precision using standard deviation (S), relative standard deviation (RSD), and range (R) and for accuracy using error (E) and relative error (RE); formulas for each are presented. Evaluation of precision and accuracy of the modified methylene blue method was made using the standard method as reference and four different LAS concentrations (0.364, 0.728, 1.456, and 2.184 mg/l); 20 independent LAS determinations (as % transmittance) were made for each of the four LAS concentrations. Standard deviations of the % transmittance were 0.22, 0.26, 0.16 and 0.29, respectively. A mathematical model of spectrophotometric data is developed by the method of least squares to use in the comparison of the two methods. An equation is introduced for representing LAS concentration vs. % transmittance data. Using this equation LAS concentrations are mathematically derived from % transmittance data; S, RSD, R,E, and RE are calculated. All data and calculated results are presented in tabular form. (Seip-IPA)
W78-05678

MODIFIED METHYLENE BLUE METHOD FOR ESTIMATING MBAS CONCENTRATION,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
L. K. Wang.
Journal American Water Works Association, Vol 67, No 1, p 19-21, January, 1975. 2 fig, 4 ref. DAAK02-73-C-0206.

Descriptors: *Surfactants, *Spectrophotometry, *Linear alkylate sulfonate(LAS), *Colorimetry, *Color reactions, *Detergents, *Analytical techniques, *Pollutant indentification, Water quality, Measurement, Testing, Foaming, Surface tension, Anions, *Methylene blue test, *Modified methylene blue test, *Anionic surfactants, Spectrophotometric analysis, *Methylene blue active substances(MBAS), Absorbance, Synthetic detergents, Filter photometry, Alkyl benzene sulfonate(ABS), Chloroform-extractable pollutants.

The principle reagents, apparatus, and analytical procedures required to perform an improved and simplified methylene blue spectrophotometric test for determination of wastewater anionic detergent concentrations are described using linear alkylate sulfonate (LAS) as the test detergent. The new procedure significantly reduces the number of reagents, apparatus, and solvent extractions required for each test, the interference caused by chloroform-extractable pollutants, and the time required for each test. Interferences which occur in the standard analytical method and result from the reaction of methylene blue with several organic and inorganic compounds sometimes present in wastewaters are not eliminated in the modified procedure. Positive errors occur more frequently than negative ones when determining anionic detergent concentrations in water. (Seip-IPA)
W78-05679

A TEST METHOD FOR ANALYZING ANIONIC OR CATIONIC SURFACTANTS IN INDUSTRIAL WATER,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
L. K. Wang.
Journal of the American Oil Chemists' Society, Vol 52, p 339-344, September, 1975. 1 fig, 34 ref, 1 append. W/A 86-294. DAAK02-73-C0-0206.

Descriptors: *Volumetric analysis, *Surfactants, *Detergents, *Linear alkylate sulfonate(LAS), *Analytical techniques, *Chemical analysis, Anions, Cations, Aqueous solutions, Water quality, Measurement, Testing, *Pollutant identification, Two-phase titration, Anionic surfactants, Cationic surfactants, Cetyldimethylbenzylammonium chloride(CDBAC), Quaternary ammonium compounds, Sodium tetraphenylboron(STB), Solution standards.

Procedures are presented for two-phase titration (a stoichiometric analytical method for quantitative identification of either cationic or anionic surfactants present in unknown wastewater samples). Two calibration curves for use in quantifying surfactant concentration are prepared using cetyldimethylbenzylammonium chloride (CDBAC) and linear alkylate sulfonate (LAS) as cationic and anionic (respectively) surfactant reference standards and sodium tetraphenylboron (STPB) solution standard as anionic surfactant titrant. Appropriate amounts of methyl orange dye, buffer reagent, chloroform and standard CDBAC are added to a 30 ml unknown water sample. CDBAC (30 ml) is added to ensure that the sample contains an excess of cationic surfactant. The solution is titrated with STPB to the end point. The amount of STPB titrant required to reach end point is compared to a reference sample (made with distilled water) requiring 35 ml STPB titrate to reach end point. Four possible titration results exist: (1) less than 35 ml of standard anionic STPB titrant is spent to reach end point, indicating that the unknown sample contains anionic surfactant; its level can be quantified by reading from the anionic (LAC) calibration curve and reported in mg/l as LAC. (Anionic surfactant level can also be determined by subtracting the anionic STPB titrant used from the amount of cationic CDBAC initially added to the unknown). (2) More than 35 ml of anionic STPB titrant are required to reach end point, indicating that the unknown contains cationic surfactant; its level is read from the cationic CDBAC calibration curve and is reported in mg/l as CDBAC. (Cationic surfactant level can also be determined by subtracting the amount of cationic CDBAC initially added to the unknown from the amount of anionic STPB spent in reaching end point. (3) 35 ml of STPB titrant are required, indicating that the unknown contains nonionic, undetectable, or no surfactant. (4) No STPB titrant is required, indicating that the concentration of anionic surfactant is too high; the sample should be diluted and retested. Procedural limitations and alternative uses for two-phase titration are discussed. (Seip-IPA)
W78-05681

DETERMINING CATIONIC SURFACTANT CONCENTRATION,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
L. K. Wang, and D. F. Langley.
Ind. Eng. Chem., Prod. Res. Div., Vol 14, No 3, p 210-212, 1975. 2 fig, 9 ref.

Descriptors: *Surfactants, *Spectrophotometry, *Colorimetry, *Color reactions, *Detergents, *Analytical techniques, Pollutant identification, Water quality, Cations, Measurement, Testing, *Methyl orange method, *Cationic surfactants, Spectrophotometric analysis, Calibration curves, Methyl orange active substances(MDAS), Cetydimethylbenzylammonium chloride(CDBAC), Chloroform extraction, Absorbance.

A methyl orange method for the accurate spectrophotometric determination of cationic surfactants in the 0.10 to 1.25 mg/l range is described. The steps include complexation of cationic surfactant with methyl orange at acidic condition, chloroform extraction, water-chloroform phase separation, and spectrophotometric measurement. The water sample to be analyzed is treated with 50 ml of chloroform and an excess of methyl orange reagent in the presence of a pH 3 buffered solution. The methyl orange reacts with the cationic surfactant forming a chloroform soluble complex. The complex is dissolved in the chloroform phase by rapidly shaking the separatory funnel for a short time. Since chloroform is heavier than water, the chloroform phase can be separated from the water phase simply by gravity separation. The intensity of yellow color in the chloroform layer is directly proportional to the methyl orange complex; thus, the intensity of the yellow color can be subsequently measured by the use of a spectrophotometer (light path = 10 cm). The absorbance curves cover a wavelength range of 300-500nm. The absorbance curves for both 50 and 10 micrograms surfactant (cetyldimethylbenzylammonium chloride) samples treated show an absorbance maximum at 415 nm. It is suggested that calibration curves be prepared for all known methyl orange-cationic surfactant complexes to expedite accurate quantitative analyses within certain concentration ranges. If the cationic surfactants present in water are of an unknown type, the cationic surfactant concentration measured by the methyl orange method is reported to be 'mg/l MOAS' (methyl orange active substances). (Seip-IPA)
W78-05682

DETERMINATION OF ANIONIC SURFACTANTS WITH AZURE A AND QUATERNARY AMMONIUM SALT,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
L. K. Wang, and P. J. Panzardi.
Analytical Chemistry, Vol 47, No 8, p 1472-1475, July 1975. 2 fig, 2 tab, 12 ref. IBN 25.

Descriptors: *Volumetric analysis, *Surfactants, *Detergents, *Linear alkylate sulfonate, *Chemical analysis, Analytical techniques, *Pollutant identification, Anions, Cations, Ions, Aqueous solutions, Water quality, Measurement, Testing, Two-phase titration, Azure A, Methyl orange, Anionic surfactants, Cetyldimethylbenzylammonium chloride(CDBAC), Quaternary ammonium compounds, Solution standards.

A new two-phase titration method, used in the determination of anionic surfactants in water and involving the use of Azure A (AA) and methyl orange as primary and secondary dye, respectively, is described. The water sample to be analyzed is introduced into a separatory funnel where AA, buffer and organic solvent (chloroform or carbon tetrachloride) are added in appropriate amounts. The solution is titrated with cationic surfactant cetyldimethylbenzylammonium chloride (CDBAC); methyl orange is added to the sample to pinpoint the end point as it is approached. A calibration curve, plotting linear alkylate sulfonate (LAS) (anionic surfactant) vs ml of 50-mg/l CDBAC cationic titrate spent is used to determine concentration of anionic surfactant in the unknown. The precision and accuracy of the test method were determined to be slightly higher or equal to the standard methylene blue spectrophotometric method. This AA titration method is simpler and less time-consuming and can be carried out in the field. Any pure quaternary ammonium salt can be used as titrant. (Seip-IPA)
W78-05683

STATE-OF-THE-ART: MILITARY EXPLOSIVES AND PROPELLANTS PRODUCTION INDUSTRY, VOL. I - THE MILITARY EXPLOSIVES AND PROPELLANTS PRODUCTION INDUSTRY,
American Defense Preparedness Association, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-05684

5B. Sources Of Pollution

MNO2 DEPOSITION IN FEEDLOT WATER LINES IN SOUTH DAKOTA,
South Dakota State Univ., Brookings. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-05202

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF VOLUME XIII. CONTAMINANT BASELINES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05218

PROCESSES OF CARBON DIOXIDE FLUX IN THE FANNING ISLAND LAGOON,
Hawaii Inst. of Marine Biology, Honolulu.
S. V. Smith, and F. Pesret.
Pac Sci 28(3), p 225-246, 1974.

Descriptors: *Path of pollutants, Water pollution sources, *Carbon dioxide, Pacific Ocean islands, *Organic carbon, Lagoons, Rain, Fanning Island.

Carbon dioxide follows a variety of transfer pathways through marine systems and a budget of CO2 can be used to enumerate thos pathways. In a coral reef system, the biogeochemical pathways of organic carbon production-consumption and calcification are likely to be prominent. Measured were the temperature, salinity, pH and total alkalinity of about 400 water samples to describe the CO2 budget at Fanning Island, Line Islands (Central Pacific) during July and Aug. 1972. Mean lagoon salinity was about 31.5%, or 3.3% below the open ocean salinity there, as a result of heavy rainfall and groundwater seepage. This salinity depression, together with data on rainfall and tides, was used to calculate a mean lagoon water residence time of about 1 mo. The CO2 budget of the lagoon water can be described in terms of processes altering the ocean water composition. Gas exchange accounted for a net CO2 evasion of less than 1.4 moles m-2 mo. -1. Freshwater dilution lowered CO2 change attributable to organic C transfer lay between -1 and +1.3 mol m-2 mo. -1. Net organic C transfer in the lagoon is near zero, suggesting a close balance between organic C production and consumption. Calcification is about 1 kg CaCO3 m-2 yr -1, much lower than the rate which can be estimated from the standing crop and expected growth rate of corals there. The CO2 system of Fanning Island, and perhaps of other coral reefs, may be potentially limiting to biological activity.–Copyright 1975, Biological Abstracts, Inc.
W78-05229

FORESTS AND WATER QUALITY,
Northeastern Forest Experiment Station, Durham, NH.
J. W. Hornbeck.
Available from the USDA Forest Service 370 Reed Rd., Broomall, Pa. 19008. In: Water Resources at the Forest-Urban Interface. Pinchot Institute Consortium Publication PIEFR-PA-2, p 11-13, 1977. 20 ref.

Descriptors: Forests, *Streamflow, *Water quality, *Sedimentation, Temperature, Nutrients, Forest watersheds, Clearcutting, Water pollution sources, Forest clearing, Nutrient cycling, Even-age management, Forest fertilization.

Forested watersheds that are the source areas for much of the Northeast's supply of clean water are sustaining increased usage in the form of timber production, recreation, wildlife habitat, aesthetics, and land development. This article reviews pertinent literature and presents research needs for maintaining the high quality of forest streams. (Forest Service)
W78-05245

WHEN SKI TRAILS ARE CUT THROUGH FOREST LAND, WHAT HAPPENS TO STREAMFLOW,
Northeastern Forest Experiment Station, Durham, NH.
For primary bibliographic entry see Field 4C.
W78-05249

STUDY OF THE ECOLOGY OF IRON BACTERIA OF FRESH WATER RESERVOIRS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow, Inst. Mikrobiologii.
For primary bibliographic entry see Field 5C.
W78-05269

MERCURY CONTAMINATION: A HUMAN TRAGEDY,
Michigan State Univ., East Lansing. Dept. of American Thought and Language.
For primary bibliographic entry see Field 5C.
W78-05278

CORRELATION COEFFICIENTS IN CHARACTERISTICS OF BACTERIOPLANKTON AND EVALUATION OF THEIR IMPORTANCE IN MODELING, (IN RUSSIAN),
Irkutskii Gosudarstvennyi Univ. (USSR). Scientific Research Inst. of Biology.
For primary bibliographic entry see Field 5C.
W78-05285

PILOT-SCALE STUDIES OF THE LEACHING OF INDUSTRIAL WASTES IN SIMULATED LANDFILLS,
J. R. Newton.
Journal of the Institute of Water Pollution Control, Vol. 76, No. 4, p 468-480, 1977. 5 fig, 5 tab, 2 ref.

Descriptors: *Leaching, *Oil wastes, *Nickel, *Chromium, *Pilot plants, Aerobic conditions, Anaerobic conditions, Domestic wastes, Metals, Waste water treatment, Industrial wastes.

Leaching properties of industrial wastes and domestic waste mixtures were studied with simulated landfills under aerobic and anaerobic conditions. Six pilot-scale landfills received one of three industrial wastes: aqueous oil emulsion; cyanide sludge; and metal-hydroxide sludge composed of nickel, chromium, and iron. Half of these experiments were conducted under anaerobic conditions and the other half under aerobic conditions. Six corresponding small-scale experiments were conducted under conditions similar to the preceding except that artificial leaching was employed rather than natural rainfall as used in the pilot-scale experiments. Samples of leachate taken after three years indicated that organic carbon concentrations and metal concentrations were lower and the pH higher under aerobic conditions. The maximum concentration of oil in the leachate was 300 mg/liter; less than 2% of the oil added was not leached from the domestic waste. Leachate concentrations of cyanide from the pilot-scale tests were 7 mg/liter or less; concentrations in small-scale experiments did not exceed 270 mg/liter. Over the three-year study period, 3% of the cyanide added was leached. Metal quantities leached were 0.2% of the nickel and 0.3% of the chromium with respect to the weight in the sludge.
W78-05303

LONG TERM PEACE RIVER CHARACTERISTICS AS A MEASURE OF A PHOSPHATE SLIME SPILL IMPACT,
University of South Florida, Tampa. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W78-05328

CHARACTERISTICS AND TREATMENT OF BREWERY WASTES,
For primary bibliographic entry see Field 5D.
W78-05336

WORKSHOP PROCEEDINGS: RESEARCH NEEDS RELATED TO ACID MINE WATER.
West Virginia Univ., Morgantown. Water Research Inst.
For primary bibliographic entry see Field 5G.
W78-05345

PESTICIDES IN IOWA SURFACE WATERS: SUMMARY OF A WORKSHOP HELD MARCH 1977.
Iowa State Water Resources Research Inst., Ames.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 045, Price codes: A07 in paper copy, A01 in microfiche. Report No. ISWRRI - 83, March, 1977. R.V. Bulkley, Ed. 117 p, 2 fig, 18 tab, 40 ref. OWRT A-999-IA(15).

Descriptors: *Pesticides, *Toxins, *Pesticide residues, *Fish toxins, Fish, Aquatic life, *Water quality control, *Pollutant identification, *Aquatic animals, *Fish conservation, *Iowa, Water pollution effects, Path of pollutants, Food chains, Aquatic population, Potable water, Lakes, Streams, Bottom fish, Surface water, Pesticide concentration, Terrestrial vertibrates, Cedar River, Iowa River, Des Moines River.

Proceedings of a workshop designed to update data on pesticides in Iowa lakes and streams and attempt to identify areas needing additional research, assemble information on types and concentrations of pesticides found, and investigate the relation of these concentrations to levels that are known to be harmful are reported. Included are abstracts of presentations on quantities and kinds of pesticides found under conditions of varying rainfall and in: (1) public drinking water supplies, (2) fish from the Iowa and Cedar Rivers, (3) small Iowa streams, (4) livestock water and farm ponds, (5) the Des Moines River, and (6) water, fish and Great Blue Heron chicks of Rathbun and Red Rock Reservoirs. Interpretations of these data are made with regard to potential harm to human health, fish and aquatic life, domestic animals, and wildlife. Current and new regulations are outlined and insecticide use is projected. A summary of available data and a list of publications containing pesticide data are included. (Seip-IPA)
W78-05349

NON-POINT SOURCES OF WATER POLLUTION.
Oregon State Univ., Corvallis. Water Resources Research Inst.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 042, Price codes: A05 in paper copy, A01 in microfiche. Seminar, July, 1976. 92 p, 14 fig, 11 tab, 123 ref. OWRT A-999-ORE(18).

Descriptors: *Pollutant identification, Water pollution sources, Forest soils, Ranges, Runoff, Agricultural runoff, Livestock, Land use, Planning, Air pollution effects, Construction, Management, Path of pollutants, *Non-point pollution sources, Cropland runoff.

Ten papers delivered at a series of public seminars on non-point water pollution sources, include: (1) The Problem in Perspective, (2) Inorganic Pollution from Forests and Rangelands, (3) Forests and Rangelands as Sources of Chemical Pollutants, (4) Cropland Run-off, (5) Livestock Production as Source of Pollutants, (6) Land Use Planning and Non-Point Source Pollution, (7) Water Pollution from Urban and Other Non-Agricultural Areas, (8) Rainfall Contamination by Airborne Pollutants, (9) Control of Pollution from Construction Activities, and (10) Managing Non-Point Source Pollution. The combined focus emphasizes the diverse origins of the non-point sources which have emerged as the principal cause of water quality degradation in Oregon. (Seip-IPA)
W78-05352

BIOLOGICAL ASSESSMENT OF THE SOLUBLE FRACTION OF THE STANDARD ELUTRIATE TEST,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5A.
W78-05366

SEDIMENT STUDIES IN BACK RIVER ESTUARY, BALTIMORE, MARYLAND.
National Enforcement Investigations Center, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 584, Price codes: A03 in paper copy, A01 in microfiche. EPA-330/2-76/021, April 1976. 36 p, 16 fig, 4 tab, 6 ref.

Descriptors: *Water pollution sources, Pollutant identification, *Sediments, *Sludge, *Dredging, *Oxygen demand, *Maryland, Correlation analysis, Nutrients, Water quality control, Diversion, Sampling, Data collections, Relocation, *Black River Estuary(Md), Baltimore(Md), Sediment oxygen demand.

An investigation was reported of the Back River Estuary located in Maryland. The study objectives were: to determine in-situ sediment oxygen demand rates of the surficial bottom deposits; to determine the general distribution and approximate depth of organic sludge deposits; to compare the sediment oxygen demand of surficial to underlying sediments; to determine existing nutrient concentrations of surficial and subsurface sediments; and to evaluate the Maryland Water Resource Authority engineering proposals for improving the water quality of the Back River Estuary. (Singh-ISWS)
W78-05369

TECHNICAL REQUIREMENTS AND ANALYSIS METHODS FOR EVALUATING THE ENVIRONMENTAL CONSEQUENCES OF GROUNDWATER CONTAMINATION,
BCS., Inc., Richland, WA.
R. W. Nelson.
Progress in Water Technology, Vol. 9, No. 1, p 167-181, 1977. 6 fig, 20 ref.

Descriptors: *Groundwater, *Water pollution, *Groundwater movement, *Path of pollutants, Evaluation, Pollutants, Injection wells, Waste disposal, Solutes, Reservoirs, Rivers, Environment, *Groundwater contamination, Environmental impact statements, Arrival times, Arrival locations.

An important evidence of public concern for environmental quality is the requirement for 'Environmental Impact Evaluations and Statements' which consider, evaluate, and formally state the probable effect of some proposed, continuing action by man on the environment. These statements are intended to help public and regulatory authorities weigh and select the options best suited to use the environment for man's benefit, while guarding against any abuse of this privilege. However, too often the effectiveness of environmental statements is nullified by public relations pressures which tend to exclude facts and scientifically analyzed alternatives. If such divergence from technical quality continues to occur, the environmental evaluation and statement concept will degenerate into a costly bureaucratic ritual, rather than play its intended beneficial role. (Sims-ISWS)
W78-05372

SEDIMENTATION OF DISPERSED OIL IN SURFACE WATERS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. of Aquatic Sciences.
M. Thuer, and W. Stumm.
Progress in Water Technology, Vol 9, No 1, p 183-194, 1977. 4 fig, 1 tab, 16 ref.

Descriptors: *Oil, *Surface waters, *Sediments, Water pollution, Pollutants, *Path of pollutants, Oil wastes, Gasoline, Absorption, Colloids, Coagulation, Organic compounds, Dispersion, Suspended solids, Model studies, Mathematical models, Laboratory tests, Sedimentation, Aggregates, Agglomerates.

Substantial quantities of water polluting mineral oil components find their way into the sediments of surface waters. Hydrocarbons settle it they get attached to settling particulate material (biological debris, clays, $CaCO_3$, metal oxides, etc.) by adsorption and by agglomeration (coagulation) of colloidal droplets with suspended matter. Formation of dispersed oil droplets from an oil film or oil layer depends strongly on the water turbulence (velocity gradient) and on the interfacial tension of the oil-water interface, which in turn is affected by surfactants (emulsifiers) incipiently present in the oil. Agglomeration of oil droplets with other suspended solids typically present in the water is a prerequisite for substantial oil sedimentation. A simple model based on surface charge densities and mass densities of the hetero-colloids coagulating predicted the conditions under which dispersed oil becomes agglomerated and evaluated whether the agglomerates formed will settle or rise. (Sims-ISWS)
W78-05373

PILOT PLANT INVESTIGATION OF THE EVOLUTION OF VARIOUS POLLUTANTS DURING ARTIFICIAL RECHARGE OF AN AQUIFER BY A BASIN,
Societe Lyonnaise des Eaux et de l'Eclairage (France).
M. Rizet, J. Mallevialle, and J. C. Cournarie.
Progress in Water Technology, Vol 9, No 1, p 203-215, 1977. 8 fig, 3 tab, 7 ref.

Descriptors: *Artificial recharge, *Aquifer management, *Groundwater recharge, *Water pollution, *Pit recharge, Induced infiltration, Water reuse, Water quality, Aquifers, Groundwater, Underground storage, Water analysis, Pollutants, Pilot plants, Recharge, Groundwater resources, *Seine River(France).

An artificial recharge pilot plant (1 cu m/hr) was employed to investigate the evolution of various pollutants in the charging basin and successive ground layers. The compounds were introduced separately at different concentrations: 1 mg/l of lead in the form of nitrate, 1 mg/l of sodium alkyl aryl sulfonate, 2 mg/l of a ZIEGLER synthetic alcohol (nonionic surfactant), 2.5 mg/l of phenol, 12.5 mg/l of a mixture of hydrocarbons and surfactants (soluble oil), 300 mg/l of a refinery effluent, and finally, lindane at concentrations of 1 micrograms/l and 10 micrograms/l. Specific algal and bacterial counts were made on the water in the basin as well as in the sand before and after passage of the polluting flows. A certain delay in penetration was observed for the non-biodegradable compounds, while the passage of the biodegradable compounds into the surface layer was stopped rapidly by acclimatization of the biotope. (Henley-ISWS)
W78-05374

THE APPLICATION OF A TWO-LAYER TIME-DEPENDENT MODEL TO POLLUTION ASSESSMENT AND CONTROL IN A SHORT STRATIFIED ESTUARY,
Sydney Univ. (Australia). Dept. of Chemical Engineering.
R. M. Pitblado, and R. G. H. Prince.
Progress in Water Technology, Vol. 9, No. 1, p 217-231, 1977. 4 fig, 2 tab, 17 ref, 1 append.

Descriptors: *Estuaries, *Rivers, *Tidal waters, *Model studies, *Australia, Mathematical models, Salinity, Biochemical oxygen demand, Dissolved oxygen, Tides, Tidal effects, Storm water, Storms, Saline water-freshwater interfaces, Water pollution, Stratified flow, Stratification, Stratified estuaries.

The development and application of a two-layer time -dependent model for a short stratified estuary were reported. The estuary and its tributaries were segmented into 22 sections, each section being composed of two perfectly mixed boxes representing the upper and lower layers. Salinity, BOD, and DO were predicted in every box each 20 minutes, closely following variations due to tidal flow. Comparison between two experimental runs and predictions was given. An important use of the model is to predict transient pollution levels in the estuary following a major storm. A simulation of such a storm was included, and the bulk movement of pollution seawards and from the upper to lower layer was demonstrated clearly. Several applications of the model to pollution control and enforcement were outlined, including the identification of polluting sources and loads and the design and interpretation of sampling schemes. (Sims-ISWS)
W78-05375

HYDROCHEMICAL EFFECTS OF WASTE PERCOLATION OF GROUNDWATER IN BASALT NEAR FOOTSCRAY, VICTORIA, AUSTRALIA,
Geological Survey of Victoria (Australia).
M. Riha.
Progress in Water Technology, Vol. 9, No. 1, p 249-266, 1977. 11 fig, 6 ref.

Descriptors: *Water chemistry, *Australia, *Groundwater, *Aquifers, *Waste water(Pollution), Basalts, Percolation, Sampling, Phenols, Monitoring, Wells, Quarries, Ponds, Waste disposal, Dissolved solids, Dispersion, Manganese, Hydraulic conductivity, Drawdown, Plumes.

Part of the basalt aquifer adjacent to the Stony and Kororoit creeks at West Footscray, has been polluted by percolation of phenolic wastes disposed into disused quarry holes by a large chemical industry. Chemical analyses of samples from 12 monitoring bores indicated that degraded water is moving through both the upper and lower basaltic aquifers. The plume of contaminated water, approximately 1 km wide, is believed to extend downgradient to Port Phillip at a distance of about 4.5 km. Since the installation of a new above-ground treatment plant and lined sludge pond in April 1974, the recharge mound in the quarry and disposal ponds declined, and there has been corresponding decrease in the phenol content of the aquifers. It is believed that this degraded water originates in part from former quarry holes located to the north and northeast outside the chemical industry property, which have been filled with gyp-

sum, roasted pyrites and other wastes. The physical properties of the basalt aquifer system are such that they are difficult to match to dispersion models derived from homogeneous media with intergranular porosity. Since the vertical hydraulic conductivity of the basalt aquifer is much lower than the horizontal hydraulic conductivity, the pollution of the lower aquifer is significantly lower and is controlled by the pressure head relations. (Visocky-ISWS)
W78-05376

PRELIMINARY DESIGN OF OCEAN OUTFALL AT SYDNEY: PROTECTION OF BATHING WATERS,
Caldwell Connell Engineers, Melbourne (Australia).
I. G. Wallis, T. J. Pollock, and M. W. Whyte.
Progress in Water Technology, Vol. 9, No. 1, p 267-278, 1977. 5 fig, 4 tab, 6 ref.

Descriptors: *Outfall sewers, *Pacific Ocean, *Water quality, *Australia, Coliforms, Diffusion, Bacteria, On-site investigations, Measurement, Data processing, Model studies, Mathematical model, Oceans, Currents(Water), Dye releases, Dye dispersion, Dye concentration, Water pollution, Pollutants, Path of pollutants, Oceanography.

Sewage generated in metropolitan Sydney is collected by 19 separate sewerage systems, the three largest of which discharge to the Pacific Ocean through outfalls at the base of the coastal cliff. Primary sewage treatment plants are installed at two of the outfalls, and another plant is under construction at the third of these major outfalls. The Sydney Metropolitan Water, Sewerage and Drainage Board is investigation the feasibility of ocean disposal of the plant effluents through long submarine outfalls. Extensive investigations have been carried out during the last four years in order: (1) to establish the performance of such outfalls: (2) to determine construction methods and costs; and (3) to define baseline biological and chemical conditions in the potential discharge areas. One of the many aspects considered in this feasibility study was the protection of bathing beaches in the outfall region from unacceptable bacterial contamination. It was concluded that ocean disposal of primaru treated sewage effluent through a deep-water submarine outfall of practical length can meet water quality standards for bathing areas. (Sims-ISWS)
W78-05377

TRANSVERSE MIXING IN MEANDERING CHANNELS WITH VARYING BOTTOM TOPOGRAPHY,
Canada Centre for Inland Waters, Burlington (Ontario). Hydraulics Research Div.
B. G. Krishnappan, and Y. L. Lau.
Journal of Hydraulic Research, Vol 15, No 4, p 351-371, 1977. 10 fig, 2 tab, 13 ref, 3 append.

Descriptors: *Dispersion, *Alluvial channels, *Meanders, *Sediment transport, *Geomorphology, Hydraulics, Model studies, Scour, Braiding, Methodology, *Movable bed, *Transverse mixing, Concentration distribution.

Using the theory of dimensions, it was established that the dimensionless dispersion coefficient in the transverse direction in meandering channels is a function of the friction factor, meander amplitude-ti-width ratio, and the width-to-hydraulic radius ratio. An attempt was made to establish the functional relationship by measuring the dispersion coefficients for various values of the above-mentioned parameters. The meandering channels used for this study had realistic bottom configurations which resulted from the scouring and deposition of the sand forming the bottom of the channels in contrast to the rigid bottom channels used in the previous studies. The dispersion coefficients were evaluated using the Generalized Change of Moment Method. Different assumptions for the behavior of the dispersion coefficient were tested, but non exhibited superiority over the others. A numerical method was developed to solve for the concentration distribution in a meandering channel. (Singh-ISWS)
W78-05390

NATURAL VEGETATION AS A SOURCE OF DIFFUSE SALT WITHIN THE COLORADO RIVER BASIN,
Utah State Univ., Logan. Dept. of Range Science.
A. Malekuti, and G. F. Gifford.
Water Resources Bulletin, Vol 14, No 1, p 195-205, February 1978. 8 fig, 4 ref. BLM 52500-CTS-16.

Descriptors: *Salts, *Colorado River Basin, *Ranges, *Vegetation, Leachate, Litter, Precipitation(Atmospheric), Winds, Overland flow, Gullies, Channels, Subsurface flow, Simulated rainfall, Laboratory tests, Sampling, Dissolved solids, Utah, *Diffuse salt, Channel processes, Price River basin(Utah).

Foliage and litter leachate from selected natural vegetation in the Price River Basin (within the Upper Colorado River Basin) was studied to determine the probable impact of plants on the amount of diffuse salt movement from rangeland watersheds. Calculations using concentrations of various leachates and characteristics of range sites expected to be high salt producers indicated that plants contribute between 0.01 and 0.02% or less of the total annual salt load to the Price River. Therefore, it was concluded that plants are not a significant source of diffuse salt within the Colorado River Basin. (Visocky-ISWS)
W78-05393

TRENDS OF SELECTED GROUND-WATER CONSTITUENTS FROM INFILTRATION GALLERIES, SOUTHEAST NASSAU COUNTY, NEW YORK,
Geological Survey, Mineola, NY. Water Resources Div.
D. J. Sulam, and H. F. H. Ku.
Ground Water, Vol 15, No 6, p 439-445, November-December 1977. 10 fig, 3 tab, 9 ref.

Descriptors: *Path of pollutants, *Water pollution sources, *Groundwater, *Septic tanks, *Cesspools, *New York, Chemical analysis, Water analysis, Nitrates, Chlorides, Hardness(Water), Dissolved solids, Water quality, Groundwater movement, Pollutant identification, *Long Island(NY), Water pollution trends.

Long-term records of ground-water quality indicate that in an unsewered area of southeast Nassau County, New York, certain constituent concentrations increased substantially from 1910 to 1975. Most of the increase virtually parallel the rate of population growth and number of houses that discharge waste water through cesspools and septic tanks. Data sites used for this study were two abandoned infiltration galleries in Wantagh and Massapequa that withdraw water from the shallow aquifer. Ranges in total solids, in milligrams per liter, during 1910-75 were from 51 to 249 at Wantagh, and from 54 to 228 at Massapequa. Maximum concentration occurred during the latter part of the period, when the effluents from thousands of cesspools and septic tanks were being discharged. Fertilizer use before and during the period of rapid urbanization (1941 to 1960) may also have added large amounts of certain constituents to the ground-water reservoir. Analysis of fresh-water discharge from streams an subsurface outflow to the bays south of the study area indicates that an estimated 54,800 pounds of constituent load is discharged daily. (Woodard-USGS)
W78-05420

AN ANALYSIS OF SALINITY IN STREAMS OF THE GREEN RIVER BASIN, WYOMING,
Geological Survey, Cheyenne, WY Water Resources Div.
L. L. DeLong.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 728, Price codes: A03 in paper copy, A01 in microfiche Water-Resources Investigations 77-103, September 1977. 32 p, 18 fig, 4 tab, 6 ref.

Descriptors: *Model studies, *Dissolved solids, *Streamflow, *Wyoming, *Regression analysis, *Salinity, Movement, Streams, Simulation analysis, Statistical models, Reach(Streams), Water quality, Water pollution, Path of pollutants, Pollutant identification, *Green River basin(Wyo), *Dissolved-solids transport.

Dissolved-solids concentrations and loads can be estimated for streamflow records using a regression model derived from chemical analyses of monthly samples. The model takes seasonal effects into account by the inclusion of simple-harmonic time functions. Monthly mean dissolved-solids loads simulated for a 6-year period at U.S. Geological Survey water-quality stations in the Green River basin of Wyoming agree closely with corresponding loads estimated from daily specific-conductance records. In a demonstration of uses of the model, an average gain of 114,000 tons of dissolved solids per year was estimated for a 6-year period in a 70-mile reach of the Green River from Fontenelle Reservoir to the town of Green River, including the lower 30-mile reach of the Big Sandy River. (Woodard-USGS)
W78-05439

DYNAMICS OF MANGANESE, CADMIUM AND LEAD IN EXPERIMENTAL POWER PLANT PONDS,
Bradley Univ., Peoria, IL. Dept. of Chemistry; and Bradley Univ., Peoria, IL. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W78-05480

BACTERIAL ANALYSIS IN THE WATER OF THE POOLS OF MOULIN-DE-VERT, VERBOIS-GENEVA, (IN FRENCH),
Geneva Univ. (Switzerland). General Microbiology Lab.
For primary bibliographic entry see Field 5A.
W78-05482

A MATHEMATICAL MODEL OF ECOLOGICAL DISTURBANCES IN A WATER BASIN ORIGINATING UNDER THE INFLUENCE OF A SHORE POLLUTION SOURCE, (IN RUSSIAN),
Institute of Biology of the Southern Seas, Sevastopol (USSR).
V. I. Belyaev.
Okeanologiya 16(3), p 457-463, 1976.

Descriptors: *Ecological distribution, *Ecosystems, Lakes, *Mathematical models, *Shore pollution, Water pollution sources.

The reconstruction of the ecological system of a basin (sea, lake) under the influence of shore pollution is considered. The problem reduces the qualitative analysis of mathematical relationships in the ecological syst em of a basin aimed at establishing frontal concentration values and computations of the pollution components which are the leading factor.--Copyright 1977, Biological Abstracts, Inc.
W78-05495

SANITARY BACTERIOLOGICAL AND VIROLOGICAL CONTROL OF WATER BODIES, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
L. V. Grigor'Eva.
Gidrobiol Zh 12(5), p 77-80, 1976.

Descriptors: Bacteriology, *Viruses, *Bioindicators, *Microbiology, *Organic wastes, Actinomycetes, Ammonifiers, Bacilli, Bacteria, Bdellovibrio-bacteriovorus, Clostridium-perfringens, Enterococci, Indicators, Saprophytes, Staphylococci, Virological studies, Water pollution sources.

On the basis of extensive multi-year studies of marine and continental water bodies, a schematic was devised for analysis of the sanitary condition of water bodies according to certain microbiological indices. Water bodies are classified as clean, polluted or heavily polluted according to the titer of intestinal bacilli, enterococci, Clostridium perfringens and ammonifiers and the quantity of intestinal phages and aerobic saprophytes. Aerobic saprophytes serve as supplemental indices or organic pollution of water bodies and the process of self-purification. In concrete instances microbiological criteria can be supplemented by determination of microorganisms of other physiological groups (Bdellovibrio bacteriovorus, staphylococci, aerobic proteolytic bacteria, nitrifiers, actinomycetes and molds).--Copyright 1977, Biological Abstracts, Inc.
W78-05504

PESTICIDE MODES OF ENTRANCE AND CONTENT IN WATER SUPPLIES, (IN RUSSIAN),
K. K. Vrochinskii.
Gidrobiol Zh 12(5), p 93-101, 1976.

Descriptors: *Organochlorine pesticides, *DDT, *Herbicides, Pesticides, Water pollution sources, *Pesticide residues, *Path of pollutants, Water supply, Reviews, Agricultural runoff.

A review is given of the characteristics of pesticide application in agriculture as the basic mode of their entrance into open water bodies by means of surface and collector-drainage streams. In the cases of direct introduction intot the water bodies of substances used in the capacity of larvicides, ichtohocides and aqueous herbicides, high local concentrations of pesticides in water bodies were observed. Data on concentrations of organochlorine pesticides, DDT and its metabolites and organophosphorous pesticides in open water bodies of various countries is given DDT, the most invensively used the organochlorine pesticides during the past 30 yr, has a stability of 35 yr and is found in practically every water body and river studied in concentrations ranging from tens to tens of thousands of parts per mg/l. An evaluation of potential danger of pesticides for water bodies requires complex calculation of their effect on hydrochemical, hydrobiological and other processes.--Copyright 1977, Biological Abstracts, Inc.
W78-05516

DISTRIBUTION OF LEAD IN SPHAGNUM FUSCUM PROFILES IN FINLAND,
Helsinki Univ. (Finland). Dept. of Botany.
P. Pakarinen, and K. Tolonen.
Oikos, Vol 28, No 1, p 69-73, 1977. 4 fig, 13 ref.

Descriptors: *Mosses, *Lead, Bog, Peat, Leaching, Wetlands, *Distribution, Water pollution sources, *Sphagnum fuscum, *Peat profile, Mylia anomala, *Finland, Hepatic layer.

Core samples were taken from ten mires. The green portion of Sphagnum fuscum usually had lower lead contents than did dead moss a few years of age, suggesting that the moss is not actively taking up lead from organic substrate. A distinct enrichment horizon of lead found at a depth of 20-50 cm demonstrates that some leaching from surface moss occurs. Rate of leaching seems to be low for the regional pattern of lead in Sphagnum remains clear. In dead Sphagnum fuscum covered by a thin layer of Mylia anomala, two maxima of lead were present: one in the upper 0-2 cm and the second deeper in the peat. (Stihler-Mass)
W78-05521

WINTER STANDING CROP AND NUTRIENT CONTENTS IN FIVE CENTRAL NEW YORK WETLANDS,
Ithaca Coll., Dept. of Biology.
For primary bibliographic entry see Field 2H.
W78-05522

AQUATIC METABOLISM OF THE COMMUNITIES ASSOCIATED WITH ATTACHED DEAD SHOOTS OF SALT MARSH PLANTS,
Georgia Univ., Sapelo Island. Marine Inst.
For primary bibliographic entry see Field 5C.
W78-05524

ONSITE CONTROL OF SEDIMENTATION UTILIZING THE MODIFIED BLOCK-CUT METHOD OF SURFACE MINING.
Kentucky Dept. of Natural Resources and Environmental Protection, Frankfort.
For primary bibliographic entry see Field 5G.
W78-05536

DEVELOPMENT STATUS AND ENVIRONMENTAL HAZARDS OF SEVERAL CANDIDATE ADVANCED ENERGY SYSTEMS,
Lockheed Missiles and Space Co., Inc., Huntsville, AL. Huntsville Research and Engineering Center.
For primary bibliographic entry see Field 5G.
W78-05538

A PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL IMPACTS FROM OIL SHALE DEVELOPMENTS,
TRW Environmental Engineering Div., Redondo Beach, CA.
For primary bibliographic entry see Field 5G.
W78-05540

FORECASTING THE COMPOSITION AND WEIGHT OF HOUSEHOLD SOLID WASTES USING INPUT-OUTPUT TECHNIQUES--AN EXECUTIVE SUMMARY,
Ebon Research Systems, Washington, DC.
D. Kidder.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 684, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA - 600/8-77-002, January 1977. 13 p, 2 fig. EPA 68-03-0261.

Descriptors: *Solid wastes, *Economic prediction, *Input-output analysis, *Forecasting, Projections, Model studies, Estimating, *Household solid waste, Economic models, INFORUM, Economic forecasting, Preding, Public administration, Materials estimates.

The feasibility of using input-output analysis (based on transactions among industries and other sectors of the economy) to estimate the volume of household solid waste for 1971 and project the future volume to 1985 was tested. The study utilized a model describing the economy in terms of materials embodied in products purchased by households and the INFORUM model extrapolation of inter-industry coefficients and production forecasts of sectoral growth. The interrelationships among (1) industries as producers and users of raw materials and semi-finished goods; and (2) industries and users (households, capital goods buryers, governments and foreign buyers) of final products are described. Path products' concepts that relate materials to long-term projection of household wastes, adjustments, and assumptions used in this model are discussed. The forecast of growth in consumer expenditures and resulting waste between 1971 and 1985 was considerable for most product categories; data are presented in tabular form. (Seip-IPA)
W78-05551

SITE SPECIFIC BURIAL OF UNFIXATED FLUE GAS SLUDGE,
Research-Cottrell, Inc., Bound Brook, NJ.
For primary bibliographic entry see Field 5E.
W78-05555

DISTRIBUTION OF OXADIAZON AND PHOSALONE IN AN AQUATIC MODEL ECOSYSTEM,
Agricultural Research Service, Beltsville, MD. Agricultural Environment Quality Inst.
For primary bibliographic entry see Field 5C.
W78-05558

DISPERSIVE SOURCES IN UNIFORM GROUND-WATER FLOW,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
B. Hunt.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY1, Proceedings Paper 13467, p 75-85, January 1978. 2 fig, 9 ref, 3 append.

Descriptors: *Dispersion, *Groundwater, *Uniform flow, *Water pollution sources, Water resources, Steady flow, Mathematical models, Equations, Groundwater movement, Model studies.

Solutions were given for instantaneous, continuous, and steady-state sources of pollution in uniform groundwater flow. Then the solutions were used to determine how long a continuous source must be in place before steady-state conditions are approached, to determine the effect of a finite aquifer depth upon solutions for an infinite aquifer depth, to calculate maximum concentrations for instantaneous sources, and to determine the time required for solutions for a point source and a source of finite size to approach each other. (Visocky-ISWS)
W78-05571

THE INFLUENCE OF CATION EXCHANGE AND GYPSUM SOLUBILITY ON THE TRANSPORT OF SODIUM, CALCIUM AND SULPHATE THROUGH SOILS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soils and Fertilizers.
For primary bibliographic entry see Field 2G.
W78-05576

THE STRATIGRAPHY AND GEOMORPHOLOGY OF THE HOFMANN FOREST POCOSIN,
Soil Conservation Service, Raleigh, NC. and North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2H.
W78-05577

NITROGEN FERTILIZER AND NITRATE CONCENTRATIONS IN TRIBUTARIES OF THE UPPER SANGAMON RIVER IN ILLINOIS,
Washington Univ., St. Louis, MO., Center for the Biology of Natural Systems.
R. Klepper.
Journal of Environmental Quality, Vol 7, No 1, p 13-22, January-March 1978. 1 fig, 9 tab, 12 ref, 1 append. NSF AEN73-07848 A03.

Descriptors: *Nitrates, *Water pollution, *Fertilizers, *Farm management, *Illinois, Regression analysis, Data processing, Farms, Streams, Tributaries, Drainage, Crops, Soybeans, Grains(Crops), Livestock, Surveys, Data collections, Pollutants, Sangamon River(Ill), Nonpoint pollution, Nitrate nitrogen.

Cross section multiple regressions were used to test the importance of nitrogen fertilizer use for variations in the nitrate nitrogen concentrations in 16 small tributaries of the Sangamon River in east

central Illinois. Data were collected and regressions were run for 2 years, 1974 and 1975. Nitrate nitrogen concentrations in the spring of each year were regressed on estimated nitrogen fertilizer use per hectare of watershed in the previous crop or calendar year and on varibles representing other aspects of agronomic practice and hydrologic features. The fertilizer data were collected by surveying approximately 300 farmers. Nitrate nitrogen concentrations were measured at 4-week intervals. The regression results are not clear-cut but lend support to nitrogen fertilizer use as an important explanatory variable for variations in nirrate nitrogen concentrations. (Sims-ISWS)
W78-05579

CHARACTERIZATION AND IMPACT OF STORMWATER RUNOFF FROM VARIOUS LAND COVER TYPES,
Wiggins-Rimer and Associates, Durham, NC.
A. E. Rimer, J. A. Nissen, and D. E. Reynolds.
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 252-264, February 1978. 7 fig, 7 tab. EPA PO-04099-01-4.

Descriptors: *Storm runoff, *Water quality, *Monitoring, *Land use, *North Carolina, Sampling, Streams, Pollutants, Water pollution, Dissolved oxygen, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Nitrogen, Phosphorus, Heavy metals, Runoff, Storms, Streams, Streamflow, Hydrography, Water pollution sources, Nonpoint pollution sources.

The potential significance of nonpoint pollution sources on water quality in streams is a factor that can no longer be ignored. This philosophy is being emphasized currently by the Environmental Protection Agency in its 208 areawide water quality management program. In conjunction with these efforts, a water quality sampling and monitoring program was implemented in the Research Triangle region of North Carolina. To analyze the relationship between land cover and runoff quality under varying storm conditions, automatic samplers were located on seven streams that drained areas of specific land cover types; four samplers were placed at locations of various land use; and six continuous water quality monitors were located on major receiving streams. The resultant hydrographs and pollutographs were presented according to the type of land cover being studied and correlated with stream quality. (Sims-ISWS)
W78-05580

A MULTIDIMENSIONAL ANALYSIS OF THE RESULTS OF THE FRENCH 1971 SURFACE WATER QUALITY NETWORK CONTROL IN THE RIVER BASIN 'SEINE-NORMANDIE',
Ecole Nationale Superieure des Mines de Paris, Fontainebleau (France). Center for Geological Information.
For primary bibliographic entry see Field 5A.
W78-05581

VARIABLE THICKNESS TRANSIENT GROUNDWATER FLOW MODEL THEORY AND NUMERICAL IMPLEMENTATION,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 2F.
W78-05584

ASPECTS OF THE RELATIONSHIP BETWEEN TEMPERATURE AND AQUATIC CHEMISTRY,
Miami Univ., Coral Gables, FL. Lab. for Water Research.
For primary bibliographic entry see Field 5C.
W78-05588

SALT WATER INTRUSION IN THE UNITED STATES,
Robert S. Kerr Environmental Research Lab., Ada, OK.
B. D. Newport.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 897, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/8-77-011, July 1977. 31 p, 8 fig, 1 tab, 37 ref.

Descriptors: *Saline water intrusion, *Groundwater, *Salts, Hydraulic systems, Coastal structures, Wells, Irrigation, Pumping, United States, Underground, Pollutant identification, Aquifer testing, Aquifer management, *Water pollution sources, Water pollution control.

Salt water intrusion, from one or more sources outlined (including hydraulic connection with ocean or brackish waters of estuaries, improper disposal of field brines, surface infiltration, salt water in limestone formations, irrigation return flow, and excessive pumping), has resulted in degradation of subsurface fresh water aquifers in 43 states of the U.S. Waste from municipal and industrial sources entering natural streams or reservoirs are responsible for the more visible types of pollution; their detection is rapid, their source(s) can usually be identified, and their elimination will result in rapid natural improvement of water quality. In contrast, the clandestine movement of salt water through a fresh water aquifer continues, defying early detection, concealing its origin(s), and creating long-term problems with expensive remedies. Current control options include reducing pumping, relocating wells (inland and/or dispersed), recharging aquifers, recharging fresh water into wells to form an hydraulic barrier, creating a trough parallel to the coast by evacuating encroaching salt water from wells, drilling scavenger wells to evacuate salt water, eliminating and regulating surface and subsurface disposal from oil fields, locating and plugging faulty wells, and eliminating and preventing surface infiltration sources. Early detection of salt water intrusion into potable aquifers is identified as an area needing additional research. (Wares-IPA)
W78-05613

FEASIBILITY OF SILVER-LEAD MINE WASTE MANIPULATION FOR MINE DRAINAGE CONTROL.
Montana Dept. of Natural Resources and Conservation, Helena. Engineering Bureau.
For primary bibliographic entry see Field 5G.
W78-05614

MINE DRAINAGE CONTROL FROM METAL MINES IN A SUBALPINE ENVIRONMENT: A FEASIBILITY STUDY.
Montana Dept. of Natural Resources and Conservation, Helena. Engineering Bureau.
For primary bibliographic entry see Field 5G.
W78-05618

DRINKING WATER SYSTEMS FOR THE TRAVELING PUBLIC: A STATUS REPORT.
Environmental Protection Agency, Washington, DC. Office of Water Supply.
For primary bibliographic entry see Field 5F.
W78-05623

TRANSPORT AND TRANSFER RATES IN THE WATERS OF THE CONTINENTAL SHELF,
Lamont-Doherty Geological Observatory, Palisades, NY.
P. E. Biscaye, W. S. Broecker, H. W. Feely, and R. D. Gerard.
Available from the National Technical Information Service, Springfield, VA 22161 as COO-2185-7, Price codes: A08 in paper copy, A01 in microfiche. Energy Research and Development Administration, April 1976. 139 p, 5 append. E(11-1)2185.

Descriptors: *Mixing, *Continental shelf, *Path of pollutants, Baseline studies, Dispersion, Water pollution effects, *Outer continental shelf, *New York Bight.

Understanding the chemical, physical and biological processes which control the origin, dispersal and fate of particulate matter, and to ultimately model the impact of energy related pollutants on the continental shelf is the goal of this research. The report is divided into four sections: (1) a general introduction; (2) spreading of water characteristics and species in solution; (3) mixing and dispersal of solids and trace metals; and (4) mixing of species across, within and out of sediments. Each section has its own introductory statement followed by a report on field work accomplished, analyses done and results of findings to-date. Finally, a list of papers published, in press or in preparation and talks given during the 1975-1976 funding period is given. (Sinha-OEIS)
W78-05627

THE INTERACTION OF OIL WITH SEA ICE IN THE ARCTIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanography.
S. Martin.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 16. Hazards, p 87-150, March 1977. 29 fig, 7 ref. 03-5-022-67.

Descriptors: *Oil pollution, *Sea ice, *Ice-water interfaces, Baseline studies, Resources development, *Hazards, Arctic Ocean, Alaska, *Outer Continental Shelf, Beaufort Sea, Petroleum, Offshore operations.

The types of first-year ice which occur in the Beaufort Sea and the way in which they interact with petroleum over a growing season is discussed. Because the specific gravity of petroleum is generally less than that of sea water, oil floats on water, and oil released under ice generally floats to the ice-water interface. From the NORCOR field experiment, it is known that if brine channels are present in the ice, oil rises up through the ice channels, then spreads out both on and within the ice surface. Therefore, the properties of the top layer of the ice will determine whether the oil once it reaches the surface will either spread out over the surface as over a glass sheet, or be absorbed within the ice. Most of the data consists of photographs of ice cores. The different kinds of ice which were observed in OCS field traverses are discussed and it is shown how the ice properties change over a growing season. The results from the NORCOR experiment are interpreted. (See also W78-05221) (Sinha-OEIS)
W78-05629

DYNAMICS OF NEAR SHORE ICE,
Washington Univ., Seattle. Div. of Marine Resources.
N. Untersteinter, and M. D. Coon.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 16. Hazards, p 164-332, March 1977. 3 append. 03-50-022-67(5).

Descriptors: *Sea ice, *Remote sensing, *Oil spills, *Baseline studies, *Environmental effects, *Arctic Ocean, Tracking techniques, Winds, Stress analysis, Operations, Oil industry, Hazards, Path of pollutants, *Outer Continental Shelf, *Trajectories, Kinematics, Beaufort Sea, Chukchi Sea, Offshore operations, Petroleum development.

The objective of the field program was to determine the kinematics of the ice in the Beaufort and Chukchi Seas by satellite tracking of data buoys. The data from the 20 buoys deployed and analyzed show that this is a reliable and economical way of determining the trajectories of sea ice. During most of the year oil spilled in the Arctic will be trapped in sea ice and subsequently transported by

it. These trajectories being developed by the tracking of data buoys will be the baseline information needed to judge how pollutants delivered to the ice will be transported. From the analysis of OCS data and the related data from AIDJEX, it appears that during much of the summer the trajectories of ice could be computed from a knowledge of wind conditions only. However, during extended periods in fall, winter and spring the trajectories are influenced by the condition of the pack ice and its internal stress. Model calculations indicate that ice velocities can be determined from the AIDJEX ice model when high quality wind data are available, together with some buoy positions to provide boundary conditions for the calculations. The model calculations provide information about the stress transmitted through the pack ice. Because it is likely that these ice stresses and severe ice conditions can be the cause of oil spills, the knowledge of ice conditions and ice stress will be important in determining times and locations for safe operations. (See also W78-05221) (Sinha-OEIS)
W78-05631

POLLUTION FROM DREDGING OPERATIONS,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
L. K. Wang, R. P. Leonard, and P. M. Terlecky, Jr.
Report No. 3-15-75, March, 1975. 16 p, 4 fig, 4 tab, 2 ref.

Descriptors: *Dredging, *Sediments, *Water pollution sources, Water pollution control, Water quality standards, Lake Erie, Ohio, Water pollution, *Dredging pollutants, *Dredging pollutants, *Dredging spoils, Sediment settling, *Dike disposal area, Dredging detention, Dredging disposal, Great Lakes Water Standards, Supernatent discharge, Ashtabula River, Grand River, Fairport Harbor.

The main features and operation methods of four types of dredges: the clamshell, dipper, pipeline, and hopper dredges are described. Sources of pollution in waterway sediments from dredging operations including (1) point pollution sources such as municipal and industrial discharges, (2) non-point sources such as storm runoff, agricultural runoff, soil erosion, and (3) random accidental spills are discussed. The results of sediment characterization studies of dredging spoils from Ashtabula and Fairport Harbors in Ohio are reported and contrasted. Investigation of sediment settleability and the effectiveness of adequate detention time of dredgings in a diked disposal area before discharge of supernatant back to the receiving stream or lake indicates that removal of heavy metals, oil, grease, and phosphorous is significant at only 1 hour settling time and is greater than 95% after 18 hours settling. Potential for use of dredged materials in land fill and land reclamation, and disposal of dredgings in along-shore and offshore diked areas and abandoned strip mine areas is briefly discussed. Tentative water quality criteria of treated sediment and water for Ashtabula River, Grand River and Lake Erie are presented. From settleability data, it is concluded that sufficient settling of dredgings in a diked disposal area followed by discharge of supernatant to Great Lakes water will not contravene proposed Great Lake Water Standards. Settling test data, pollutant content in dredged materials, and water quality, criteria are presented in tables. (Seip-IPA)
W78-05673

STATE-OF-THE-ART: MILITARY EXPLOSIVES AND PROPELLANTS PRODUCTION INDUSTRY, VOL. I - THE MILITARY EXPLOSIVES AND PROPELLANTS PRODUCTION INDUSTRY,
American Defense Preparedness Association, Washington, DC.
J. Patterson, N. I. Shepira, J. Brown, W. Duckert, and J. Polson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 385, Price codes: A06 in paper copy, A01 in microfiche. EPA Report No 600/2-76-213a, October, 1976. Vol I of III, 96 p, 18 fig, 3 tab. R802872.

Descriptors: *Explosives, *Waste water treatment, *Pollutant identification, *Water pollution control, *Water pollution sources, Nitrates, Acids, *Propellants, Nitrating acids, Nitric acid, Sulfuric acid, Oleum, Acetic acid, Acetic anhydride, Ammonium nitrate, Load/Assembler/Pack(LAP), Red water, Trinitrotoluene(TNT), Tetryl, RDX/HMX, Nitrocellulose, Nitroglycerine.

Wastewater effluents of the military explosives and propellants manufacturing industry are investigated. New wastewater treatment technologies are outlined for cross-flow filtration, evaporative dewatering, catalyzed ozonation, reverse osmosis, use of powdered activated carbon, wastewater extraction, and ion exchange. The major steps in the manufacture of munitions are described. The essential process involved in the production of the major explosive and propellant chemicals and their assembly into end-item munitions are described for trinitrotoluene (TNT), tetryl, cyclotrimethylenetrinitramine/cyclotetramethylenetrinitramine (RDX/HMX), nitrocellulose, nitroglycerine, nitrocellulose-base propellants, ball powder, and black powder. Nitrating acid manufacture is outlined for nitric acid, sulfuric acid, oleum, acetic acid, acetic anhydride, and ammonium nitrate. Loading of explosives or propellants into field hardware is described. Approaches to water pollution abatement, such as manufacturing improvements water management, and outfall treatment, are briefly discussed. Water pollutants resulting from basic explosive and acid manufacture, the compounding of explosives and propellants, and loading procedures are described. Acid drippings, solvent spills, rust, stack scrubber drainings, floor washdown wastewater, 'red water' from TNT purification, and water solutions of various explosives contribute to the pollution problems. General conclusions and recommendations are reported. Subsequent volumes present the bulk of the wastewater treatment, sampling, and monitoring data and evaluate current and new treatment processes. (Seip-IPA)
W78-05684

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALINATION PLANTS. PART I, FLUME STUDY OF THE MIXING CHARACTERISTICS OF DENSE JETS DISCHARGED INTO A FLOWING FLUID, VOL I, MAIN TEXT. APPENDIX A: NOTATION. APPENDIX B: CONDUCTIVITY PROBE CALIBRATION AND DATA REDUCTION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
F. M. Holly, Jr., and J. L. Grace, Jr.
Available from National Technical Information Service, Springfield, VA 22161 as ADA-032 703, Price codes: A04 in paper copy, A01 in microfiche. Research Report H-71-2, August, 1971. part I of II, 57 p, 17 fig, 3 tab, 16 ref, 2 append. 14-30-2656.

Descriptors: *Desalination wastes, *Brine disposal, *Brines, *Dispersion, *Model studies, Waste dilution, Flumes, Outlets, Estuaries, Ocean circulation, Discharge measurement, Efficiencies, *Brine plumes, Effluent jet discharge, Brine dispersion, *Plume spread, Effluent diffuser system, Brine dilutions, *Dispersion rates, Equilibrium distribution, Discharge velocity, Single-port diffuser, Multiple-port diffuser.

A physical model was utilized to evaluate the degree of mixing attainable through the use of desalination plant effluent-diffusers located on an estuary or ocean floor beyond the surf zone, from which dense brine is discharged vertically through circular ports into a uniform and steady crosscurrent. Nearly 400 tests were run in a 1:20 scale, uniform-flow, level-bottom flume to evaluate the effects of port diameter, brine flow rate, density difference between brine and ambient fluid, and ambient fluid velocity on the geometry and mixing characteristics of brine discharged through a single-port diffuse. Geometry data were taken through photographic and visual observations; dilution data were compiled using combined conductivity-temperature probes. The product of the ratio of ambient to port velocities and a port densimetric Froude number has been found to be the significant parameter in all aspects of the problem. Equations are presented for the calculation of the upper boundary of a jet, the prediction of the maximum effluent concentrations to be expected for a given set of design/operating parameters and the prediction of plume spread. Tests using a multiple-port diffuser verified that linear superposition of single-port results can be used to predict multiple mixing characteristics. Tests using heated brine indicate that the presence of a temperature differential of up to 10C between the brine and ambient fluid has no significant effect on the plume mixing characteristics. A multiple-port diffuser was found to have a significant advantage over a simple outfall pipe in keeping high concentrations of dissolved metallic ions away from the ocean floor. (See also W78-05690) (Seip-IPA)
W78-05689

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALINATION PLANTS, PART II. TESTS OF EFFLUENT DISPERSION IN SELECTED ESTUARY MODELS, VOLUME I. MAIN TEXT,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
W. H. Bobb, R. A. Boland, Jr., and F. A. Herrmann.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-032 710, Price codes: A09 in paper copy, A01 in microfiche. Research Report H-71-2, September, 1971. Part II of II, 183 p, 169 fig. 14-30-2656.

Descriptors: *Desalination wastes, *Bine disposal, *Brines, *Dispersion, *Equilibrium, Freshwater, Outlets, Estuaries, Delaware River, Effluent jet discharge, Jet mixing, Brine dispersion, Effluent diffuser system, Freshwater inflow, Effluent buoyancy, Dispersion rates, *Effluent mixing, Equilibrium distribution, *San Diego Bay, *Galveston Bay.

The dispersion of heated waste brine from desalination plant outfalls, the dynamic equilibrium distribution of the waste after sustained plant operation, and the effects of freshwater inflow on dispersion rates and equilibrium values were studied. The comprehensive fixed-bed models of San Diego Bay, Galveston Bay, and Delaware River located at the Waterways Experiment Station, are typical of estuaries on which salt-water conversion facilities are frequently located; therefore, test results can be applied to other similar estuaries. Heated effluent from 10-million gallon per day (mgd) plant models was introduced into the water. In estuaries such as San Diego Bay, where minimal tidal current velocities and fresh water discharge exist, dispersion and flushing rates are slow and the time required to reach dynamic equilibrium is long. In large, shallow bays such as Galveston Bay, outfall sites must be chosen carefully since flow conditions in the immedate vicinity of the diffuser significantly impact overall dispersion rates and may trap plant effluent. In estuaries such as the Delaware River, having large freshwater discharge and tidal currents and a reasonably regular shape, sufficient mixing and dispersion of the effluent will probably occur after the energy of the jet leaving the diffuse is expended. The mixing and dispersion rates in estuarines similar to the Delaware River vary directly with total freshwater flow into the estua-

ry, while the time to reach dynamic equilibrium varies inversely with total freshwater flow. Test results and data are presented in figures. (See also W78-05689) (Seip-IPA)
W78-05690

5C. Effects Of Pollution

INFECTIOUS HEMATOPOIETIC NECROSIS OF RAINBOW TROUT IN MONTANA: A CASE REPORT,
National Fish Hatchery, Hagerman, ID.
J. E. Holway, and C. E. Smith.
J Wildl Dis. 9(4), p 287-290, 1973.

Descriptors: *Hematopoietic necrosis, *Montana, *Rainbow trout, Trout, *Viruses, Fish diseases, Fish hatcheries, Water pollution effects.

Infectious hematopoietic necrosis was diagnosed in rainbow fingerlings (Salmo gairdneri kamloops) during an epizootic at a hatchery in Montana. Microscopic pathology and effects of the causative virus in cell culture are described.--Copyright 1974, Biological Abstracts, Inc.
W78-05204

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME V. RECEPTORS--BIRDS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05210

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME VI. RECEPTORS--FISH, LITTORAL, BENTHOS,
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05211

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME VII. RECEPTORS--FISH, LITTORAL, BENTHOS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05212

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME VIII. RECEPTORS--FISH, LITTORAL, BENTHOS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05213

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME IX. RECEPTORS--FISH, LITTORAL, BENTHOS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05214

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME X. RECEPTORS--FISH, LITTORAL, BENTHOS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05215

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XI. RECEPTORS--MICROBIOLOGY.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05216

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XII. EFFECTS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05217

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF VOLUME XIII. CONTAMINANT BASELINES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05218

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XVI. HAZARDS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05221

PROCESSES OF CARBON DIOXIDE FLUX IN THE FANNING ISLAND LAGOON,
Hawaii Inst. of Marine Biology, Honolulu.
For primary bibliographic entry see Field 5B.
W78-05229

MATHEMATICAL MODELLING OF LIMNIC ECOSYSTEMS WITH RECURSIVE ESTIMATION METHODS, (IN GERMAN),
For primary bibliographic entry see Field 2H.
W78-05237

SANITARY-TOXICOLOGICAL ASSESSMENT OF THE CAPROLACTAM PRODUCTION EFFLUENTS TREATED IN BIOLOGICAL INSTALLATIONS, (IN RUSSIAN),
Kemerovo State Medical Inst. (USSR).
V. P. Kovtun.
Gig Sanit 8, p 15-19, 1976.

Descriptors: Biological studies, *Caprolactam, *Effluents, Water pollution, *Toxicity, Aeration, Waste water treatment, Rodents.

Sanitary-toxicological investigations of the caprolactam production effluents that were treated in aerotanks, consisting of mixers with regenerators, showed the effluents to be highly toxic for albino mice. The existing system of decontamination does not provide the necessary hygienic effectiveness. The discharge of these treated effluents into a water body may deteriorate water quality.--Copyright 1977, Biological Abstracts, Inc.
W78-05248

PROCEEDINGS OF THE CONFERENCE ON ASSESSING THE EFFECTS OF POWER-PLANT-INDUCED MORTALITY ON FISH POPULATIONS.
Energy Research and Development Administration, Oak Ridge, TN.; and Oak Ridge National Lab., TN.
CONF-770501. Proceedings of a Conference held at the Riverside Motor Lodge, Gatlinburg, Tennessee, May 3-6, 1977. Van Winkle, W. (Ed.) 365 p. W-7405-eng-26.

Descriptors: *Conferences, *Powerplants, *Environmental effects, *Life history studies, *Fish mortality, *Monitoring, *Model studies, *Fish populations.

The conference was sponsored by th U. S. Energy Research and Development Administration (Division of Biomedical and Environmental Research) and Electric Power Research Institute. The proceedings contains 20 papers pertaining to the subject of the conference. Subjects covered in these papers are case histories; estimating abundance, production, and mortality rates of young fish; compensation and stock-recruitment relationships; monitoring programs and data analysis; and the use of population models. (See W78-05252 thru W78-05268) (Chilton-ORNL)
W78-05251

DENSITY DEPENDENCE, DENSITY INDEPENDENCE, AND RECRUITMENT IN THE AMERICAN SHAD (ALOSA SAPIDISSIMA) POPULATION OF THE CONNECTICUT RIVER,
McGill Univ., (Montreal). Dept. of Biology.
W. C. Leggett.
CONF-770501, In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 3-17, 6 fig, 1 tab, 19 ref.

Descriptors: *Environmental effects, Population, Density, Fish, *Connecticut River, Mortality, Eggs, Larvae, Growth rates, Juveniles, Adult growth stage, Temperature, River flow, Forecasting, American shad, Density-dependence, Density-independence, Egg-to-adult survival, Recruitment.

Investigation showed that in the Holyoke-Turners Falls area of the Connecticut River, where the size of the spawning stock has increased dramatically since 1955, bot egg-to-adult survival rates and juvenile growth rates have shown a strong negative correlation with stock size. In the population of the river as a whole, egg-to-adult survival was estimated to be 0.00056% at replacement levels, and 0.00083% at the point of maximum population growth. Density-independent mortality was also shown to be an important regulator of juvenile year-class strength and of recruitment. Annual deviations from predicted recruitment were large and the causes of these deviations are poorly understood. Temperature and flow regimes during spawning and early development were involved. It was suggested that inspite of the availability of a strong data base, the potential for error in numerical prediction of the effects of proposed levels of increased mortality on pre-recruit is large, while the biologically acceptable range of error is small. (See also W78-05251) (Chilton-ORNL)
W78-05252

SOME FACTORS REGULATING THE STRIPED BASS POPULATION IN THE SACRAMENTO-SAN JOAQUIN ESTUARY, CALIFORNIA,
California State Dept. of Fish and Game, Stockton.
H. K. Chadwick, D. E. Stevens, and L. W. Miller.
CONF-770501, In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 18-35, 8 fig, 1 tab, 17 ref. Dingell-Johnson, Calif. F-9-R.

Descriptors: *Environmental effects, Population, Density, Fish, Striped bass, Estuaries, Flow, Power plants, Mortality, *Sacramento-San Joaquin Estuary(Calif).

The measurements of young striped bass abundance and of adult recruitment indicate that the principal variations in survival occur within about the first two months of life. These variations are correlated with, and apparently largely controlled by, the magnitude of water diversions from the estuary and magnitude of delta outflow. Diversions act as a density-independent source of mortality in regulating population size. Delta outflow controls the transport of young bass to suitable nursery areas which, in turn, influences survival through factors such as food availability. At the two electrical generating power plants in the Sacramento-San Joaquin Estuary, mortality of entrained bass was 10% or less for many conditions and approached 100% only at temperatures of 30C or more. Inpingement was insignificant at these two power plants. (See also W78-05251) (Chilton-ORNL)
W78-05253

MAN'S IMPACT ON THE COLUMBIA RIVER STOCKS OF SALMON,
Washington Univ., Seattle. Fisheries Research Inst.
E. O. Salo, and Q. J. Stober.
CONF-770501, In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977, p 36-45, 5 fig, 6 ref.

Descriptors: *Environmental effects, *Powerplants, *Columbia River, *Salmon, Management, Fish management, Spawning, Productivity.

Investigation of the effects of the impacts on Columbia River salmon stocks shows that the effect has increased with the addition of each new dam on the river, while the resiliency of the species has declined. Changes in the environment have reduced productivity of salmon until recruitment (in terms of spawners) has fallen below replacement. The upriver salmon is in a tenuous condition, and it is doubtful that all combined mitigative efforts can ensure the survival of these stocks. Efforts to mitigate impacts on lower-river stocks appear likely to succeed. A policy of zero impact for all new developments has been adopted. (See also W78-05251) (Chilton-ORNL)
W78-05254

POPULATION DYNAMICS OF YOUNG-OF-THE-YEAR FISH IN A RESERVOIR RECEIVING HEATED EFFLUENT,
Fish and Wildlife Service, Clemson, SC. Southeast Reservoir Investigations.
R. Ruelle, W. Lorenzen, and J. Oliver.
CONF-770501. In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 46-67, 3 fig, 8 tab, 19 ref.

Descriptors: *Environmental effects, *Water pollution, *Thermal pollution, Reservoirs, Fish, Temperature, Populations, Nuclear powerplants, Powerplants, Sunfishes, Yellow perch, Crappie, Shad.

This paper describes the limnetic young-of-the-year fish population in Keowee Reservoir, South Carolina, before and after discharge of heated water from a nuclear power plant. After the plant went into operation the reservoir reached higher temperatures, warmed eariler in the spring, remained warm later in the fall, and the thermocline sank at an accelerated rate during the summer. Relative abundance of the young of three endemic forms (yellow perch, black crappie, and sunfishes) declined during the time of the sutyd. Reduced numbers were measured in all areas of the reservoir, but were greatest in areas closest to the heated water discharge. Numbers of an introduced species (threadfin shad) changed little during the time of the study. It was suggested that the decline in abundance of young fish might be due to temperature avoidance of adults in areas were higher temperatures existed which contributed to reduced spawning and young in the area. Determining the causes of reduced numbers of yound was confounded by possible reduction normally associated with the aging of a reservoir. (See also W78-05251) (Chilton-ORNL)
W78-05255

ESTIMATING THE SIZE OF JUVENILE FISH POPULATIONS IN SOUTHEASTERN COASTAL-PLAIN ESTUARIES,
National Marine Fisheries Service, Beaufort, NC. Beaufort Lab.
M. A. Kjelson.
CONF-770501. In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 71-89, 1 fig, 4 tab, 62 ref.

Descriptors: *Management, *Fish populations, *Forecasting, Sampling, Estuaries, *Coastal plains, *Estimating, *Southeast US.

The objective of this paper is to provide information for evaluating and planning of sampling programs designed to obtain accurate and precise estimates of fish abundance. Several basic methods for obtaining absolute abundance of fish populations are discussed. These include the area-density, mark-recapture, and direct-count methods. The area-density method is recommended as being the more feasible of the three. An important decision in the use of this method is the choice of an appropriate sampling gear relative to the species of fish, the nursery habitat involved, and the budgetary limitations. Blockage methods, encircling devices, drop nets, lift nets, trawls and seines are discussed. The obtaining of sufficient number of samples and the assessing of gear catch efficiencies to improve accuracy are of high value. Cooperative effort between several interested organizations is suggested. (See also W78-05251) (Chilton-ORNL)
W78-05256

STRIPED BASS (MORONE SAXATILIS) MONITORING TECHNIQUES IN THE SACRAMENTO-SAN JOAQUIN ESTUARY,
California State Dept. of Fish and Game, Stockton.
D. E. Stevens.
CONF-770501. In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 90-108, 6 fig, 33 ref. Dingell-Johnson, Calif. F-9-R.

Descriptors: Populations, *Monitoring, Density, *Striped bass, Estuaries, *Sacramento-San Joaquin Estuary, Sampling, Estimating, Fish populations.

Egg and larva surveys with plankton nets in spring were found to provide the best descriptions of where and when bass spawn but these surveys tend to underestimate standing crops of eggs. Estimates of larva mortality rates do not explain annual abundance differences measured by the summer tow-net survey. Abundance-flow correlations indicate that when spring and summer flows are low or moderate, young bass abundance is indexed effectively by annual, summer tow-net survey. At high flows, this survey underestimates abundance. A midwater trawl satisfactorily measures abundance of young bass in the fall but not in the winter. Catch-per-unit-effort data for sport-fishing party boats effectively monitored two-year-olds until 1956 when a change in angling regulations increased recruitment age from two to three years. The Petersen method and indices from party-boat catches are said to be the best monitoring techniques for bass three years old and older. Party-boat catches and postcard surveys are useful in monitoring long-term catch trends. (See also W78-05251) (Chilton-ORNL)
W78-05257

STRIPED BASS ICHTHYOPLANKTON ABUNDANCE, MORTALITY, AND PRODUCTION ESTIMATION FOR THE POTOMAC RIVER POPULATION,
Martin Marietta Corp., Baltimore, MD. Environmental Technology Center.
T. T. Polgar.
CONF-770501. In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 109-125, 3 tab, 13 ref. 18-74-04(75).

Descriptors: Populations, Density, *Striped bass, *Potomac River, Monitoring, Model studies, Estimating, Mortality, Production, Plankton, *Ichthyoplankton.

Ichthyoplankton surveys were carried out as part of the Maryland Power Plant Siting Program. Age-dependent models were developed which used the field survey data for estimating mortality rate and production for each successive ichthyoplankton stage. The model assumes either a uniform age distribution or an exponential age distribution within each stage. Under the assumption of uniform age distribution, undersampling of any stage affected the population parameters of that stage and the immediately preceding stage. Under the assumption of exponential age distribution, undersampling of a particular stage affected the population parameters of that stage and all preceding stages. (See also W78-05251) (Chilton-ORNL)
W78-05258

AN ARGUMENT SUPPORTING THE REALITY OF COMPENSATION IN FISH POPULATIONS AND A PLEA TO LET THEM EXERCISE IT,
Michigan Univ., Ann Arbor. School of Natural Resources.
J. T. McFadden.
CONF-770501. In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 153-183, 4 fig, 2 tab, 88 ref.

Descriptors: *Environmental effects, Populations, Density, Powerplants, Fish, *Compensation, Exploitation, Fisheries, Fish management.

Processes which reduce population growth at high densities and increase growth at low densities are compensatory. This paper presents a general case argument for the general operation of compensation in animal populations. It supports the view that compensation is operative in fish populations with three lines of evidence: the historical development of the concept is traced through its applications in fishery management, and the present day consenus held by the world's leading fishery scientists is summarized; a selection of compensatory mechanisms which operate in fish populations is reviewed; and a large number of cases, in which substantial levels of exploitation by fisheries have been sustained by fish populations without serious depletion, are cited. The applicability of fishery exploitation principles to power plant impacts is discussed. (See also W78-05251) (Chilton-ORNL)
W78-05259

ASSESSING THE IMPACT OF POWER PLANT MORTALITY ON THE COMPENSATORY RESERVE OF FISH POPULATIONS,
National Power Plant Team, Ann Arbor, MI. Office of Biological Services.

C. P. Goodyear.
CONF-770501. In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 185-194, 4 fig, 1 tab, 5 ref.

Descriptors: Environmental effects, *Powerplants, *Mortality(Fish), Populations, *Compensation, Exploitation, Density, *Striped bass, Model studies, Population dynamics.

Compensation is defined as the sum of all density-dependent phenomena that act to stabilize the population. A technique designed to quantify the degree to which compensatory phenomena are exerted in exploited populations is used to examine the impact of power plant mortality on a hypothetical striped bass population. It was found that power plant mortality had a more severe impact on the compensation ratio and compensatory reserve for an exploited stock than for an unexploited stock. (See also W78-05251) (Chilton-ORNL)
W78-05260

DEVELOPMENT OF A STOCK-PROGENY MODEL FOR ASSESSING POWER PLANT EFFECTS ON FISH POPULATIONS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
S. W. Christensen, D. L. DeAngelis, and A. G. Clark.
CONF-770501. In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 195-225, 7 fig, 10 tab, 1 append, 22 ref.

Descriptors: *Environmental effects, *Model studies, *Fish populations, Density, Compensation, Mathematical models.

The model is a multi-age-class model based on general biological principles. The application of the model is intentionally results oriented in the sense that it was forced to assume a variety of arbitrary stock-progeny relationships. For each set of parameters which produced a desired form of relationship, the impact factor was evaluated at one or more levels of impact. The impact factor is a measure of the sensitivity of the stock to power plant cropping and, generally, is positively related to the slope at the equilibrium point and to a lesser extent is negatively related to the slope at origin. The timing of cropping in relationship to compensation is important in determining the impact factor. For a wide range of stock-progeny relationships, power plant cropping in the model always acts to decrease, and never to increase, the equilibrium stock size from its unimpacted value. The maximum amount of power-plant-induced mortality that can be tolerated by the stock can be calculated from the slope of the curve at the origin. (See also W78-05251) (Chilton-ORNL)
W78-05261

QUALITY OF INFERENCE CONCERNING THE EFFECTS OF NUCLEAR POWER PLANTS ON THE ENVIRONMENT,
Washington Univ., Seattle. Center for Quantitative Science in Forestry, Fisheries and Wildlife.
D. A. McCaughran.
CONF-770501. In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 229-242, 9 fig, 1 tab, 3 ref.

Descriptors: *Environmental effects, *Nuclear powerplants, Monitoring, Designs, Powerplants, Analysis of variance, Detectable differences.

The study presented deals with minimum detectable differences in the environment and the probability of detection in several experimental designs. The relationships of cost and detectable change is discussed. Presently, analysis of variance is the most common statistical procedure applied to nuclear power plant monitoring data. Relationships between station number, replicate number, variance, and minumum detectable difference with power = 0.90 and alpha = 0.10 for phytoplankton, zooplankton, smelt, and alewives at the Zion Nuclear Power Plant are given. It is recommended that the regulatory agencies should make a concerted effort in defining unacceptable environmental change and insist upon monitoring studies capable of detecting such changes. (See also W78-05251) (Chilton-ORNL)
W78-05262

FACTORS TO CONSIDER IN MONITORING PROGRAMS SUGGESTED BY STATISTICAL ANALYSIS OF AVAILABLE DATA,
Battelle Pacific Northwest Labs., Richland, WA.
J. M. Thomas.
CONF-770501. In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 243-255, 1 fig, 1 tab, 15 ref.

Descriptors: *Environmental effects, *Nuclear powerplants, *Monitoring, Statistical methods, Power, Sampling, Designs.

The purpose of this paper is to outline past experience and to suggest what might be done to assess environmental changes induced by nuclear power plants. Desirable changes in emphasis on what to measure and how to conduct the field work (including a stopping rule), quantitative issues which impinge on the choice of field designs, suggestions for methods of statistical analysis, and estimation of sample sizes necessary to detect changes in population numbers based on evaluated data are discussed. (See also W78-05251) (Chilton-ORNL)
W78-05263

ESTIMATION OF AGE STRUCTURE OF FISH POPULATIONS FROM LENGTH-FREQUENCY DATA,
Oak Ridge National Lab., TN. Environmental Sciences Div.
K. D. Kumar, and S. M. Adams.
CONF-770501. In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 256-281, 8 fig, 9 tab, 23 ref.

Descriptors: *Model studies, Fish populations, Simulation analysis, Length, Age, Probability, Channel catfish, Sunfishes, Age-length key, Age structure, Probability model.

The model presented demonstrates that when the age-length key is available, maximum-likelihood estimates of the age structure of a fish population can be obtained. In the event that the key is not available, approximate estimates of the age structure can be obtained. Use of the model for determination of the age structure of channel catfish and white crappie populations is demonstrated. (See also W78-05251) (Chilton-ORNL)
W78-05264

PREDICTION OF FISH BIOMASS, HARVEST, AND PREY-PREDATOR RELATIONS IN RESERVOIRS,
Bureau of Sport Fisheries and Wildlife, Fayetteville, NC. National Reservoir Research.
R. M. Jenkins.
CONF-770501. In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 282-293, 10 fig, 13 ref.

Descriptors: *Environmental effects, *Powerplants, *Model studies, Populations, Reservoirs, Fish, Prey, Predator, Standing crop, Fish harvest, Dissolved solids.

Methods of estimating fish crop and production which can be used to provide indexes to average reservoir conditions and to help identify perturbed environments are presented. Regression analyses of the effect dissolved solids on fish standing crops in 166 reservoirs produced formulas with coefficients of determination of 0.63 to 0.81. It was concluded that long-term monitoring of reservoir fish populations will be required to identify changes which can be positively attributed to power plant effects. The indexes of fish crop and harvest presented are recommended as the current best estimators and their use is urged until better models can be developed. (See also W78-05251) (Chilton-ORNL)
W78-05265

EFFECTS OF POWER STATION MORTALITY ON FISH POPULATION STABILITY IN RELATIONSHIP TO LIFE HISTORY STRATEGY,
Stone and Webster Engineering Corp., Boston, MA. Environmental Engineering Div.
E. J. Horst.
CONF-770501. In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 297-310, 6 fig, 3 tab, 18 ref.

Descriptors: *Environmental effects, *Powerplants, Populations, Model studies, Fish, Mortality, Life history studies.

This paper investigates the effect of life history on the population growth rate when additional mortality occurs in early life. Fish population dynamics are modeled using the Leslie model to assess impact by eigenvalue analysis and by simulation. With the use of eigenvalue analysis, growth rate, age distribution, and population stability are investigated. Four fish populations are modeled at equilibrium with a stable age distribution. The effect of power plant mortality is modeled as a reduced survivorship in the first year of life. In order, from most to least, affected of the fish popultions studied were silverside, menhaden, winter flounder, and cunner. These results are generally consistent with the life history theory of r- and k-selection. It was concluded that in the selection of a species for assessment, consideration should be given to susceptibility and sensitivity of the species to perturbation. (See also W78-05251) (Chilton-ORNL)
W78-05266

SENSITIVITY ANALYSIS APPLIED TO A MATRIX MODEL OF THE HUDSON RIVER STRIPED BASS POPULATION,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
S. B. Saila, and E. Lorda.
CONF-770501. In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 311-332, 5 tab, 18 ref.

Descriptors: *Environmental effects, *Powerplants, Model studies, Population, Mortality, Striped bass, *Hudson River, Growth stages, Leslie matrix model, Sensitivity analysis.

The Leslie matrix model was used to examine the dynamics of the Hudson River striped bass population. The results of the simulations suggested that the dominant latent root of the population matrix is relatively insensitive to increased mortality in age class 0; the derived population parameters and measures of perturbation (consisting of the mean reproductive value, the stable population unit, the stable growth rate, the perturbation index, and the relative adult popula-

tion size after a finite period) are more descriptive of population effects resulting from perturbations than is the dominant latent root. If only one of the five life stages in age class 0 is subjected to increased mortality, the population can tolerate losses up to 20% before being reduced to 50% of its initial size in 20 years but if each of the stages in age class 0 is subjected to increased mortality, the % loss/life stage must be less than 5% to not have the size of the adult population reduced by 50% in 20 years. Any reduction in fishing mortality in one or several of the age classes 3 to 20 will permit a higher tolerance for additional mortality in the y-o-y life stages. (See also W78-05251) (Chilton-ORNL)
W78-05267

COMPARISON OF SIMULATION MODELS USED IN ASSESSING THE EFFECTS OF POWER-PLANT-INDUCED MORTALITY ON FISH POPULATIONS,
Washington Univ., Seattle. Center for Quantitative Science.
G. Swartzman, R. Deiso, and C. Cowan.
CONF-770501. In: Proceedings of the Conference on Assessing the Effects of Power-Plant-Induced Mortality on Fish Populations held in Gatlinburg, Tennessee, May 3-6, 1977. p 333-361, 3 fig, 4 tab, 31 ref.

Descriptors: *Environmental effects, *Powerplants, *Model studies, Fish populations, Mortality, Striped bass.

Eight models for assessing powerplant impacts on fish populations are compared. The focus of the comparison between models is on locating differences between models which result in different values of PR, long-term fishery yield, or first-year adult population size. In the striped bass life cycle models, major differences in predictions of yield and population reduction result from using density-dependent vs density-independent fishing mortality and from using different values for the probability of natural survival of fish in age classes 1-3. Entrainment factors, total egg production, equilibrium population size, and survival probabilities were major differences in parameter values for the life cycle models. (See also W78-05251) (Chilton-ORNL)
W78-05268

STUDY OF THE ECOLOGY OF IRON BACTERIA OF FRESH WATER RESERVOIRS, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow, Inst. Mikrobiologii.
G. A. Dubinina.
Izv Akad Nauk SSSR Ser Biol 4, p 575-592, 1976.

Descriptors: Bacteria, Ecology, *Iron bacteria, Lakes, Morphology, Reservoirs, Swamps, Water pollution effects, Distribution, Path of pollutants.

Data bearing on the distribution of the iron bacteria species in various types of lakes and swamps of the humid zone are presented. The influence of the concentration of Fe, Mn, O2; the presence of humic substances; and temperature influence the number of iron bacteria and their vertical distribution in the lakes. The morphological and cytological peculiarities of the separate representatives, important from the ecological point of view, are described.--Copyright 1977, Biological Abstracts, Inc.
W78-05269

MERCURY CONTAMINATION: A HUMAN TRAGEDY,
Michigan State Univ., East Lansing. Dept. of American Thought and Language.
P. A. D'Itri, and F. M. D'Itri.
Environmental Management, Vol 2, No 1, p 3-16, January 1978. 4 fig, 54 ref.

Descriptors: *Mercury, *Toxins, *Poisons, *Fungicides, *Chemical industry, Water pollution, Fishing, Fishkill, Aquatic environment, Grains, Wheat, Barley, Industrial wastes, Waste water disposal, Waste water(Pollution).

The impact of mercury contamination of fish and grain seeds on humans, the environment, and economies was documented. The first historical instance of large scale mercury poisoning occurred in Japan three years after the Shin Nihon Chisso Co began discharging wastes into Minamata Bay. Residents of Minamata Bay who ate fish conaining up to 50 ppm of mercury developed constricted vision, mental imbalance, numbness in the extremities, decreased muscle coordination, and loss of speech, hearing, and taste as a result of methylmercury poisoning. Children born to victims of the poisoning were often deformed and mentally retarded; residual poisonings were still occurring after 1960, eight years after the initial discovery of methylmercury poisoning. Seed grain treated with alkylmercury fungicides was found to be the source of alkylmercury poisoning of animals birds, and farmers in Sweden during the 1960's. An alkylmercury poisoning epidemic occurred in Iraq in 1971-1972 when nearly 100,000 metric tons of alkylmercury-treated wheat and barley were shipped to that country. The grain, labelled as poisonous, was used by rural inhabitants to make flour, and later contaminated meat supplies and fish. Isolated cases of mercury poisoning in the United States have been attributed to contaminated grain-fed livestock and contaminated swordfish. Indian guides in Ontario, Canada, developed mercury poisoning after eating fish which contained up to 7 ppm of mercury as a result of the discharge of mercury bearing waste into lakes by a chemical company. Monetary compensation and assistance to victims, especially in Canada and Japan, have been considerable. (Lisk-FIRL)
W78-05278

CORRELATION COEFFICIENTS IN CHARACTERISTICS OF BACTERIOPLANKTON AND EVALUATION OF THEIR IMPORTANCE IN MODELING, (IN RUSSIAN),
Irkutskii Gosudarstvennyi Univ. (USSR). Scientific Research Inst. of Biology.
O. M. Kozhova, and L. M. Mamontova.
Gidrobiol zh 12(5), p 63-66, 1976.

Descriptors: *Bacterioplankton, *Heterotrophs, *Mathematical models, Seasonal, *Correlation analysis, Ecosystems, Model studies.

The dependence of the general population of bacteria and heterotrophs on a series of biotic and abiotic factors were studied by means of a paired correlation and a large diversity of relationships between these indices was established. Levels and coefficient values of the correlation were ambiguous and changed according to season, year and horizon. The test confirmed the necessity of statistical development of material for determination of reliable relationships between components of the ecosystem imperative for establishment of mathematical models.--Copyright 1977, Biological Absracts, Inc.
W78-05285

MICROBIAL AEROSALS FROM FOOD-PROCESSING WASTE SPRAY FIELDS,
Army Dugway Proving Ground, UT.
For primary bibliographic entry see Field 5E.
W78-05290

QUALITATIVE AND QUANTITATIVE DETERMINATION CHLORINATED ORGANIC COMPOUNDS IN WASTE WATERS FROM BLEACHING WORKS BY GAS CHROMATOGRAPHY AND MASS SPECTROSCOPY (QUALITATIVE AND QUANTITATIVE BESTIMMUNG VON CHLORIERTEN ORGANISCHEN VERBINDUND IN BLEICHEREIABWAESSERM MITTELS GASCHROMATOGRAPHIE UND MASSENSPEKTROSKOPIE),
Swedish Forest Products Research Lab., Stockholm.
For primary bibliographic entry see Field 5A.
W78-05320

LONG TERM PEACE RIVER CHARACTERISTICS AS A MEASURE OF A PHOSPHATE SLIME SPILL IMPACT,
University of South Florida, Tampa. Dept. of Chemistry.
D. F. Martin, and Y. S. Kim.
Water Research, Vol. 11, No. 11, p 963-970, 1977. 2 fig, 3 tab, 30 ref.

Descriptors: *Phosphates, *Molybdenum, *Iron, *Humic acids, *Mine wastes, Florida, Red tide, Phosphorous, Carbon, Fishkill, On-site data collections, Sampling, Industrial wastes, Rivers.

Water samples collected from the Peace River in Florida following a 1971 phosphate slime spill were compared with 174 samples in an evaluation of the long-range pollution effects and possible correlations with red tide blooms. Water samples taken at four monitoring stations were analyzed for dissolved organic carbon, chelated iron, molybdenum, phosphorus, and humic and tannic acids. Constituent fluxes for each station and correlation coefficients of the tested parameters were calculated; percent deviations were established. The results indicated that iron or molybdenum sources changed considerably after the phosphate slime spill, but returned to normal by 1974. The correlation coefficient between iron and phosphate concentration was positive in 1972. In 1974, negative correlation coefficients were observed. The phosphate spill was found responsible for the death of 90% of the fish population in the polluted areas, with population recovery requiring 15-24 months. Iron and molybdenum concentrations were thought to have an indirect effect on the growth of red tidal blooms in the receiving bay waters. (Lisk-FIRL)
W78-05328

TREATMENT OF WASTE WATER FOR EUTROPHICATION CONTROL (SANGYO HAISUI NO FUEIYOKASEIBUN NO SHORI NI KANSURU KENKYU),
Fermentation Research Inst., Tokyo (Japan) Div. of Microbe Engineering.
For primary bibliographic entry see Field 5D.
W78-05342

WORKSHOP PROCEEDINGS: RESEARCH NEEDS RELATED TO ACID MINE WATER.
West Virginia Univ., Morgantown. Water Research Inst.
For primary bibliographic entry see Field 5G.
W78-05345

TOXICITY OF BLUE-GREEN ALGAE, CAUSATIVE AGENTS OF 'WATER BLOOM', (IN RUSSIAN),
Akademiya Nauk URSR, Kiev Inst. Hidrobiologii.
L. A. Sirenko, Yu. A. Kirpenko, L. F. Lukina, O. V. Kovalenko, and L. M. Zimovets.
Gidrobiol Zh 12(4), p 22-28, 1976.

Descriptors: *Cyanophyta, *Eutrophication, *Decomposing organic matter, Algae, Daphnia-magna, *Microcystis-aeruginosa, Mineralization, *Toxicity, Water pollution effects, Sampling, Biomass, Rodents.

The maximal toxicity of blue-green algae, agents of water blooms, is found at the mixed algological composition of biomass samples, the viable colonies of Microcystis aeruginosa being prevalent. At the initial stages of decomposition, toxicity may

increase due to the other products of organic matter decomposition. Deep mineralization of the latter lowers the biological activity of the toxic compounds with respect to water fleas (Daphnia magna) and albino rats.--Copyright 1977 Biological Abstracts, Inc.
W78-05347

PESTICIDES IN IOWA SURFACE WATERS: SUMMARY OF A WORKSHOP HELD MARCH 1977.
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 5B.
W78-05349

BIOGEOCHEMISTRY OF DEEP LAKES IN THE CENTRAL ALASKAN RANGE,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5A.
W78-05358

PROSPECTS OF STUDYING EUTROPHICATION IN BODIES OF WATER OF RECREATION COMPLEXES, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Inst. Geografii.
L. L. Rossolimo.
Gidrobiol Zh 12(4), p 5-10, 1976.

Descriptors: *Eutrophication, *Recreation, Water pollution effects, *Waste loading.

Changes in the regime of recreational water bodies according to the relation of water body loading by eutrophic substances and recreation loading (the number of guests, time of their stay at the water body, etc.) are studied. The effect of anthropogenic action in different water bodies is determined by both the value of loads and significant trophic and morphological indexes of the water body: littorals within the recreation zone, and the whole water body.--Copyright 1977 Biological Abstracts, Inc.
W78-05457

THE ACCUMULATION OF CHLORINATED CONSTITUENTS FROM PRE-BLEACHING EFFLUENTS IN A FOOD CHAIN IN WATER,
Pulp and Paper Research Inst., Helsinki (Finland).
O. Seppovaara, and T. Hattula.
Paperi ja Puu, Vol. 59, No. 8, p 489-494, August, 1977. 5 fig, 12 ref, 1 tab.

Descriptors: *Bleaching wastes, *Food chains, *Water pollution effects, Wastes, Industrial wastes, Pulp wastes, Pulp and paper industry, Effluents, Bacteria, Mollusks, Fish, Pine trees, Microorganisms, Water pollution, Mixing, Waste dilution, Water pollution sources, Daphnia, Aquatic life, Chlorine radioisotopes, Chlorine, Kraft pulp, Kraft mills, Planorbarius, Guppies, Lebister reticulatus, Chlorine compounds.

The accumulation of Cl(36)-labeled chlorinated constituents from prebleaching of pine sulfate pulp in a food chain comprising bacteria, water fleas (Daphnia pulex), molluscs (Planorbarius), and guppies (Lebister reticulatus) was investigated in test aquaria. The strong sublethal concentrations used were 2% for chlorination-stage and 6% for alkaline-extraction stage effluents. The synergistic effect of all chlorinated compounds was slight. Accumulation factors in the steady state in chlorination-stage tests were about 10 for the fish flesh and molluscs and 20 for the liver. In the extraction-stage tests the corresponding values were about 9 and 14, respectively. Mixing with total mill effluent and dilution in the recipient water should also greatly reduce accumulation. The organisms almost completely eliminated the accumulated substances in 10 days. (Brown-IPC)
W78-05459

CHEMICAL IDENTIFICATION OF CONSTITUENTS IN A TOXIC HARDBOARD PLANT EFFLUENT.
Fisheries and Marine Service, West Vancouver (British Columbia). Pacific Environment Inst.
For primary bibliographic entry see Field 5A.
W78-05464

ENVIRONMENTAL (IMPACT) ASSESSMENT: DONOHUE-ST. FELICIEN (KRAFT MILL) PROJECT,
Beak Consultants Ltd., Mississauga (Ontario).
W. Eedy, and K. Schiefer.
In: Canadian Pulp and Paper Association, Environment Improvement Conference, November 1-3, 1977, Moncton, New Brunswick, Preprints (CPPA Technical Section, Montreal), p 51-57. 5 fig, 4 ref.

Descriptors: *Pulp wastes, *Water pollution effects, *Simulation analysis, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Foreign countries, Canada, Aquatic environment, Atlantic salmon, Aquatic animals, Fish, Salmon, Invertebrates, Water quality, Toxicity, Environmental effects, Feasibility studies, *Kraft mills, Ashuapmouchouan River(Canada).

The aquatic studies are emphasized in this review of an environmental impact assessment prepared for the proposed Donohue-St. Felicien bleached kraft mill in Quebec. The studies conclude that no adverse impacts from the mill will be incurred by the local aquatic environment. The flows and assimilative capacity of the Ashuapmouchouan River are adequate to prevent significant deterioration of water quality outside the mixing zone. The simulated effluent is not toxic to landlocked Atlantic salmon or locally important invertebrate species. Effluent concentrations even during periods of the lowest recorded flows from the mill site area should not deter migrating salmon. (Swichtenberg-IPC)
W78-05467

IMPACT OF NON-SETTLEABLE SUSPENDED SOLIDS ON RECEIVING WATERS,
B. C. Research Ltd., Vancouver.
E. G. H. Lee, J. C. Mueller, and C. C. Walden.
In: Canadian Pulp and Paper Association, Environment Improvement Conference, November 1-3, 1977, Moncton, New Brunswick, Preprints (CPPA Technical Section, Montreal), p 105-110. 3 fig, 11 ref, 6 tab.

Descriptors: *Pulp wastes, *Suspended solids, *Water pollution effects, Wastes, Industrial wastes, Water pollution sources, Turbidity, Photosynthesis, Nutrients, Algae, Nitrogen, Phosphorus, Microorganisms, Aquatic life, Pulp and paper industry, Effluents, Fertilization, Water pollution, Pollutants.

Bleached kraft mill effluents (BKME) contain 5-21 lb/air-dry ton nonsettleable suspended solids and contribute up to 2 mg/liter suspended solids to receiving waters (assuming a minimal dilution of 1/40). Turbidity is increased slightly by nonsettleable solids. Light absorbance data suggest that 1-2 mg/liter nonsettleable solids reduces the depth of the eutrophic zone but does not reduce overall photosynthetic activity due to the scattering of incident light (as contrasted with absorption) by nonsettleable solids. Nonsettleable solids from raw and limed clarified BKME are low in nutrients and have minimal fertilization effects on algal production whereas nonsettleable solids from biotreated BKME are rich in N and P and stimulate algal growth. Inhibitive effects of nonsettleable solids on algal productivity have not been observed. (Swichtenberg-IPC)
W78-05471

STEAM STRIPPING OF CONDENSATES FOR REMOVAL OF ODOR, FIVE-DAY BOD, TOXICITY AND FISH TAINTING PROPENSITIES,
B. C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5D.
W78-05473

EFFECTS OF SULFITE WASTE LIQUOR COLOR ON ALGAL GROWTH,
Lakehead Univ., Thunder Bay (Ontario)
R. G. Rosehart, and H. Muzik.
In: Canadian Pulp and Paper Association, Environment Improvement Conference, November 1-3, 1977, Moncton, New Brunswick, Preprints (CPPA Technical Section, Montreal), 16 p. 4 fig, 3 ref, 1 tab.

Descriptors: *Sulfite liquors, *Water pollution effects, *Algae, *Color, Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Aquatic life, Microorganisms, Chlorella, Aquatic algae, Pulp and paper industry, Effluents.

After an incubation period of 8 days, spent sulfite liquor (containing 300 APHA color standard units) at depths of 2, 3, and 5 cm in plexiglass cells fitted over a water bath containing the cell culture flasks reduced the growth of Chlorella vulgaris by 25, 27, and 35%, respectively. The effects of color were more harmful than toxicity for the conditions studied. (Swichtenberg-IPC)
W78-05474

DYNAMICS OF MANGANESE, CADMIUM AND LEAD IN EXPERIMENTAL POWER PLANT PONDS,
Bradley Univ., Peoria, IL. Dept. of Chemistry; and Bradley Univ., Peoria, IL. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W78-05480

SANITARY BACTERIOLOGICAL AND VIROLOGICAL CONTROL OF WATER BODIES, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
For primary bibliographic entry see Field 5B.
W78-05504

PHYTOPLANKTON IN A TEMPERATE-ZONE SALT MARSH: NET PRODUCTION AND EXCHANGES WITH COASTAL WATERS,
State Univ. of New York at Stony Brook. Dept. of Ecology and Evolution.
R. A. Moll.
Marine Biology, Vol 42, p 109-118, 1977. 7 fig, 4 tab, 27 ref.

Descriptors: *Salt marshes, *Primary productivity, *Phytoplankton, *Carbon cycle, Wetlands, Marshes, Tidal marshes, Coastal marshes, Aquatic microorganisms, Cycling nutrients, Photosynthesis, Plankton, Nutrients, Sea water, New York, Light penetration, Light intensity, Shallow water, *Flax Pone, Long Island(NY), Extinction coefficients, Coastal waters.

Phytoplankton production and associated variables were measured in Flax Pond, a 52 ha salt marsh, to determine mean annual net primary production. Productivity on a mg carbon/cu m/hour basis was quite high due to the high levels of nutrients in the salt marsh. However, when the productivity values were reduced by the combined effect of high extinction coefficients and the shallow basin of water water available for photosynthesis, the net production by phytoplankton was small. Dividing the net production estimates by the number of square meters in the entire salt marsh resulted only in 11.7 g carbon/sq m/year fixed by phytoplankton, a small fraction of normal nearshore production. There was a net flux of phytoplankton from the coastal waters into the marsh; during the summer up to 0.2 g

chlorophyll/sq m of phytoplankton was carried in with the tides daily and remained in the marsh. Analysis of the productivity data, as well as variables associated with productivity (pH, standing crop, nutrients, extinction coefficient), indicated that the aquatic portion of the marsh behaved more as a net consumer rather than a net producer of phytoplankton. (Steiner-Mass)
W78-05511

FLAX POND ECOSYSTEM STUDY: EXCHANGES OF PHOSPHORUS BETWEEN A SALT MARSH AND THE COASTAL WATERS OF LONG ISLAND SOUND,
Marine Biological Lab., Woods Hole, MA.
G. M. Woodwell, and D. E. Whitney.
Marine Biology, Vol. 41, p 1-6, 1977. 3 fig, 1 tab, 19 ref.

Descriptors: *Coastal marshes, *Phosphorus, *Seasonal, *Cycling nutrients, Wetlands, Tidal marshes, Salt marshes, Grasses, Organophosphorus compounds, Phosphates, Coasts, Sea water, *New York, Nutrients, Phytoplankton, Marsh plants, *Flax pond, *Long Island Sound(NY), Coastal waters, Spartina alterniflors.

A study of a tidal Spartina alterniflora marsh shows that net exchanges of phosphate, organic phosphorus, and total phosphorus occur at various times throughout the year, but that there is no net gain or loss from the marsh over a yearly period. Both forms of phosphorus followed seasonal patterns of concentration. Phosphate concentrations declined rapidly starting in February, from winter highs of 75-100 micrograms/liter to a minimum of about 20 in April. The decline corresponded to the spring phytoplankton bloom in Long Island Sound. Phosphate increased slowly during the summer and rapidly in August to peak in September, when a second, smaller decline occurred in October at the time of the full phytoplankton bloom. The annual organic phosphorus pattern was basically the inverse of the phosphate: winter concentrations tended to be low, summer levels were high, and there were pronounced peaks at the times of spring and fall plankton blooms. The year-to-year variation in organic phosphorus was greater than that for phosphate. The marsh accumulates phosphorus in organic and inorganic forms when abundant and releases it in the most usable form (PO4) during the summer at the times of greatest biotic activity. (Steiner-Mass)
W78-05514

HETEROTROPHIC ACTIVITY ASSOCIATED WITH PARTICULATE SIZE FRACTIONS IN A SPARTINA ALTERNIFLORA SALT-MARSH ESTUARY, SAPELO ISLAND, GEORGIA, USA, AND THE CONTINENTAL SHELF WATERS,
Georgia Univ., Sapelo Island. Marine Inst.
R. B. Hanson, and W. J. Wiebe.
Marine Biology, Vol. 42, p 321-330, 1977. 6 fig, 2 tab, 37 ref.

Descriptors: *Salt marshes, *Detritus, *Particle size, *Degradation(Decomposition), *Estuaries, Wetlands, Marshes, Tidal marshes, Coastal marshes, Plankton, Deterioration, Decomposing organic matter, Tides, Carbon radioisotopes, Bacteria, *Georgia, Tidal waters, Continental shelf, *Heterotrophic activity, *Sapelo Island(Geo).

An investigation was undertaken to determine the distribution and activity of the heterotrophic microplankton associated with particles from a salt marsh-estuarine ecosystem to the western edge of the Sargasso Sea. Heterotrophic activity was determined by the uptake of C14-glucose. More than 80% of the activity was associated with detritus greater than 3 micrometers in creek, river, and coastal (within 4 km of shore) waters. In the Gulf Stream, approximately 80% of the heterotrophic activity was in the fraction les than 3 micrometers. In the estuary, total heterotrophic activity fluctuated with the tides: the greatest activity occurred near low ebb tide at all locations. The lowest activity was measured at slack low and high tides. In creek water most of the heterotrophic activity was associated with particles between 14 and 180 micrometers, whereas in coastal waters most of the activity was in the fraction greater than 180 micrometers. (Steiner-Mass)
W78-05515

PESTICIDE MODES OF ENTRANCE AND CONTENT IN WATER SUPPLIES, (IN RUSSIAN),
For primary bibliographic entry see Field 5B.
W78-05516

A MULTIVARIATE ANALYSIS OF THE NICHES OF PLANT POPULATIONS IN RAISED BOGS. I. NICHE DIMENSIONS,
New Hampshire Univ., Durham. Dept. of Botany.
For primary bibliographic entry see Field 2H.
W78-05517

EFFECTS OF SALINITY AND INUNDATION ON THE GROWTH OF AGROSTIS STOLONIFERA AND JUNCUS GERARDII,
Vrije Univ., Amsterdam (Netherlands). Biological Lab.
J. Rozema, and B. Blom.
Journal of Ecology, Vol 65, p 213-222, 1977. 1 fig, 4 tab, 31 ref.

Descriptors: *Salt marshes, *Halophytes, *Salt tolerance, *Biomass, *Productivity, Wetlands, Tidal marshes, Aquatic plants, Grasses, Resistance, Salts, Tides, Tidal waters, Sea water, *Salinity, Sodium chloride, Sodium, Potassium, Calcium, Phosphorus, Root development, Flooding, *Agrostic stolonifera, *Juncus gerardii, *Netherlands.

Maritime populations of agrostic stolonifera L. and Juncus gerardii Lois--characteristic plant species of sandy and muddy salt marshes--were grown from seed in sand culture at three levels of inundation and two concentrations of sodium chloride. Biomass production, stolon length and internode length were stimulated in A. stolonifera by flooding, wheras biomass, shoot height and rhizome length were depressed in J. gerardii. Addition of seawater markedly depressed the growth of A. stolonifera, whereas that of J. gerardii was not significantly affected. Absence of significant differences in degree of succulence as a result of salinity indicates an unimportant role of succulence as a salt regulation mechanism in both species. Increasing uptake of sodium did not seem to reduce the potassium content, whilst neither inundation nor salinity had a significant effect upon the calcium or magnesium content of the root material, but phosphorus deficiency in shoots did not occur. The metabolic adaptations to waterlogging of these two flooding-tolerant species did not seem to include malate accumulation or stimulation of nitrate reductase activity. (Steiner-Mass)
W78-05519

RESPONSE OF WEST COAST BEACH TAXA TO SALT SPRAY, SEAWATER INUNDATION, AND SOIL SALINITY,
California Univ., Davis. Dept. of Botany.
M. G. Barbour, and T. M. DeJong.
Bulletin of the Torrey Botanical Club, Vol 104, No 1, p 29-34, January-March, 1977. 3 fig, 2 tab, 12 ref.

Descriptors: *Pacific Coast region, *Halophytes, *Beaches, *Ecological distribution, Mortality, Plant morphology, Aquatic plants, Biomass, Wetlands, *Salt spray, *Saline water inundation, *Soil salinity, Tolerance index.

Twelve taxa, characteristic of beach vegetation along the Pacific Coast of the United States, were grown from seed and subjected to realistic levels of salt spray (50 mg/sq dm/day) and seawater inundation (residual soil salinity of 3,328 ppm). Mortality, morphology, and biomass were measured and combined in a tolerance index. For most taxa, this tolerance index correlated well with zonation position in the field (average plant position from tide line inland to foredune; $r > 0.85$). Three or four taxa behaved anomalously, exhibiting either much more or much less tolerance than expected from their zonation position, and we conclude that a single-factor approach is too naive to account for the distribution of all beach taxa. (Stihler-Mass)
W78-05520

AQUATIC METABOLISM OF THE COMMUNITIES ASSOCIATED WITH ATTACHED DEAD SHOOTS OF SALT MARSH PLANTS,
Georgia Univ., Sapelo Island. Marine Inst.
J. L. Gallagher, and W. J. Pfeiffer.
Limnology and Oceanography, Vol. 22, No. 3, p 562-565, 1977. 2 fig, 9 ref.

Descriptors: *Coastal marshes, *Marsh plants, *Carbon cycle, *Detritus, Wetlands, Marshes, *Salt marshes, Tidal marshes, Respiration, Carbon, Degradation(Decomposition), Decomposing organic matter, *Metabolism, Dissolved organic carbon, Atlantic coastal marshes.

The annual aquatic respiration and dissolved organic carbon cycles of the attached dead plant community were examined in two stands of Spartina alterniflora and one of Juncus roemerianus. The two S. alterniflora communities had comparable respiration rates while the J. roemerianus was only half as rapid; the annual patterns in all three stands were similar. Respiration rates were low in winter, increased in later spring and early summer, and dropped sharply in midsummer. Another peak was reached in early fall, after which the rate dropped to the winter low. The dissolved organic carbon pattern was the inverse of the annual temperature cycle except for a high value in July. Without the July value, the correlation coefficient between dissolved organic carbon and incubation temperatures was -0.74. (Steiner-Mass)
W78-05524

LIMITATIONS ON MACROPHYTES IN A EUTROPHIC LAKE, LOCH LEVEN. II. WAVE ACTION, SEDIMENTS AND WATERFOWL GRAZING,
Saint Andrews Univ. (Scotland). Dept. of Botany.
B. P. Jupp, and D. H. N. Spence.
Journal of Ecology, Vol. 65, p 431-446, 1977. 3 fig, 6 tab, 45 ref.

Descriptors: *Pondweeds, *Plant growth, *Waves(Water), *Waterfowl, *Lakes, Rooted aquatic plants, Aquatic plants, Wetlands, Freshwater plants, Submerged plants, Environmental effects, Biomass, Shore protection, Grazing, Sediments, Nutrients, Phytoplankton, Shores, Eutrophication, Water pollution effects, *Loch Leven(Scotland).

Limitations of the two most important submerged macrophytes, Potamogeton filiformis and P. pectinatus, were shown to result from wave action and from grazing by waterfowl. Wave action operated directly, by producing coarser, more nutrient-poor sediments in exposed situations. Protection from wave action and from waterfowl grazing by 'Perspex' tubes and by wire enclosures led to increased biomass levels. These findings were corroborated by transplant experiments between a sheltered and an exposed site. Up to 80% of the end-of-season biomass differences could be attributed to the effects of wave action, the remainder to waterfowl grazing. Shoot lengths of completely protected plants of P. filiformis at the exposed site were only half those of plants growing at the sheltered site, and this difference was correlated with differing phosphorus levels in the sediments. Maximum biomass levels, however, were still low compared with published data for other eutrophic lakes, and this reduction was

attributed to the combined effects of phytoplankton competition, wave action, and grazing. (See also W78-01942) (Steiner-Mass)
W78-05527

ECOSYSTEM IMPACTS OF URBANIZATION ASSESSMENT METHODOLOGY.
Corvallis Environmental Research Lab., OH.
For primary bibliographic entry see Field 6G.
W78-05533

TRITIUM RETENTION BY COWS AND STEERS AND TRANSFER TO MILK,
Environmental Monitoring and Support Lab., Las Vegas, NV.
A. L. Mullen, A. A. Moghissi, J. C. Wawerna, B. A. Mitchell, and E. W. Bretthauer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 975, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/3-77-076, June 1977. 17 p, 4 fig, 5 tab, 18 ref.

Descriptors: *Cattle, *Dairy industry, Bioassay, Biochemistry, Radioisotopes, *Tritium, Isotope studies, Radiation, Radioecology, Nevada, Milk, Foods, *Tritiated water, Beef, Radiobiology, Nevada Test Site, Exposure, Half-life.

A study was undertaken in dairy cows and beef animals to evaluate both the short-term and long-term behavior of tritium in a significant source of exposure. Eight lactating dairy cows and three steers received a single oral administration of tritiated water. Milk and blood from the lactating cows and blood from the steers were periodically collected and analyzed for tritium content. The tritium content of whole milk decreased with time, giving a curve expressed as a three component exponential which yielded half-times of 3.04 plus or minus 0.09, 11.1 plus or minuw 2.58, and more than 120 days. Tritium in the blood serum of steers decreased with half-lives of 4.05 plus or minus 0.21 and 40.4 plus or minus 9.82 days. Additional study of the milk to assess tirtium incorporation in the various fractions showed half-times of 2.93 plus or minus 0.14 and 43.7 plus or minus 4.28 days for milk serum; 2.08 plus or minus 0.56 and more than 50 days for milk protein; and 3.28 plus or minus 0.35 and 60.7 plus or minus 43 days for butterfat. There was little significant difference in the rate of tritium in body water turnover in lactating dairy cows vs steers. Although whole milk is the major route of exposure of humans consuming tritiated dairy products, additional information on the turnover rate of tritium in milk solids is necessary before an accurate determination of radiation dose can be made. Further studies with a biological receptor are recommended to estimate accurately the exposure/dose resulting from tritium consumption. (Wares-IPA)
W78-05537

129I IN ANIMAL THYROIDS FROM NEVADA AND OTHER WESTERN STATES,
Environmental Monitoring and Support Lab., Las Vegas, NV. Monitoring System Research and Development Div.
For primary bibliographic entry see Field 5A.
W78-05541

HEALTH EFFECTS OF NITRATES IN WATER,
Hebrew Univ., Jerusalem (Israel). Environmental Health Lab.
H. I. Shuval, and N. Gruener.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 479, Price codes: A08 in paper copy, A01 in microfiche. Report No EPA-600/1-77-030, June, 1977. 149 p, 31 fig, 52 tab, 153 ref, 2 append. IBA614. 06-012-3.

Descriptors: *Nitrates, *Nitrites, *Potable water, *Public health, Epidemiology, Toxicity, Pollutants, Water pollution effects, *Hemoglobins, Infants, Rats, Israel.

The results of a series of field and laboratory studies designed to evaluate the health effects of nitrates in drinking water are presented. Epidemiological studies indicated that infants consuming appreciable amounts of water high in nitrates in the form of powdered milk formula show raised methemoglobin levels. This is also true for infants consuming tap water with a nitrate concentration ranging from 45 to 55 ppm and provides direct epidemiological evidence in support of the current nitrate standard in drinking water of 45 ppm. Laboratory studies of the acute and chronic toxic effects of nitrites indicate that: (1) nitrites can pass the placenta of the rat, causing raised methemoglobin levels in the fetus; (2) pregnant rats are particularly sensitive to exposure to nitrites; (3) pups born to dams exposed to nitrites during gestation show poor growth and development; (4) rats exposed to sodium nitrite in drinking water for 18 months show distinct deviations in heart blood vessels. Exposure of mice to nitrites in drinking water causes behavioral effects such as lowered motor activity and increased isolation-induced aggression. Epidemiological and toxicological study results provide little basis for a liberalization of the current drinking water standard for nitrates (45 ppm), and some evidence is presented which questions whether the current standard provides a sufficient margin of safety below the detectable effect level. It is suggested that nitrates and nitrites may be more toxic than previously considered. (Wares-IPA)
W78-05543

ECOLOGICAL AND AESTHETIC IMPLICATIONS FOR THE MERRIMACK ESTUARY OF THE MERRIMACK BASIN WASTEWATER MANAGEMENT ALTERNATIVES,
Massachusetts Univ., Gloucester, Marine Station.
P. F. Smith, and E. Gilfillan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 141, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, April, 1975. 35 p, 1 fig, 4 tab, 12 ref. OWRT A-058-MASS(1).

Descriptors: *Estuaries, *Fish establishment, *Fish ladders, *Water pollution effects, *Water pollution control, *Sewage effluents, Waste water treatment, Shellfish, Clams, *Fish populations, Massachusetts, Ecology, Aesthetics, *Merrimack River estuary(Mass), *Merrimack River(Mass).

Physical and biological conditions of the Merrimack estuary and pollution abatement plan consequences are assessed. History and present status of the indigenous fish and shellfish populations are reported. Dams and upstream pollution have eliminated entire populations of migratory fish; sewage contamination of softshell clambeds has virtually destroyed a once-lucrative commerical fishery industry. High river pollution levels resulted from industrialization and population of river basin communities. Temperature, salinity, fecal coliform counts, pesticide residues, detergent content, nutrient and bacterial levels, dissolved oxygen flushing rate, and productivity are reported. Since the closing of many industrial mills, the estuary is at its best in 100 years; all present pollution results from upstream sewage effluence. Waterflow populations and habitats are described; indirect pollutant effect on birds results only from prey contamination. Construction of fish ladders around the existing Merrimack river dams is recommended to effectively reestablish sport and commerical fishery industries. Pollution abatement would significantly enhance esthetic and recreational values. Impact assessments are made of wastewater management schemes for (1) removing all pollutants from the river without diverting any river water; (2) diverting about 500 million gallons of water/day and removing all pollutants; (3) diverting 250-500 million gallons/day at all times and removing pollutants. Water nutrients levels and indigenous estuary flora and fauna are listed. (Seip-IPA)
W78-05554

ANILINES: SELECTIVE TOXICITY TO BLUE-GREEN ALGAE,
Texas Univ. at Austin, Port Aransas Marine Science Inst.
J. Batterton, K. Winters, and C. Van Baalen
Science, Vol 199, No 4333, March 1978, p 1068-1070, 1 fig, 2 tab, 16 ref.

Descriptors: *Cyanophyta, *Environmental effects, *Water pollution effects, *Toxicity, Pollutant identification, Algae, Bioassay, Water pollution effects, *Anilines.

Agmenellum quadruplicatum (strain PR6) was found to be sensitive to aniline and p-toluidine. Lawn assays showed growth inhibition of the algae by p-toluidine and aniline at 1 microg per disk and 50 ppb in liquid culture. Seven other species of blue-green algae indicated varying sensitivities ranging from 1 to 100 micrograms of p-toluidine. Experiments in which rates of photosynthesis and respiration of strain PR6 were monitored revealed only a gradual decline of these processes over the time period coinciding with the loss of viability. (Chilton-ORNL)
W78-05556

BLUE-GREEN ALGAL INHIBITION OF DIATOM GROWTH: TRANSITION FROM MESOTROPHIC TO EUTROPHIC COMMUNITY STRUCTURE,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
K. I. Keating.
Science, Vol 199, No 4332, March 1978, p 971-973, 1 fig, 1 tab, 18 ref.

Descriptors: *Cyanophyta, Environmental effects, Biological communities, Populations, Algae, *Diatoms, *Eutrophication, *Algal toxins, *Inhibition, Inhibitors, *Mesotrophy, Trophic levels, Water pollution effects, Allelopathy.

An inverse correlation between winter populations of blue-green algae and the levels of spring diatom bloom indicate that under apparently favorable conditions the ability of an endogenous diatom species to develop bloom is limited by the occurence of a blue-green attributed to a waterborne substance. Detailed study of filtrates of axenic Anabaena holsaticum indicated the presence of a complex of metabolic products which in combination inhibit diatom growth. Blue-green algal dominance of euthrophic lakes is attributed to this allelopathy. It is suggested that dilution is one cause for the limited occurrence of blue-green algal dominance in marine waters. (Chilton-ORNL)
W78-05557

DISTRIBUTION OF OXADIAZON AND PHOSALONE IN AN AQUATIC MODEL ECOSYSTEM,
Agricultural Research Service, Beltsville, MD. Agricultural Environment Quality Inst.
D. Ambrosi, A. R. Isensee, and J. A. Macchia.
Journal of Agricultural and Food Chemistry, Vol 26, No 1, January-February 1978, p 50-53, 2 fig, 2 tab, 7 ref.

Descriptors: Environmental effects, *Water pollution effects, Herbicides, Insecticides, Algae, Snails, Daphnia, Fish, Toxicity, *Path of pollutants, Distribution, *Oxadiazon, *Phosalone.

Four species of aquatic organisms (algae, snails, daphnids, and fish) were exposed to oxadiazon and phosalone in a model ecosystem for 48 and 31 days, respectively. Oxadiazon was introduced to the ecosystem adsorbed to 400 g of soil at the rate of 1 and 10 ppm. Soil treated with 10 ppm phosalone was aged for 84 days before being introduced into the system. Snails were the only organisms unaffected by both oxadiazon and phosalone. Algae growth was severely reduced by oxadiazon but was not affected by phosalone.

Daphnid and fish were unaffected by oxadiazon but both were killed by phosalone. All organisms accumulated oxadiazon and phosalone 30 to 300 times greater than the water content. (Chilton-ORNL)
W78-05558

TRITIUM OXIDE UPTAKE BY ALGAE: AN INDEPENDENT MEASURE OF PHYTOPLANKTON PHOTOSYNTHESIS,
Michigan State Univ., Hickory Corners. W.K. Kellogg Biological Station.
For primary bibliographic entry see Field 5A.
W78-05559

DIVERSITY OF SHALLOW-WATER GASTROPOD COMMUNITIES ON TEMPERATE AND TROPICAL BEACHES,
Woodward-Clyde Consultants, San Francisco, CA.
T. M. Spight.
The American Naturalist, Vol III, No 982, November-December 1977, p 1077-1097, 3 fig, 7 tab, 1 append, 54 ref.

Descriptors: Environmental effects, *Latitudinal studies, *Ecological distribution, Ecotypes, Tropical regions, Temperate, *Gastropods, *Snails, *Distribution patterns, Habitats.

Prosobranch gastropod assemblages on a tropical and a temperate rocky shore were compared to evaluate how composition changes when there is a five-fold difference in regional species list. Tropical beach quadrats contained no more species than did ones from the temperate beach. Locally, diversity varied with habitat structure (shore height and substrate). Structure-diversity relationships were different at the two latitudes. High-shore habitats supported more in the tropical community and low-shore rock habitats were equally diverse at both latitudes. Diversity and density varied more among adjacent habitats on any one beach than among latitudes within a particular habitat type. (Chilton-ORNL)
W78-05560

TEMPERATURE RELATIONS OF AERIAL AND AQUATIC RESPIRATION IN SIX LITTORAL SNAILS IN RELATION TO THEIR VERTICAL ZONATION,
Texas Univ. at Arlington. Dept. of Biology.
R. F. McMahon, and W. D. Russell-Hunter.
The Biological Bulletin, Vol 152, No 2, April 1977, p 182-198, 6 fig, 1 tab, 57 ref. 15-653, NSF BMS-72--2511-A01.

Descriptors: Environmental effects, *Temperature, *Respiration, *Snails, Intertidal areas, Aquatic habitats, Terrestrial habitats, *Littoral, Oxygen requirements, *Vertical zonation, Aerial respiration, Aquatic respiration.

Aerial and aquatic oxygen consumption rates were determined over a range of 5-45C at 5C intervals for six species of marine littoral snails. Three subtidal species (Acmaea testudinalis, Lacuna vincta, and Mitrella lunata) did not show any metabolic adjustment to increasing temperature, with thermal limits reached at 30 to 35C. Aerial respiration in A. testudinalis was similar to aquatic respiration but rates averaged only 36.4% of aquatic rates. Intertidal congeners (Littorina obtusata, L. littorea and L. saxatilis) showed varying degrees of aerial and aquatic metabolic regulation with increasing temperature. L. obtusata showed a respiratory pattern of passive endurance to high temperatures in air and in water. L. littorea remained active when exposed to air and had a zone of metabolic regulation between 20 and 30C. L. saxatilis is exposed to air for 70-95% of the tidal cycle and is characterized by reduced aerial and aquatic respiration rates above 25C. (Chilton-ORNL)
W78-05561

GENETIC ASPECTS OF LARVAL GROWTH UNDER REDUCED SALINITY IN MYTILUS EDULIS,
Dalhousie Univ., Halifax (Nova Scotia). Dept. of Biology.
D. J. Innes, and L. E. Haley.
The Biological Bulletin, Vol 153, No 2, October 1977, p 312-321, 3 fig, 2 tab, 30 ref.

Descriptors: Environmental effects, *Salinity, Larvae, *Larval growth stage, *Growth rates, Genetics, *Mollusks.

Adult specimens of Mytilus edulis in spawning conditions were collected from a shallow, enclosed bay which was known to experience fluctuations in salinity. Growth of resulting larvae showed no significant difference in mean length between larvae raised at 30% salinity than those raised at 18% salinity after 18 days growth. Salinities below this significantly decreased growth. Families of larvae of known parentage raised at different salinities indicated substantial genetic variation in larval length measured 16 days after fertilization, as well as significant genetic interaction with salinity. This was interpreted as the presence of genes influencing larval growth which depend on salinity for their expression and may be related to the past selective influence of a fluctuating environment. (Chilton-ORNL)
W78-05562

THE ONTOGENY OF SWIMMING BEHAVIOR IN THE SCYPHOZOAN, AURELIA AURITA. II. THE EFFECTS OF IONS AND DRUGS,
Maryland Univ., College Park. Dept. of Zoology.
W. E. Schwab.
The Biological Bulletin, Vol 152, No 2, April 1977, p 251-262, 3 fig, 4 tab, 25 ref. NSF GB-36437.

Descriptors: *Environmental effects, *Behavior, Ions, Physiological ecology, Sodium Lithium, Potassium, Chlorine, Calcium, Magnesium, Pharmological agents, Swimming behavior, Procaine, Caffeine, Tryptamine, Veratrine, Aurelia aurita.

Responses of Aurelia medusae to pharmacological agents (procaine, caffeine, tryptamine, and veratrine) and ionic variation (sodium, lithium, potasium, chlorine, calcium, and magnesium ions) were classified into four respnse types: no response; inhibition of pacemaker activity; inhibition of both pacemakers and swimming muscles; and increase in pacemaker output. Swimming pacemakers of Aurelia medusae became hyperactive in Mg+2 free solutions. This response appeared to be general in swimming scyphozoa. The response pattern to pharmacologically-active compounds indicated that the coelentrate neuromuscular system is different from those of other phyla. The response spectrum is not consistent within the Cnidaria. Responses of adult medusae to ionic variation showed no consistent pattern within various scyphomedusae. Comparison of responses to test solutions of the medusa, scyphistoma, and strobila showed that the neuromuscular systems are physiologically different. (Chilton-ORNL)
W78-05564

ASPECTS OF THE RELATIONSHIP BETWEEN TEMPERATURE AND AQUATIC CHEMISTRY,
Miami Univ., Coral Gables, FL. Lab. for Water Research.
W. Drost-Hansen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 612, Price codes: A07 in paper copy, A01 in microfiche. Report to Environmental Protection Agency, Washington, D.C. May 1973. 148 p, 28 fig, 66 tab. EPA-68-01-1811.

Descriptors: *Water temperature, Aquatic life, *Physical properties, *Chemical properties, Water properties, Reviews, Density, Thermal expansion, Vapor pressure, Osmosis, Hydrogen ion concentration, Ions, Specific heat, Thermal conductivity, Viscosity, Diffusion, Surface tension, Solubility, *Thermal pollution, Water pollution effects.

The purpose of this review was threefold: first, to examine the effects of temperature on the physical and chemical properties of natural waters (specifically water of interest to the continental United States), second, to discuss some of the influences of the chemical changes-effected by temperature changes-on the suitability of these waters to support life; and third, to delineate some of the effects and the underlying mechanisms of temperature changes on the cell chemistry of the aquatic biota, that is, a thermochemical perspective of the aquatic biology under possible heat stress. (Henley-ISWS)
W78-05588

FEEDING EXPERIMENTS WITH MYTILUS EDULIS L. AT SMALL LABORATORY SCALE. III FEEDING OF WASTE ORGANIC PRODUCTS FROM THE FISH INDUSTRY OF BREMERHAVEN AS A MEANS OF RECYCLING BIODEGRADABLE WASTES,
Institut fuer Merresforschung Bremerhaven (West Germany).
J. Murken.
10th European Symposium on Marine Biology, Ostend, Belgium. Vol. 1, p. 273-284, 1975. 1 fig, 3 tab, 22 ref.

Descriptors: Commercial fishing, *Organic wastes, *Decomposing organic matter, *Animal growth, *Biodegradation, *Mussels, Commercial shellfish, *Shellfish farming, *Mortality, *Recycling, *Pollution abatement, *Silts, *Suspended solids, *Algae, Waste water(Pollution), *Tissue analysis.

At a discontinuous feeding regime 700 mussels were fed with different amounts of pure fish-waste water(fish debris and dissolved organic material) and with several combinations of waste water, algal suspension and suspended silt. After a feeding period of 60 days, all mussels fed exclusively with fish-waste showed a high decrease in dry-tissue weight and a relatively high mortality. With a mixture of waste water and suspended silt, the initial dry-tissue weight kept more of less constant. An increase of 32.9% was observed by feeding a mixture of waste water and algal culture. The highest increase in dry-tissue weight (169.4%) could be obtained by a combination of waste water, algal culture and suspended silt. (Katz)
W78-05612

FEASIBILITY OF SILVER-LEAD MINE WASTE MANIPULATION FOR MINE DRAINAGE CONTROL.
Montana Dept. of Natural Resources and Conservation, Helena. Engineering Bureau.
For primary bibliographic entry see Field 5G.
W78-05614

RECLAMATION OF SURFACE MINED COAL SPOILS,
Kentucky Agricultural Experiment Station, Lexington. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W78-05615

MINE DRAINAGE CONTROL FROM METAL MINES IN A SUBALPINE ENVIRONMENT: A FEASIBILITY STUDY.
Montana Dept. of Natural Resources and Conservation, Helena. Engineering Bureau.
For primary bibliographic entry see Field 5G.
W78-05618

TRANSPORT AND TRANSFER RATES IN THE WATERS OF THE CONTINENTAL SHELF,
Lamont-Doherty Geological Observatory, Palisades, NY.

For primary bibliographic entry see Field 5B.
W78-05627

COASTAL MORPHOLOGY, SEDIMENTATION AND OIL SPILL VULNERABILITY,
South Carolina Univ., Columbia. Div. of Coastal Research.
For primary bibliographic entry see Field 5G.
W78-05628

THE INTERACTION OF OIL WITH SEA ICE IN THE ARCTIC OCEAN,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-05629

DYNAMICS OF NEAR SHORE ICE,
Washington Univ., Seattle. Div. of Marine Resources.
For primary bibliographic entry see Field 5B.
W78-05631

BENTHOS-SEDIMENTARY SUBSTRATE INTERACTIONS,
Alaska Univ., College. Inst. of Marine Science.
C. M. Hoskin.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 17. Hazards, p 511-518, March 1977. 1 fig. 03-5-022-56.

Descriptors: *Benthos, *Sediments, *Baseline studies, Resources development, Alaska, Food chains, *Outer Continental Shelf, Bering Sea, Grain size, Petroleum development, Offshore operations.

Grain size parameters are correlated with abundance and species composition of the macrobenthos. Disturbance of interactions between macrobenthos and sediment may cause changes in the distribution and abundance of benthos. Because the benthos is a part of the food web which man harvests at various levels, changes in the benthos may affect the richness of the harvest. There are 9 stations having matching sediment and macrobenthos data from which the variations in grain size modes can be seen. Tabulation of macrobenthos species abundance from these stations has been done. No species is common to all 9 stations, and the data available are too sparse to warrant comment except that macrobenthos seems to be as variable as grain size modes. When macrobenthos data for the remaining 57 stations becomes available, correlations between sediments and benthos can be made. (See also W78-05222) (Sinha-OEIS)
W78-05643

5D. Waste Treatment Processes

PRODUCTIVITY AND NITROGEN BALANCE IN LARGE SCALE PHYTOPLANKTON CULTURES,
Woods Hole Oceanographic Institution, Woods Hole, MA.
C. F. D'Elia, J. H. Ryther, and T. M. Losordo.
Water Research, Vol 11, p 1031-1040, 1977. 9 fig, 1 tab, 21 ref. Also as: Woods Hole Oceanographic Institution Contribution No. 3882. SG-04-6-158-44016.

Descriptors: *Biomass, *Nitrogen, *Phytoplankton, *Tertiary treatment, *Sewage treatment, Aquaculture, Waste water treatment, Seasonal variations, Sewage treatment aquaculture system, Phaeodactylum tricornutum.

Biomass production and nitrogen balance was studied in 35,000 gal phytoplankton cultures comprising the first stage in a tertiary sewage treatment-mariculture system. The diatom Phaeodactylum tricornutum persisted for most of the study. At secondary sewage effluent loadings sufficient to produce residual dissolved inorganic nitrogen concentrations above approximately 5 microgram atoms l to the -1 power, and N:C ratio (molar) of 0.17 was obtained and algal growth was not nutrient-limited. Biomass levels, and hence pond particulate carbon and nitrogen output, varied in response to solar irradiance and dilution rate, but not temperature. An inverse relationship existed between algal biomass concentration and dilution rate, such that in late spring optimal pond yields occurred between 0.55 and 0.65 dilutions. Better than 95% dissolved total nitrogen removal was obtained. Net dissolved organic nitrogen production, that would offset dissolved inorganic nitroegn removal, did not occur. Pond particulate nitrogen output was usually less than dissolved total nitrogen removal. (NOAA)
W78-05205

PROCESS FOR PURIFYING WATER,
Degremont, Rueil-Malmaison (France). (Assignee).
For primary bibliographic entry see Field 5F.
W78-05236

PROCESS FOR PURIFYING WASTE WATER,
Hoeschst A.G., Frankfurt am Main (West Germany).
R. Klein, and J. Helberg.
U.S. Patent No. 4,052,301, 5 p, 1 fig, 3 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 963, No 1, p 255, October 4,1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water pollution control, Industrial wastes, Chemical precipitation, Hydrogen ion concentration, Flocculation, Polyolefin production plant, Titanium and aluminum salts.

The waste waters of a polyolefin production plant are generaly first conveyed through a piping system into a waste water collecting tank, from where they are transferred to further waste water treatment installation, e.g., to the distillation plant for recovering alcohol. A serious disadvantage is the fact that in treatment plants a pH of the waste water of less than 10 has the titanium and aluminum salts, which are dissolved in the waste water, gradually build up linings inside the pipe walls. The object of the invention is to provide a further treatment for the waste water in such a way that the contamination of the main canal with titanium and aluminum salts will be kept as los as possible and that possibly an undesirably clogging of the pipes will be avoided. This problem is solved by adjusting the pH of the aqueous phase -- after having separated the polymer suspension--to from 4.5 to 9.5, preferably from 5 to 9 and by eliminating simultaneously the titanium and aluminum hydroxides which precipitate. The precipitation tendency and the settling speed of the hydroxides can be improved by the addition of suitable flocculation agents. (Sinha - OEIS)
W78-05242

SANITARY-TOXICOLOGICAL ASSESSMENT OF THE CAPROLACTAM PRODUCTION EFFLUENTS TREATED IN BIOLOGICAL INSTALLATIONS, (IN RUSSIAN),
Kemerovo State Medical Inst. (USSR).
For primary bibliographic entry see Field 5C.
W78-05248

HIGH PERFORMANCE LIQUID CHROMATOGRAPHIC DETERMINATION OF UNREACTED ACRYLAMIDE EMULSION OR AQUEOUS HOMOPOLYMERS OR EMULSION COPOLYMERS,
Petrolite Corp., St. Louis, MO. Tretolite Div.
For primary bibliographic entry see Field 5A.
W78-05270

ADSORPTION OF SOLVENTS ON ACTIVATED CARBON. ENVIRONMENTAL PROTECTION AND RECOVERY (ADSORPSJON AV LOSNINGMIDLER PA AKTIVT KULL. KOMBINER MILJOVERN MED LONNSOM GJENVINNING),
B I Flatgard.
Teknisk Ukeblad, Vol 124, No 45, p 20, 23-24, 1977. 2 fig.

Descriptors: *Activated carbon, *Adsorption, *Separation techniques, *Chemical wastes, *Industrial wastes, Solvents, Recycling, Waste water treatment.

The use of activated carbon to adsorb solvent vapors generated during industrial processes is described. Activated carbon, being apolar and having a large specific surface area, is suitable for the treatment of most industrial solvents. Activated carbon has an absorption capacity of 3-35 kg of solvent/100 kg. After completion of the adsorption cycle, the solvent is generally desorbed by steaming. The solvent vapor is separated from the steam by condensation, subsequent cooling, or water separation; the activated carbon is cooled and dried prior to reuse in the treatment process. (Takacs-FIRL)
W78-05271

REMOVAL OF PHENOL FROM WASTEWATERS IN GRID PLATE TYPE SCRUBBERS (OBSEFENOLIVANIE STOCHYNKH VOD V SKRUBBERAKH S RATELKAMI PROVAL'NOGO TIPA),
L. A. Vlasova, and M. V. Fisich.
Koks i Khimia, No 9, p 34-35, 1977. 1 tab.

Descriptors: *Chemical wastes, *Phenols, *Industrial wastes, *Sodium compounds, *Alkalis(Bases), Separation techniques, Absorption, Design data, Waste water treatment.

The desire to produce standard sodium phenolates containing at least 15% phenol and a maximum free alkali content of 8% made it necessary to reconstruct and add nine grid plates to existing steam injection scrubbers used to remove phenol from waste waters generated at a coking plant. Phenol was removed from the vapor phase by spraying with an alkaline solution. The efficiency of phenol separation was found to decrease with an increase in the molar ratio of phenols to sodium hydroxide in the circulating spray liquid which lead to desorption of the phenols. To increase the phenol separation efficiency, it was necessary to switch to multi-step spraying with liquid flow redistribution in the absorption zone of the scrubber. (Takacs-FIRL)
W78-05272

PHYSICOCHEMICAL PRINCIPLES OF THE OPTIMAL SELECTION OF NATURAL SORBENTS FOR THE ADSORPTIVE REMOVAL OF SURFACE-ACTIVE SUBSTANCES FROM WASTEWATER (FIZIKO-KHIMICHESKIE PRINTSIPY RATIONAL NOGO PODBORA PRIRODNYKH SORBENTOV DLIA ADSORBTSIONNEI OCHISTKI STOCHNYKH VOD OT POVERKHNOSTNO-AKTIVNYKH VESHCHESTV),
I. I. Tar-sevich.
Ukrainskii Khimicheskii Zhurnal, Vol 43, No 9, p 930-935, 1977. 3 fig, 19 ref.

Descriptors: *Adsorption, *Clays, *Surfactants, *Separation techniques, *Montmorillonite, *Kaolinite, Industrial wastes, Textiles, Effluents, Hydrogen ion concentration, Chemical wastes, Waste water treatment.

The suitability of natural adsorbents, such as clay minerals, for the removal of surfactants from waste water is discussed. Montmorillonite is recommended for the treatment of textile industry wastes which may contain nonionic surfactants,

such as isooctylphenol polyethyleneglycol ester. Various clay minerals, especially montmorillonite and vermiculite, can also be used for the adsorption of cation-active surfactants, such as dodecylammonium chloride. The sorption of cationic surfactants on polar sorbents is pH-dependent, making it possible to increase the cation exchange capacity of montmorillonite from 0.71 to 1.07 mg-equivalents/g by increasing the pH from 7 to 9.6-9.8. The adsorption of anionic surfactants on kaolin and other clay minerals is a rather complex process, where the van-der-Waals interaction also plays an important role. Palygorskite is considered best suited for the adsorption of anionic surfactants from waste water. (Takacs-FIRL)
W78-05273

OXIDATION OF CERTAIN DIALKYLDITHIOCARBAMATES IN DILUTE AQUEOUS SOLUTIONS (OKISLENIE NEKOTORYKH DIALKILDITIOKARBAMATOV V RAZBAVLENNYKH VODYNKH RASTVORAKH),
P. N. Taran, and V. M. Marchenko.
Ukrainskii Khimicheskii Zhurnal, Vol 43, No 10, p 1030-1032, 1977. 1 fig, 1 tab, 7 ref.

Descriptors: *Thiocarbamate pesticides, *Oxidation, *Chemical wastes, *Industrial wastes, *Chlorination, Ozone, Ultraviolet radiation, Waste water treatment, Waste treatment.

Hydrogen peroxide, potassium permanganate, chlorine, ozone, and ultraviolet radiation were evaluated as oxidants of ziram and TMTD in water at concentrations of 2 and 12 mg/liter, respectively. Ziram was oxidized completely by all of the agents tested, although the oxidation product was identified as the more toxic TMTD. Hydrogen peroxide and potassium permanganate were not effective in oxidizing TMTD. Complete oxidation of TMTD was achieved by the application of chlorine at a concentration of 7.5 mg/mg, by ozine at 3.3 mg/mg, and by ultraviolet irradiation. (Takacs-FIRL)
W78-05274

HYGENIC ASSESSMENT OF THE THERMAL DECOMPOSITION OF THE ACRYLATES PRODUCTION WASTES,
M. L. Lubyansky, M. M. Levina, V. M. Blagodatin, G. V. Sudkova, and G. I. Kuzmina.
Gigiena i Sanitariya, Vol 8, p 43-46, 1977. 2 tab.

Descriptors: *Thermal properties, *Fused salts, Industries, *Industrial wastes, *Degradation(Decompostion), Chemical wastes, Water pollution control, Smoke, Waste water treatment.

Health aspects of the treatment of wastes from acrylate manufacturing by thermal decomposition were evaluated. The study indicated that more hygenic conditions could be achieved for the thermal decontamination of the acrylate wastes. It was recommended that scientific data on the properties of the combustion products be considered in the design of production and treatment facilities. Smoke gases, discharged with the combustion products, and the toxicity of fusible salts produced during the process were suggested as significant factors for consideration in designing installations. (Lisk-FIRL)
W78-05275

ALONG THE WATER CLEANUP ROAD.
For primary bibliographic entry see Field 5G.
W78-05276

METHOD FOR TREATING WASTE WATER,
Asahi Kasei Kogyo Kabushiki Kaisha, Osaka (Japan). (Assignee).
Y. Tagashira, H. Tagaki, K. Inagaki, K. Ishii, and O. Hiroyuki.
United States Patent 4,070,281. Issued January 24, 1978. Official Gazette of the United States Patent Office, Vol. 966, No 4, p 1491, January, 1978.

Descriptors: *Carbon, *Nitrogen, *Chemical wastes, *Patents, *Industrial wastes, Oxidation, Decomposing organic matter, Copper, Chemical degradation, Design data, Waste water treatment.

An oxidation system has been patented for the removal of inorganic cyanide from organic waste water. A wet oxidation process is used in conjunction with a copper compound and an ammonium salt to oxidize the cyanide-bearing waste water at a temperature of 175-300C and a pressure of 20-150 kg/sq cm. The oxidized waste is then separated into oxidized liquid and gas; the liquid is then treated with an oxygen-generating substance. This step effects the oxidation-decomposition of the inorganic cyanide remaining in the liquid to carbon dioxide and nitrogen. The copper remaining in the oxidized liquid is then extracted. The ammonium salt used in the initial wet oxidation process may be an ammonium sulfate, ammonium nitrate, ammonium sulfamate, ammonium hydrogencarbonate, ammonium chloride, ammonium iodide, ammonium formate, ammonium acetate, ammonium oxalate, or ammonium hydrogen-tartrate. (Lisk-FIRL)
W78-05277

REGENERATION OF SPENT SULFURIC ACID (REGENERATION VON ABFALLSCHWEFELSAEURE),
Hoechst A. G., Frankfurt am Main (West Germany).
K. Bondenbenner, H. Plessen, and R. Steiner.
Chemie Inginieur Technik, Vol 50, No 1, p 30-36, 1978. 7 fig, 163 ref.

Descriptors: *Electrolysis, *Chemical wastes, *Sulfur compounds, *Inorganic compounds, *Organic compounds, Separation techniques, Waste water treatment, Equipment, Industrial wastes.

The recovery of sulfuric acid from spent solutions can be accomplished by several processes, including electrolysis. Spent sulfuric acid solutions containing at least 20% sulfuric acid are usually preconcentrated to a sulfuric acid concentration of 60-70% concentration is further concentrated to 90% for sulfuric acid regeneration or is decomposed to sulfur dioxide with simultaneous purification processes. Electrolysis is often used to remove contaminating organic or inorganic compounds from spent sulfuric acid solutions before regeneration of sulfuric acid from dilute spent sulfuric acid baths with an acid concentration of less tha 20% can be accomplished. However, increased evaporation of the solution contributes to significant cost increases as the sulfuric acid concentration decreases. (Lisk-FIRL)
W78-05279

CONTROL OF MERCURY FROM KJELDAHL WASTES,
Western Regional Research Lab., Berkeley, CA.
E. Hautala, and G. M. McDonald.
Journal of the Association of Official Analytical Chemists, Vol 61, No 1, p 208-209, 1978. 1 fig, 7 ref.

Descriptors: *Mercury, *Chemical wastes, *Calcium carbonate, *Sodium sulfate, *Hydrogen sulfides, Industrial wastes, Water pollution sources, Waste water treatment, Separation techniques, Filtration.

The concentration of mercury in Kjeldahl waste solutions is reduced by treatment with calcium carbonate and sodium sulfite to yield an insoluble and filterable mercury compound. The waste water is first neutralized to pH 7.0 with sulfuric acid, followed by the addition of enough sodium sulfite to produce a hydrogen sulfite odor. Calcium carbonate is added to the waste liquid and to the filter through which the solution is separated. Filtration with calcium carbonate produces insoluble mercury sulfide and a disposable filtrate. The filtrate contains a residual mercury content ranging 0.04-0.07 ppm. Without the addtional treatment of calcium carbonate as a filter aid, filtrates are not uniformly clear or consistently low in mercury content. Initial neutralization of the waste solution effectively reduces the mercury content of 18-hour settled effluent from 0.35 to 0.05 ppm and of sludge filtrate from 0.05 ppm to nearly no residual mercury. (Lisk-FIRL)
W78-05280

BIOLOGICAL TREATMENT SOLVES LOW TEMPERATURE WASTEWATER PROBLEMS,
Reichold Chemicals Ltd., Sainte Therese (Quebec).
C. Charette, and J. Herbineaux.
Industrial Wastes, Vol. 24, No. 1, p 30, 32-33, January-February, 1978. 1 fig, 2 tab.

Descriptors: *Biological treatment, *Activated sludge, *Microbiol degradation, *Chemical industry, *Chemical wastes, Aeration, Aerated lagoons, Ammonia, Phenols, Waste water treatment, Industrial wastes.

A waste water system has been developed at the Reichhold Chemicals Limited plant in Quebec, Canada, which maintains biological activity in the treatment process during low winter temperatures. A biological treatment system for wastes from the manufacture of phenolic, urea-formaldehyde, alkyd, and polyester resins was modified to enhance the activity of the microorganisms during the winter months. A 10-hp aerator in the first equalization basin was converted to a 25-hp submerged turbine; two 25-hp aerators in the second biological treatment basin were converted to 40-hp submerged turbine units. Air was injected into the aeration cell by two 50-hp blowers; an integral clarifier was installed at the outlet of the aeration tank. A high flow rate was created by the aerators; sludge was returned to the ports from the sludge scraper located along the clarifier. An additional unit was installed to monitor and control pH, phenol, formaldehyde, phosphate, ammonia, COD, and nitrites-nitrates. By lowering the pH to 7.4, efficient biological activity was maintained during the winter months when temperatures fell as low as -28C. BOD levels in the treated wastes were reduced by 97.8% and COD was reduced by 93.6%. Phenol, formaldehyde, ammonia, and orthophosphate concentrations were reduced to the levels acceptable for discharge into a municipal waste water treatment facility. (Lisk-FIRL)
W78-05281

TOXIC WASTE TREATED BY WASTE RECOVERS USABLE CHEMICALS.
Engineering News-Record, Vol. 200, No. 9, p 14, March, 1978.

Descriptors: *Toxins, *Chemical wastes, *Recycling, *Chemical treatment, *Fuels, Electronics, Alcohols, Waste water treatment, Industrial wastes, Treatment facilities, Carbon filters.

Chemical recovery from toxic wastes by treatment with other chemical wastes will be practiced by a waste treatment plant in Newark, New Jersey. The chemical treatment process will allow the recovery to resaleable chemicals and fuels, such as alcohol from electronics industrial effluent. The hazardous materials will be recycled and the residues neutralized and stored in landfills in New York and Illinois. The plant will have a 100,000 gal/day capacity when it opens in May, with provisions for a future capacity of 500,000. The treatment system was developed by Earthline Co, a subsidiary of SCA Services, Inc of Boston, Massachusetts. The plant is expected to eliminate much of the illegal disposal of raw waste that has been occurring. West scrubbers and carbon filters

will be installed to eliminate particulate emissions from the recovery process. (Lisk-FIRL)
W78-05282

PROCESS FOR TREATMENT OF WASTE WATER EXHAUSTED FROM WATER-WASH SPRAY BOOTH USING WATER-SOLUBLE PAINT,
Nippon Paint Co. Ltd., Tokyo (Japan). (Assignee).
T. Inoue, M. Kimura, and H. Matuda.
United States Patent 4,071,449. Issued January 31, 1978. Official Gazette of the United States Patent Office, Vol. 966, No. 5, p 1874, January, 1978.

Descriptors: *Paints, *Coagulation, *Alkalis(Bases), *Acids, *Patents, Separation techniques, Salts, Solubility, Adhesion, Waste water treatment, Industrial wastes.

A treatment process for the removal of uncoagulated, water-soluble paint from waste water has been patented. The waste water discharged from a water-wash spray booth is treated with an acidic agent followed by an alkaline agent. The pH of the waste water is maintained at pH 6.0-9.0; the addition of the acid and alkali causes the formation of an insoluble or partially soluble salt. The water-soluble paint is then precipitated from solution as a non-adhesive coagulation product. The acidic and alkaline agents are added to sufficient amounts to bring about coagulation of the water-soluble paint in the wash water effluent. The non-adhesive, coagulation product can then be removed from the waste water after the liquid-solid separation treatment. (Lisk-FIRL)
W78-05283

METHOD FOR TREATMENT OF CYANIDE-CONTAINING WASTE WATER,
Mitsu Toatsu Chemicals, Inc., Tokyo (Japan). (Assignee).
H. Watanabe, K. Toyoshima, M. Noutomi, and H. Yamakawa.
United States Patent 4,071,448. Issued January 13, 1978. Official Gazette of the United States Patent Office, Vol. 966, No. 5, p 1874, January, 1978.

Descriptors: *Nitrogen compounds, *Chemical wastes, *Patents, *Chemical reactions, *Aeration, Industrial wastes, Incineration, Separation techniques, Waste water treatment.

A patent has been issued for a waste water treatment process which removes cyanide and recovers metals. The waste water is first mixed with formaldehyde at a ratio of 1.0-1.3 moles of formaldehyde per mole of cyanide compound. The mixture is immediately heated to a temperature of 300-1200C in an atmosphere containing oxygen. Sufficient oxygen is provided to yield an oxygen content in the exhaust gases of 2-11% by volume. The water and volatile materials are evaporated and the cyano-containing compounds are incinerated. The metals contained in the waste water can then be recovered as solids. (Schulz-FIRL)
W78-05284

FIRST BOC INDUSTRIAL TREATMENT UNIT.
Water and Waste Treatment, Vol. 20, No. 11, p 11-12, November, 1977.

Descriptors: *Oxygenation, *Biochemical oxygen demand, *Food processing industry, *Aeration lagoons, *Aeration, Industrial wastes, Waste water treatment, Activated sludge, Biodegradation, Sewage treatment.

The largest industrial waste treatment plant in England to use BOC Ltd's oxygenation system is discussed. The Vitrox oxygenation system, designed by BOC Ltd. of England, was installed at the Whitworth Holdings Ltd's food processing operation in Irthlingborough, Northamptonshire, for a pilot plant study. The processing plant has achieved full output with two aeration tanks assisted by Vitrox systems and has been estimated as resulting in substantial capital savings. Biological oxygen demand was automatically controlled by maintenance of the dissolved oxygen content in the effluent by oxygen addition. Sludge bulking was prevented when the aeration systems were overloaded with the use of supplementary oxygen supplied automatically by the Vitrox system. The system suplies oxygen during peak flows when the aeration tanks have reached their 75% normal load capacity. (Lisk-FIRL)
W78-05286

BOC EFFLUENT TREATMENT FOR BOD.
Processing, Vol. 23, No. 11, p 9, November, 1977.

Descriptors: *Oxygenation, *Biochemical oxygen demand, *Food processing industry, *Aeration lagoons, *Aeration, Industrial wastes, Waste water treatment, Activated sludge, Biodegradation, Sewage treatment.

An oxygenation system used in the treatment of effluent from a food processing plant is evaluated. The Vitrox oxygenation system, manufactured by BOC Ltd of England, has been found to increase the capacities of the two aeration tanks in operation. It was estimated that the Vitrox system could be provided at half the cost of a bio-tower system. The BOC Vitrox system controls the dissolved oxygen content in the effluent, preventing BOD overloads. The system also assists conventional aeration systems when oxygen demand exceeds the aerators' capabilities. A portion of the effluent is initially extracted and oxygenated by the Vitrox system. Breakdown of the incorporated oxygen to produce microbubbles occurs under pressure and assists biodegradation. An activated sludge aerator tank with a 75% normal flow capacity was assisted by an automatic Vitrox system in the food processing industry examined. (Lisk-FIRL)
W78-05287

PHOTOSYNTHETIC BACTERIA IN WASTE TREATMENT--MIXED CULTURE STUDIES WITH RHODOPSEUDOMONAS CAPSULATA,
New South Wales Univ., Kensington (Australia). School of Biological Technology.
H. Sawada, and P. L. Rogers.
Journal of Fermentation Technology, Vol. 55, No. 4, p 311-325, 1977. 9 fig, 4 tab, 30 ref.

Descriptors: *Biological treatment, *Bacteria, *Laboratory tests, *Growth rates, *Organic acids, Photosynthetic bacteria, Biochemistry, Cultures, Chemical oxygen demand, Dissolved oxygen, Light, Biochemical oxygen demand, Waste water treatment.

Interactions between Rhodopseudomonas capsulata and a Klebsiella species in mixed cultures on glucose media were examined in an effort to define the photosynthetic bacteria's role in treating high BOD wastes. A one-liter controlled culture vessel was used for both batch and continuous cultures. The Klebsiella converted glucose into volatile fatty acids, which were then utilized by Rhodopseudomonas capsulata. The autolysis of Klebsiella cells stimulated growth of Rhodopseudomonas capsulata. Light-energy limitation was more likely at higher rates of dilution when the energy needs of photosynthetic bacteria were also higher. Dissolved oxygen tension (DOT) was critical; 1% air saturation was optimal for Rhodopseudomonas capsulata growth and COD reduction. Maximal Rhodopseudomonas capsulata growth for single-stage continuous culture occurred at dilution rates under 0.10/hr. More volatile fatty acids were assimilated in a two-stage continuous culture when the residence time in the second stage was longer. (See also W78-05289) (Snyder-FIRL)
W78-05288

PHOTOSYNTHETIC BACTERIA IN WASTE TREATMENT--PURE CULTURE STUDIES WITH RHODOPSEUDOMONAS CAPSULATA,
New South Wales Univ., Kensington (Australia) School of Biological Technology.
H. Sawada, and P. L. Rogers
Journal of Fermentation Technology, Vol. 55, No. 4, p 297-310, 1977. 5 fig, 8 tab, 36 ref.

Descriptors: *Biological treatment, *Photosynthetic bacteria, *Nutrient requirements, *Growth rates, *Biochemical oxygen demand, Cultures, Laboratory tests, Light intensity, Dissolved oxygen demand, Industrial wastes, Food processing industry, Trace elements, Amino acids, Chemical oxygen demand, Waste water treatment.

Laboratory studies were conducted to select a typical strain of bacteria found in industrial and agricultural waste waters and to determine its optimal growth conditions in pure-batch and continuous cultures. Rhodopseudomonas capsulata, a typical photosynthetic bacterium, was used in batch culture studies on the nutrient requirements for bacterial growth, including carbon, vitamin, amino acid, and trace element requirements. The studies revealed that the growth of R. capsulata on lower fatty acids could be promoted by the addition of a yeast extract to the culture. Certain vitamins, trace elements, and amino acids were required in addition to the carbon source, growth-promoting substrates, and basal salts. The dilution rate, illumination intensity, and dissolved oxygen tension were observed to control the degree of photosynthetic activity and the subsequent reduction of COD in the effluent. (See also W78-05288) (Snyder-FIRL)
W78-05289

FISH BY-PRODUCTS--FISH MEAL AND FISH SILAGE,
Ministry of Agriculture, Fisheries and Food, Hull (England). Humber Lab.
For primary bibliographic entry see Field 5E.
W78-05291

HOW THE NEW PLANT WORKS.
Cubelet Press, Vol 43, No 1, p 5, January, 1978.

Descriptors: *Biological treatment, *Treatment facilities, *Food processing industry, *Automatic control, *Water reuse, Industrial wastes, Industrial water, Microorganisms, Waste water treatment.

The California and Hawaiian Sugar Company has recently installed a 1.8 mgd biological treatment system to renovate water from its Crockett Refinery and from the adjacent Crockett-Valona Sanitary District. Nitrogen and phosphoric acid are added to the waste water in a 3.5 million-gal surge tank to promote the growth of nutrient-removing microorganisms. The waste water is then pumped to three 1,000,000-gal reactor tanks where it is mixed by turbines and oxygenated to promote microbial activity. Sludge is removed in clarifiers and centrifuged prior to disposal. Water which is not reused in refinery operations is discharged into the Carquinez Strait through an outfall/diffuser system for dilution with San Francisco Bay waters. A computerized control system monitors flow rates, nutrient requirements, process unit operation, and treated water quality. (Schulz-FIRL)
W78-05292

TREATMENT OF EFFLUENTS FROM AMMONIA PLANTS--PART I--BIOLOGICAL NITRIFICATION OF AN INORGANIC EFFLUENT FROM A NITROGEN-CHEMICALS COMPLEX,
Natal Univ., Durban (South Africa). Dept. of Chemical Engineering.
F. G. Neytzell-de Wilde.
Water SA, Vol 3, No 3, p 113-122, July, 1977. 8 fig, 4 tab, 7 ref.

Descriptors: *Ammonia, *Chemical wastes, *Nitrification, *Mathematical models, *Industrial wastes, Chemical oxygen demand, Sludge treatment, Suspended solids, Waste water treatment.

The treatment of effluents from ammonia plants is considered with respect to the biological nitrification of an inorganic effluent from a nitrogen-chemicals complex. The conditions for the biological oxidation of ammonia in an inorganic effluent containing high levels of ammonia and nitrate were investigated in continuous tests. The treatment process is described in four parts: the biological nitrification of an inorganic effluent from a nitrogen-chemicals complex; biological oxidation of carbon-one compounds (amines and methanol) in an effluent from a reforming plant serving an ammonia complex; ozonation of amines in an effluent from a reforming plant serving an ammonia complex; and biological denitrification of an inorganic effluent from a nitrogen-chemicals complex. A series of equations are presented for the relationship between sludge age and unoxidized substrate, and for the calculation of volatile suspended solids levels, oxygen consumption, acid production, and the required retention time. (See also W78-05294 thru W78-05296) (Baker-FIRL)
W78-05293

TREATMENT OF EFFLUENTS FROM AMMONIA PLANTS--PART II--BIOLOGICAL OXIDATION OF CARBON-ONE COMPOUNDS IN AN EFFLUENT FROM AN AMMONIA PLANT,
Natal Univ., Durban (South Africa). Dept. of Chemical Engineering.
F. G. Neytzell-de Wilde, and J. Groves.
Water SA, Vol 3, No 3, p 123-132, July, 1977. 6 fig, 1 tab, 33 ref.

Descriptors: *Ammonia, *Biological treatment, *Oxidation, *Sludge treatment, *Chemical wastes, Industrial wastes, Odor, Microorganisms, Waste water treatment.

The treatment of effluents from ammonia plants is considered with respect to the biological oxidation of carbon-one compounds. The conditions for the biological oxidation of mono-, di, and trimethylamine and methanol present in a condensate from an ammonia synthesis gas stream have been investigated in continuous units. The amines were completely decomposed to ammonia and carbon dioxide and the methanol to carbon dioxide. At high flow rates and short sludge retention times, very little ammonia was converted to nitrates and nitrates and nitrosoamine was detected. The biomas produced contained a high protein content and a satisfactory balance of amino acids and may prove useful as a source of single cell protein. (See also W78-05293) (Baker-FIRL)
W78-05294

TREATMENT OF EFFLUENTS FROM AMMONIA PLANTS--PART III--- OZONATION OF AMINES IN AN EFFLUENT FROM A REFORMING PLANT SERVING AN AMMONIA COMPLEX,
Natal Univ., Durban (South Africa). Dept. of Chemical Engineering.
F. G. Neytzell-de Wilde.
Water SA, Vol 3, No 3, p 133-141, July, 1977. 9 fig, 2 tab, 22 ref.

Descriptors: *Ammonia, *Oxidation, *Ozone, *Chemical wastes, *Industrial wastes, Odor, Chemical reactions, Design data, Air pollution, Waste water treatment.

The treatment of effluents from ammonia plants is discussed with emphasis on the ozonation of amines in an effluent from a reforming plant serving an ammonia complex. The process condensate which arose from a reforming plant contained methylamines, ethanol, and ammonia. Ozone was evaluated for the oxidation of the methylamines in aqueous solutions. Trimethyamine in the nonionized form reacted most readily with ozone. Good solutions. Trimethylamine in the nonionized form reacted most readily with ozone. Good conversion of trimethylamine to an odorless oxidation product was achieved with a 1:1.5 ratio of amine to ozone when ozone when ozone was passed into a packed tower through which an alkaline solution of the amine was flowing. Dimethylamine and monomethylamine did not react as readily. The composition of the industrial effluent was such that the pH was buffered in the range 8.5-8.7. Effective ozonation of the amines was not possible without the addition of a considerable amount of alkali. Although trimethylamine was effectively reduced by the treatment process, odors contributed by the remaining monomethylamine and dimethylamine fractions were still considered objectionable. (See also W78-05293) (Baker-FIRL)
W78-05295

TREATMENT OF EFFLUENTS FROM AMMONIA PLANTS, PART IV--DENITRIFICATION OF AN INORGANIC EFFLUENT FROM A NITROGEN-CHEMICALS COMPLEX USING METHANOL AS CARBON SOURCE,
Natal Univ., Durban (South Africa). Dept. of Chemical Engineering.
F. G. Neytzell-de Wilde, G. R. Nurse, and J. Groves.
Water SA, Vol 3, No 3, p 142-154, July, 1977. 9 fig, 4 tab, 21 ref.

Descriptors: *Ammonia, *Chemical wastes, *Denitrification, *Microorganisms, *Industrial wastes, Odor, Sludge treatment, Organic wastes, Waste water treatment.

The treatment of effluents from ammonia plants is considered with respect to the denitrification of an inorganic effluent from a nitrogen-chemicals complex using methanol as a carbon source. Careful consideration of various physico-chemical and biological treatment methods led to the conclusion that bacteial nitrification followed by denitrification was the most suitable method for nitrogen removal. Studies on the denitrification of nitrified effluent containing approximately 2800 mg/liter nitrate-nitrogen are described. Methanol was used as the carbon and energy source because it is completely oxidized to carbon dioxide and water and does not directly increase the COD or BOD of the resulting effluent. Methanol is also completely miscible with water; its composition is constant; and the stoichiometry of the reactions is relatively straight forward. Optimum results were obtained by denitrifying a fully nitrified effluent to which a portion of original effluent containing both nitrate-N and ammonia-N had been added to yield a concentration of ammonia-N which was required for assimilation only. Operation under these conditions yielded the best methanol: total-N ratio, although the microbial yield was greater. Free hydrogen sulfide was toxic to bacteria but could be controlled by operating with a small nitrate residual and no methanol present in the effluent. Equations were derived, based on the Monod relation, for the denitrification reaction. (See also W78-05293) (Baker-FIRL)
W78-05296

CLEANING WATER BY ULTRAFILTRATION...AN OVERVIEW OF SYSTEM REQUIREMENTS AND CAPABILITIES,
Permutit Co., Inc., Paramus, NJ.
E. J. Connelley.
Plant Engineering, Vol 31, No 23, p 145-147, November, 1977. 6 fig.

Descriptors: *Membrane processes, *Reverse osmosis, *Industrial wastes, *Tertiary treatment, *Water reuse, Recycling, Costs, Membranes, Filtration, Design data, Waste water treatment, *Ultrafiltration.

Ultrafiltration has been used in the diary industry primarily to treat wastewater and recover cheese byproducts and in the chemical industry to upgrade process water. The process may play a key role in most industrial water and wastewater treatment systems as the environmental regulations get tougher. Ultrafiltration is essentially a pressure-sensitive process. It can be defined as planned fouling. The more foulants in the water, the lower the operating flux and the more expensive the system will be. Selection criteria used to determine the limitations and requirements of an ultrafiltration system are discussed. Descriptions of the three types of membranes used in ultrafiltration systems are given. These three types include: hollow-tube membranes, spiral-wound membranes, and hollow-fiber membranes. Costs of ultrafiltration equipment are dropping as production volume increases. Generalizations regarding pricing are considered. (Baker-FIRL)
W78-05297

MONITORING CONTINUOUSLY THE OXYGEN DEMAND OF INDUSTRIAL EFFLUENT AND SURFACE WATERS,
Philips Gloeilampenfabrieken N.B., Eindhoven (Netherlands). Application Lab.
For primary bibliographic entry see Field 5A.
W78-05298

MEETING 1983 EFFLUENT REQUIREMENTS.
For primary bibliographic entry see Field 5G.
W78-05299

OMC-LINCOLN MEETS TOUGH DISCHARGE ORDINANCE.
For primary bibliographic entry see Field 5G.
W78-05300

MECHANICAL PLATING,
Cadmium Association, London (England).
M. S. White.
Product Finishing, Vol. 30, No. 10, p 9-10, 14, October, 1977. 2 fig, 1 tab.

Descriptors: *Cadmium, *Chromium, *Zinc, *Lead, *Lime, Sodium compounds, Industrial wastes, Waste water treatment, Chemical precipitation, Metals.

A mechanical plating process has been designed to produce low amounts of effluent requiring treatment. Small components were plated with cadmium, zinc, tin, and lead powders in a rotating barrel with glass beads, aqueous activator, and promoter chemicals. The effluent produced by this plating process contained weak acids, high iron concentrations, and coating matter. By raising the pH of the waste water solution to 8.5 with the addition of slaked lime or sodium hydroxide, metals were precipitated. The pH of the solution had to be raised to 10.5 for cadmium precipitation. The settled sludge contained insoluble metal hydroxides. It was necessary to chemically pretreat chromium ions before precipitation. Mechanical plating was not found to produce metal complexes, toxins, or spray from the rotating barrel. (Lisk-FIRL)
W78-05301

NEW WAYS TO TREAT ELECTROLESS COPPER EFFLUENTS.
Products Finishing, Vol. 42, No. 4, p 81-82, January, 1978.

Descriptors: *Copper, *Lime, *Sulfides, *Heavy metals, *Chemical wastes, Waste water treatment, Industrial wastes, Copper sulfate, Sulfur compounds, Waste water disposal.

Two new methods to treat electroless copper effluents that significantly reduce the heavy metal content are described. Complexes formed during electroless copper plating are resistant to some

conventional effluent treatment methods. Other methods, such as sulfide precipitation, produce toxic fumes or unacceptable residues. Iron-bearing effluent and large quantities of sludge are produced with ferrous lime treatment; lime precipitation is most effective for Ethylenediaminetetraacetic acid (EDTA) treatment. The first method involves the addition of a 37% formalin solution and 50% sodium hydroxide solution to the combined bath and wash to produce an overall formaldehyde-sodium hydroxide concentration of 2.5 g/liter formaldehyde and 6 g/liter NaOH. A seeder added during agitation provides catalyzed carbon particles to which copper and othe heavy metals attach. The particles settle and the supernatant is then decanted for subsequent reuse. Organic sulfur compounds with high molecular weight are added to the effluent during the second stage of treatment. Polyelectrolytes added during agitation of the effluent, which has been adjusted to pH 5-7, assist in the precipitation of copper and other heavy metals. The residual sludge is dewatered and disposed of in a landfill. Both methods result in an effluent with a heavy metal content of 1 ppm or less. (Lisk-FIRL)
W78-05302

ELECTROLYTIC TREATMENT OF ACIDIC COPPER EFFLUENTS IN PARTICULATE ELECTRODE CELLS,
University of the Witwatersrand, Johnannesburg (South Africa). Dept. of Chemical Engineering.
A. W. Bryson, S. W. Orchard, and P. W. E. Young.
Water SA, Vol. 3, No. 1, p 9-11, January, 1977. 1 tab, 2 fig, 6 ref.

Descriptors: *Electrolysis, *Metals, *Copper, *Electrodes, *Permselective membranes, Industrial wastes, Electro-osmosis, Chemical wastes, Design data, Equipment, Waste water treatment.

Two types of particulate electrode cells, the fixed porous electrode and the fluidized bed electrode, have been developed for the treatment of dilute acidic effluents from the electroplating industry which contain copper sulfate. The power efficiencies of both electrode cells are reported as sufficiently high to make them feasible for use in the treatment of spent rinse water. The fixed porous electrode consists of a randomly packed bed of lead cylinders which act as a cathode and a lead sheet as an anode separated from the cathode by an anion-permeable membrane. Copper-coated glass spheres comprise the cathode in the fluidized bed electrode which also contains a lead anode and an anion - permeable membrane. Although the fluidized bed is considered more efficient, fairly tight control of the flow rate is required and the maximum height of the bed is limited to about 1 m with existing membranes. Greater heights would require the cell to be split into two or more beds with interstage pumping. Concentrations of sulfuric acid in the effluent as high as 1 g/liter are not expected to limit the use of the electrodes; mixing of a portion of the anolyte exit stream with the incoming effluent is suggested for situations where the sulfuric acid concentration is below 1 g/liter. (Baker-FIRL)
W78-05304

PLASTIC ROTARY PUMP PROVIDES 20 YEARS OF SERVICE.
For primary bibliographic entry see Field 8G.
W78-05305

ELECTRODIALYSIS IN ADVANCED WASTE WATER TREATMENT,
Ben-Gurion Univ. of the Negev. Beersheba (Israel). Office of Research and Development.
E. Korngold, K. Kock, and H. Strathmann.
Desalination, Vol. 24, No. 1-3, p 129-139, January, 1978. 6 fig, 1 tab, 4 ref.

Descriptors: *Electrodialysis, *Copper, *Salts, *Phosphates, *Desalination, Separation techniques, Membrane processes, Water purification, Industrial wastes, Waste water treatment, Recirculated water.

Laboratory and pilot plant studies were conducted to examine the application of electrodialysis to a variety of industrial waste water effluents with low salt concentrations and few membrane fouling components, such as organic materials or charged particles with high molecular weights. The technical and economic feasibility of electrodialysis treatment was considered for the following industrial waste waters: chemical copper plating, chemical plating, electro-plating, phosphate plating, and sulfuric acid pickling. Electrodialysis of chemical copper plating baths removed sodium sulfate and formate, along with removal of 1.25 g copper/kg sodium sulfate. Formaldehyde and ethylenediaminetetraacetic acid concentrations were relatively unaffected. Electrodialysis of rinse water from chemical plating produced a copper concentration of 6 g of copper/liter of brine from 2.3 cu m rinsing water. Electroplating rinsing water contains a salt concentration of 1.0-2.0%, while electrodialysis efficiency requires salt concentrations ranging from 0.01-0.5 moles/liter. A membrane area of 240 sq m would be required to treat one cu m of rinse water. Zinc ion concentrations in phosphate plating rinse water were reduced from 6.5 ppm to <1 ppm by electrodialysis. A recovery of 60-70% of sulfuric acid from pickling solutions was achieved by electrodialysis. One cu m of rinse water yielded 6.5 kg of sulfuric acid after electrodialysis treatment. (Lisk-FIRL)
W78-05306

SULPHURIC ACID PICKLING PROCESS FOR BRASS WITH SLIGHT POLLUTION EFFECTS (UMWELTFREUNDLICHES BEIZVERFAHREN FUER MESSING IN SCHWEFELSAEURE),
K. E. Knipps.
Metal, Vol. 32, No. 1, p 53-55, January, 1978. 1 fig.

Descriptors: *Copper, *Zinc, *Electrolysis, *Metals, *Anion exchange, Filtration, Waste water treatment, Recirculated water, Industrial wastes, Sodium compounds.

A method has been developed for the in-process regeneration of sulfuric acid pickling liquor for brass and standing rinse waters. The simulataneous in-process regeneration system produces a clear bath and a highly effective pickling liquor. At low acid concentrations, the pickled brass products maintain a high quality copper surface that is free of cementation due to the low metal content. Copper is recovered from the pickling liquor by filtration and electrolysis. Zinc is filtered from the rinsing water and is regenerated with sodium hydroxide in an anion exchange column. The zinc then undergoes electrolysis and is returned to the standing rinse water. Crystalline sodium sulfate is also recovered during the regeneration and preparation process; no hydroxide is recovered. Water consumption is reduced by the use of the demineralized circulation water. (Lisk-FIRL)
W78-05307

GUIDELINES ISSUED FOR METAL FINISHING EFFLUENTS.
For primary bibliographic entry see Field 5G.
W78-05308

PLATING SYSTEM CUTS POLLUTION WOES.
Chemical Engineering, Vol. 85, No. 5, p 87, February, 1978. 1 tab.

Descriptors: *Cadmium, *Sulfates, *Lime, *Metal, *Chemical precipitation, Zinc, Copper, Iron, Stainless steel, Waste water treatment, Industrial wastes, Viscosity, Electrolysis.

A Cadvert sulfate cadmium plating process, developed by 3M Co, simplifies the treatment of plant effluents and reduces cadmium concentrations required for plating. The system consists of a mixture of Cadvert-374 and -275, cadmium oxide, sulfuric acid, and water maintained at an optimum plating temperature of 72F. With this system, cadmium plating can be performed on a variety of metals, including stainless steel without prior nickel striking. Carbonitrided steel plating with cadmium can be accomplished by the addition of fluoroboric acid to the Cadvert solution. Cadmium requirements for the plating solution can be reduced from 2-6 oz/gal of solution for cyanide cadmium plating to 2 oz/gal with Cadvert plating. Dragout losses are reduced because the solution is less viscous; break-in electrolysis is eliminated with this plating system. Effluent treatment involves raising the solution to pH 10.5 with lime or caustic to precipitate cadmium and neutralizing the effluent before disposal. Since the Cadvert is acidic, corrosion-resistant tanks constructed of polypropylene or polyethylene are required. (Lisk-FIRL)
W78-05309

INVESTIGATIONS INTO DEHYDRATION OF DEPOSITS FROM THE PURIFICATION PLANT FOR GRINDING WASTE MATERIAL OF CRYSTAL GLASS MANUFACTURING PLANTS (BADANIA NAD ODWADNIAMIEM OSADOW Z OCZYSZCZALNI SCIEKOW POSZLIFIERSKICH Z HUT SZKTA KRYSZTATOWEGO),
Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
For primary bibliographic entry see Field 5E.
W78-05310

RUSSIAN CLOSED-CYCLE CHEMICAL WORKS,
S. Shantyar.
Water and Waste Treatment, Vol. 21, No. 1, p 7, January, 1978.

Descriptors: *Water consumption, *Industrial wastes, *Tertiary treatment, *Chemical wastes, *Water reuse, Recycling, Biological treatment, Activated sludge, Sewage treatment, Waste water treatment, Waste water disposal.

The Pervomaisk chemical complex in the Ukraine has become the first industrial complex in the USSR to operate with a closed-cycle water system. Because mixing of effluent streams resulting from various manufacturing processes may produce complex reactions, the wastes are treated separately in five streams and the on-site reuse of waste water is maximized. The buffer pond, used to treat discharges having a low mineral content, is also used to treat sewage from the chemical complex and the neighboring town. Ion-exchange resins are used to treat the waste water prior to reuse. Materials recovered during the waste water treatment process are also recycled, with polyvinyl chloride particles used in the manufacture of facing tiles. Activated sludge is used for protein-vitamin feed concentrates and ammonia and nitric acid liquors for nitrogenous fertilizers. Adoption of the closed-cycle water system has reduced water consumption at the plant to 3% of its previous level. (Schulz-FIRL)
W78-05311

THE INTEGRATED STEELWORKS OF SOLMER AT FOS-SUR-MER.
For primary bibliographic entry see Field 5G.
W78-05312

MICROBIAL TREATMENT OF AN INDUSTRIAL EFFLUENT CONTAINING VOLATILE FATTY ACIDS,
Orange Free State Univ., Bloemfontein (South Africa). Dept. of Microbiology.
J. C. Du Preez, and P. M. Lategan.
South African Journal of Science, Vol. 73, No. 11, p 349-351, November, 1977. 1 fig, 1 tab, 7 ref.

Descriptors: *Oil industry, *Acid, *Microbial degradation, *Minerals, *Salts, Bacteria, Oil wastes, Fermentation, Analytical techniques, Laboratory tests, Waste water treatment, Proteins, Carbon, Industrial wastes.

Bacterial consumption of fatty acids was tested in laboratory experiments with aqueous effluent produced by an oil-from-coal plant. The effluent consisted of 70% acetic acid, 15% propionic acid, 10% butyric acid, 5% valeric acid, 0.1% emulsified oil, 0.02% alcohols and ketones, and 2-10 ppm iron. Batch fermentation of the effluent with selected organisms was conducted in a mineral salt solution culture medium at 30 and 40C with a constant pH controlled by sulfuric acid additions. A 24-hour incubation period indicated that two strains of Acinetobacter calcoaceticus exhibited the greatest growth rate and cell yield at optimum temperatures of 30-32C at pH 7.0. Measurement of fatty acid components after fermentation showed that A. calcoaceticus strain B1 consumed 99% of the fatty acids, leaving only isobutyric acid. Strain B2 reduced the fatty acids 88%, completely consuming n-butyric and n-valeric acids. The fatty acids in solution were the only source of carbon for the bacteria; the pH was observed to rise as these acids were converted. The use of these bacteria for fatty acids treatment was considered a potential source of single cell protein. (Lisk-FIRL)
W78-05313

SHOCK BACKWASH FILTER CUTS WASH WATER WASTE,
D. Martin.
Process Engineering, p 71, September, 1977.

Descriptors: *Filtration, Pulp and paper industry, *Food processing industry, *Filters, *Deposition, Separation techniques, *Industrial wastes, Waste water treatment, Waste water disposal.

Tubular filters with automatic shock backwash systems for cleaning were discussed. Parallel linking of tubular filter units allowed for the treatment of flow rates up to 3,000 gal/min with suspended solids content up to 500 ppm. The backwash system, with an automatic pressure sensor, shuts the outlet valve, allowing air or gas pressure in the effluent contained in the dome of the tube to build up. When adequate compression is attained, the drain is opened, causing a high velocity flow over the filter to clear the deposit. The system contains reusable filters, is corrosion resistant, and is enclosed to prevent exposure to products to the atmosphere. A 50% increase in flow rate may be attained by parallel linking of dual tube filter systems. The filter system has been used in the pulp and paper industry and may be adapted for use in chemical, food and beverages, and other industries. Filter elements are available in fabric bag, wire mesh, and perforated and slotted stainless steel. corrosion resistant linings for treatment of chemicals are in the process of design. (Lisk-FIRL)
W78-05314

MEMBRANE PROCESS FOR THE TREATMENT OF SULPHITE SPENT LIQUOR. POSSIBILITIES AND LIMITS. (MEMBRANVERFAHREN ZUR BEHANDLUNG VON SULFITABLAUGEN MOEGLICHKEITEN UND GRENZEN),
Technische Hochschule, Darmstadt (West Germany). Inst. fuer Makromolekulare Chemie.
T. Krause, and G. Widjaja.
Das Papier, Vol. 31, No. 11, p 461-467, 1977. 12 fig, 2 tab, 10 ref.

Descriptors: *Membrane processes, *Carbohydrates, *Lignins, *Sulfonates, Pulp and paper industry, *Industrial wastes, Separation techniques, Waste water treatment, Sulfite liquors.

Ultrafiltration of sulfite pulp industry liquor was tested with commercial membranes. Pilot units, based on the hollow fiber principle, were employed to separate solids contained in the sulfite spent liquor from the wash water used in the pulping process. The pilot ultrafiltration cell operated in a discontinuous mode. Commercial membranes with varying pore sizes were used in the ultrafiltration of the sulfite spent liquor. Separation characteristics of the membranes for carbonhydrates and lignine sulfonates were observed. Lignine sulfonates were fractionated from the spent liquor produced during acid magnesium bisulfite digestion. Fractionated quantities of carbonhydrates and lignine sulfonates was calculated for lignine sulfonates contained in the concentrates and the filtrates. (Lisk-FIRL)
W78-05315

THE PRODUCTION OF CHEMICALS FROM PULPING WASTE,
Swedish Forest Products Research Lab., Stockholm.
For primary bibliographic entry see Field 5E.
W78-05316

CROWN ZELLERBACH'S WASTE WATER TREATMENT UNIT IN WASHINGTON SAID TO BE AREA'S LARGEST.
Paper Trade Journal, Vol. 162, No. 2, p 24, January, 1978.

Descriptors: Pulp and paper industry, *Pulping wastes, *Biochemical oxygen demand, *Aerated lagoons, *Aeration, Sludge disposal, Waste water treatment, Water quality control, Industrial wastes, Waste water disposal, Washington.

A $7.6-million secondary waste treatment facility is being used to process up to 75 mgd of effluent from the Crown Zellerbach Corp pulp and paper mill in Camas, Washington. Two aeration basins with a combined area of 108 acres contain 53 surface aerators which reduce the BOD level in the waste water. The effluent is first pumped to a primary treatment and sludge disposal plant. The waste water is then pumped into the larger of the two aeration basins where its BOD level is reduced by 88% over a three-day aeration period. The waste water is then transferred to the second basin, covering 42 acres, where it undergoes another two days of aeration and a further BOD reduction of 6%. The treated effluent is then discharged into the Columbia River. The Crown Zellerbach Corp, which produces 360,000 tons of paper each year, at the Camas mill, has spent more than $22 million on waste treatment facilities over the last 11 years. (Lisk-FIRL)
W78-05317

POSSIBILITIES AND MEASURES TAKEN BY THE PULP INDUSTRY FOR THE PROTECTION OF THE ENVIRONMENT (MOEGLICHKEITEN UND MASSNAHMEN DER ZELLSTOFFINDUSTRIE IM INTERESSE DES UMWELTSCHUTZES).
For primary bibliographic entry see Field 5G.
W78-05318

METSA-BOTNIA'S KRAFT MILL COMES ON STREAM,
J. Kalish.
Pulp and Paper International, Vol. 19, No. 12, p 57-61, 84, November, 1977. 2 fig, 1 tab.

Descriptors: *Treatment facilities, Pulp and paper industry, *Pulp wastes, *Water pollution control, Clarification, Aeration, Oxidation lagoons, Recycling, Effluents, Industrial wastes, Equipment, Waste water treatment.

The 250,000 ton/yr bleached kraft operation at Kaskinen on the western coast of Finland is described. The $244 million mill was designed to process both hardwood and softwood pulps in a highly streamlined, single-line operation. A Kamyr digester rated at 885 air dry m tons/day, followed by a conventional six-stage C/DEHDED bleaching line, comprises the main processing line. A separate 140 tpd M and D Bauer Digester is used to process sawdust which is then blended with the main pulp line before screening. Since water supplies from the River Narpio are somewhat limited, the mill was designed for the relatively low water consumption of 140 cm m/ton of pulp. Average water requirements are 200 cu m/ton. Waste water from the plant first passes to a 60 m-diameter clarifier for removal of fiber. The sludge from the clarifier underflow is dewatered and then incinerated in the mill's power boiler. A fine-bubble bottom aeration system, developed in Finland by Nokia, is used to reduce the BOD content. The system includes a 15.6-ha lagoon equipped with nine aeration raft units, each about 40-m long and having its own compressor. The system of fine-bubble diffusers distributes compressed air to a depth of about 4 m at an energy cost of 2.2-2.5 kg 02/kWh. BOD reductions of about 50% are achieved for the 49,000 cu m/d of waste water generated at the plant. (Schulz-FIRL)
W78-05319

PULP AND PAPER RESEARCH AT UQTR--RELIEF FOR AN EMBATTLED INDUSTRY,
For primary bibliographic entry see Field 5E.
W78-05321

IS CHEAP RECOVERY IN SIGHT FOR SULFITE.
For primary bibliographic entry see Field 5E.
W78-05322

PULP INDUSTRY AND PROTECTION OF SURFACE WATERS (ZELLSTOFF-INDUSTRIE UND GEWAESSERSCHUTZ),
For primary bibliographic entry see Field 5G.
W78-05323

THE KATOX-F PROCESS FOR PURIFYING OF NON-BIODEGRADABLE WASTEWATERS,
Krupp Industrie-und Stahlbau, Essen (West Germany). Abt. Umwelttechnik.
C. Oehme.
La Tribune du Cebedau-Becewa, Vol 30, No 407, p 344-350, October, 1977.

Descriptors: *Textiles, Pulp and paper industry, *Chemical industry, *Activated carbon, *Oxidation flocculation, Chemical precipitation, Chemical oxygen demand, Biochemical oxygen demand, Water purification, Waste water treatment, Industrial wastes.

An oxidation and precipitation system has been developed for the treatment of non-biodegradable waste water effluent from various industries. The Katox-F catalytic oxidation process effectively clarifies and decontaminates the high COD- and low BOD-containing wastes from textile, paper, cellulose, leather, chemical, and pharmaceutic industries. A series of three activated carbon wash basins is used to accelerate the oxidation of toxins contained in the industrial effluent. The reduction of COD in the first wash basin is about 50%, with further COD reductions of 40% and 30% in the second and third basins, respectively. The oxidized effluent then undergoes flocculation with a precipitant such as lime of FeSO4 for the removal of phosphates, carbonates, sulphates, albuminous compounds, and organic carbon acids. The COD reduction in this step is appoximately 50%. Removal of all remaining contaminants is achieved by filtration through an ion exchange column which effectively reduces the COD content by 90%. A cost analysis is presented for the use of a Katox precipitation plant for the purification and decolorization of up to 1,200,000 cu m of waste water from a textile mill near Bielefeld, Germany.

The treated effluent can be reused or discharged to public waters. (Lisk-FIRL)
W78-05324

ECOLOGICAL ASPECTS OF WATER USAGE IN THE TEXTILE INDUSTRY,
CIBA-GEIGY Ltd., Basle (Switzerland).
G. Duerig.
Review of Progress in Coloration and Related Topics, Vol 7, p 70-79, 1976. 15 fig, 16 tab, 33 ref.

Descriptors: *Textiles, *Dyes, *Water supply, *Waste water treatment, *Industrial wastes, Heavy metals, Biochemical oxygen demand, Chemical oxygen demand, Cotton, Activated sludge.

Water usage and waste water treatment methods used by the textile industry are discussed. It is estimated that the textile industry uses 50-300 liters of water per every kilogram of finished textiles. A 96% water consumption reduction was realized by the replacement of a continuous washer or a rotary hydroextraction system with a winch washing system for the washing of reactive dye prints. The biodegradation of textile wastes has been accelerated by the reduction of high oxygen demands through the replacement of enzyme degradation with a persulfate oxidizing agent. The high levels of heavy metals which can occur in textile effluents often result in the need for treatment in excess of that occurring during dyeing procedures before the wastes can be discharged into a treatment facility. The activated sludge process has been recommended for the removal of solids and biodegradable material produced by cotton mills. Removal of other wastes such as dyes, chemicals, and nondegradable materials must be achieved by other treatment processes, such as sedimentation, ion exchange, aerobic treatment, or electrolyis.
W78-05325

WOOL DYEING TECHNIQUES WITH LOW CHROMIUM CONCENTRATIONS IN WASTE WATERS (WOLLFARBEVERFAHREN MIT NIEDRIGEM CHROMGEHALT DES ABWASSERS),
International Wool Secretariat, Ilkley (England). Technical Centre.
L. Benisek.
Textilveredlung, Vol. 12, No. 9, p 406-415, September, 1977. 6 fig, 12 tab, 35 ref.

Descriptors: *Chromium, *Dyes, *Textiles, *Chemical reactions, *Effluents, *Reduction(Chemical), Organic acids, Chemical wastes, Water pollution control, Waste water treatment, Industrial water.

A wool dyeing process which yields lower residual hexavalent and trivalent chromium concentrations in dye bath effluents has been developed. The process involves the addition of alpha-hydroxy-monocarboxylic acids, especially lactic acid, to the after-chrome dyeing step. The acids are added at the normal dye to dichromate ratios within an optimum pH range of 3.4-3.6. The hexavalent chromium is reduced to the trivalent state on the wool fiber. Within the optimum pH range, lactic acid addition may not be required for potassium dichromate concentrations below 1% and high dye to dichromate ratios. Sulfates or complexing agents such as ethylenediaminetetraacetic (EDTA) acid may produce an increase in the residual chromium bath concentration. The residual hexavalent chromium concentration may also be reduced by the addition of other dicarboxylic and hydrocarboxylic acids which form stable complexes with trivalent chromium. Lactic acid does not affect shade or color fastness; the flame-resistance of the wool is slightly improved over that produced by conventional dyeing methods. (Schulz-FIRL)
W78-05326

EFFLUENT TREATMENT IN THE TEXTILE INDUSTRY,
Shirley Inst., Manchester (England).
For primary bibliographic entry see Field 5G.
W78-05327

MINI-SYMPOSIUM ON EFFLUENT CONTROL 'UPDATE 1976--GROUP IV',
Waste Water Engineers, Inc., Nashville, TN.
T. H. Patton, Jr., and H. Ellison.
Journal of the American Leather Chemists Association, Vol. 72, No. 11, p 444-449, November, 1977. 2 tab.

Descriptors: *Tannery wastes, *Treatment facilities, *Industrial wastes, *Waste water treatment, *Costs, *Chrome, Sludge treatment, Ammonia, Sulfur compounds, Odor, Water pollution control, Waste water disposal.

A summary of the presentations and discussions which occurred during the Group IV Mini-Symposium on Effluent Control at the Seventy-second annual meeting of th American Leather Chemists Association is presented. Updated pollution control facilities for the Armira Corporation's tannery in Bolivar, Tennessee, and a discussion of various effluent control aspects were the major topics of te symposium. Armira's Bolivar tannery is a complete chrome tannery, designed to process salted cattle hides. Waste from the tannery's treatment system is discharged to the Hatchie River, a slow moving river draining a large agricultural and woodland area. The various points raised and discussed in the symposium included: chrome (the differentiation between hexavalent and trivalent chrome), ultimate fate of tannery sludges, sulfate standards for waste effluent, ammonia nitrogen standards, development of effluent stream standards, municipal discharge user charges, European tannery practices, power cost and availability, irrigation, and odor problems. (Baker-FIRL)
W78-05329

THE USE OF POLY-ELECTROLYTES IN A CLOSED SYSTEM OF TANNERY EFFLUENTS,
Johannesburg Tanning Co., Ltd., Transvaal (South Africa).
N. Berg, and P. Marais.
Journal of the Society of Leather Technologists and Chemists, Vol. 61, No. 6, p 129-131, November-December, 1977. 3 tab.

Descriptors: *Tannery wastes, *Polyelectrolytes, *Sodium compounds, *Clarification, *Flocculation, Suspended solids, Separation techniques, Oxidation, Aeration, Waste water treatment, Industrial wastes.

Clarification of tannery waste water was achieved with polyelectrolytes and ferrous sulfate. The effluent from the lime yard and chrome tanning procedures contained a large quantity of OA, 900-1,200 ppm, with a pH range of 7.1-11.2. The polyelectrolyte clarification procedure was selected because of the high, precipitable sodium sulphide content of the OA and the readily oxidized properties of the other organic substances. Ferrous sulfate was chosen for its ability to form an insoluble sulfide precipitate and a ferrous ion precipitate. Settlement of the organic materials occurred during clarification with the ferrous sulfate and polyelectrolyte at a rate of 1-2 m/h. Further clarification was achieved because of the attraction and aggregation of charged and uncharged particles to form large particles in tube settlers. Sludge was removed to a batch vacuum pump filter press for dewatering before the effluent was subjected to a second aeration. This step reduced the OA from 200-300 ppm to 80-120 ppm, a level within effluent standards for discharge to a municipal treatment facility. (Lisk-FIRL)
W78-05330

TREATMENT PLANT AT REDBOURN.
For primary bibliographic entry see Field 5G.
W78-05331

ON-LINE INDUSTRIAL WATER POLLUTION MONITORS,
For primary bibliographic entry see Field 5A.
W78-05332

SUBMERGED ENCLOSURES MAY HELP SINK PLANT PROBLEMS,
H. F. Instruments, Ltd., Bolton (Ontario).
F. S. Posgate.
Water and Wastes Engineering, Vol. 14, No. 9, p 127-128, 131-133, September, 1977. 5 fig.

Descriptors: Equipment, *Suspended solids, *Separation techniques, *Water treatment, Waste water treatment, Costs, Treatment facilities, Settling basins, Industrial wastes, Municipal wastes.

The use of submersible settling enclosures for the treatment of water and waste water is considered. An enclosure of reinforced polyethylene, submerged and connected to the intake at water plants, should remove most of the suspended solids in raw water and reduce the cost of plant control. The device does not require power and it can occupy land which has no other value. Estimated life, with periodic servicing, is expected to extend beyond 20 and closer to 50 years. Large industrial reservoirs used for quiescent settling of suspended solids are subject to weather disturbances. It is not always practical to cover large reservoirs with plastic sheeting. A submerged settler installed close to the effluent discharge in such reservoirs could be used to provide continuous discharge under all conditions to receiving waters. The suspended solids and turbidity loads of raw water entering treatment plants would be largely reduced. By using a submerged settler connected to the effluent discharge, the spill could be contained. The settler could also be aerated to reduce the BOD load on the receiving water. (Baker-FIRL)
W78-05333

TREATING THE EFFLUENT,
G. Solt.
Engineering, p 831-833, October, 1977.

Descriptors: *Industrial wastes, *Waste water treatment, *Costs, *Chemical wastes, *Equipment, Waste water disposal, Metals, Separation techniques.

Recent advances in the field of industrial waste water treatment are reviewed. The first advancement came in the form of wider recognition that effluent treatment processes cannot be viewed in the same manner as manufacturing processes used in an industry's normal activity. The effluent process is alien to the industry it serves. The staff who operate the treatment plant often tend to lack any wider expertise in the field. Economic factors which must be considered in the selection of a treatment process are reviewed. In some cases, such as those in which the effluent contains cyanide, the degree of freedom in such a selection is very small. At other times, the choice between various kinds of treatment is dependent upon the desired effluent quality and the corresponding cost. Specific problems in the metal finishing, steel, pulp and paper, and oil refining industries are discussed. (Baker-FIRL)
W78-05334

THE USE OF MEMBRANE FILTERS TO PRODUCE BACTERIA-FREE WATER TO BE USED IN A SPF-LABORATORY, (IN GERMAN),
Schering A. G., Berlin (West Germany). Dept. fuer Tierzucht Haltung.
For primary bibliographic entry see Field 5F.
W78-05335

CHARACTERISTICS AND TREATMENT OF BREWERY WASTES,
S. Beszedits.
Water and Pollution Control, Vol. 115, No. 10, p 10-13, October, 1977. 1 fig, 2 tab.

Descriptors: Food processing industry, *Biochemical oxygen demand, *Suspended solids, *Activated sludge, *Trickling filters, Treatment facilities, Biological treatment, Industrial wastes, Waste water treatment, *Brewery wastes.

Various processing stages in beer production include mashing, fermentation, storage or lagering, and bottling. Waste water is produced during the brewing process at a rate of 15 barrels of water to one barrel of finished product. Effluents from breweries are generally high in BOD and suspended solids and low in nutrients, hence nitrogen and phosphorus must usually be added for biological treatment. Characteristics of several effluent streams from the brewery process are summarized. Various breweries have adopted process changes to reduce the effluent volume as well as the pollutant load in terms of BOD and suspended solids. The Adolph Coors Company brewery in Golden, Colorado, has modified operations to reduce the total waste volume by 58%, the BOD by 75%, and the suspended solids by 79%, relative to average figures for brewery waste water. Results of a sampling program to provide data on variations in effluent characteristics with them are presented. Although most breweries in North America discharge their effluents to municipal sewers, neutralization and some degree of pretreatment is usually required. The activated sludge process has been used at the Coors plant and at other breweries. Contact stabilization, oxygen aeration, trickling filters, rotating biological filters, and anaerobic filters have also been employed. Recent studies have examined the recovery of spent grain, spent hop, trub, and excess yeast for use as animal feed supplements. (Schulz-FIRL)
W78-05336

COKE PLANT EFFLUENTS NITRIFICATION STUDY,
J. Komow.
Water and Pollution Control, Vol. 116, No. 1, p 14, 16, January, 1978.

Descriptors: *Nitrification, *Biological treatment, *Biochemical oxygen demand, *Ammonia, *Hydraulic structures, Pilot plants, Laboratory tests, Chlorination, Nitrates, Treatment facilities, Waste water treatment, Industrial wastes.

The application of the biological nitrification process to coke plant effluents was evaluated in laboratory and pilot plant studies. Analytical observations of the coke plant effluent indicated that nitrification had to be suppressed to obtain accurate BOD data for carbonaceous elements in the waste. Four biological treatment tests with single and two stage models were conducted with controlled pH and additions of glucose and phosphorus. In both models, hydraulic retention times of 1.8 days were found more effective than shorter retention times. A 97% nitrification rate was accomplished in the experiments, with total elimination of cyanide and a reduction of freon-extractable materials levels to effluent standards. The addition of a polyelectrolyte to the clarification stage was considered as a means of reducing residual BOD levels and suspended solids. Pilot plant operations demonstrated that ammonia liquor concentrations of 250 mg/liter of nitrogen could be reduced to 10 mg/liter. Denitrification tests in the pilot plant were unsuccessful because of mechanical problems. The substitution of pure oxygen for air in the aeration process was examined as a means of economically maintaining a dissolved oxygen content of 6-8 mg/liter in the reactor. (Lisk-FIRL)
W78-05337

THE SUCCESS OF REINFORCED PLASTICS FOR PROCESS PLANT IN CORROSIVE ENVIRONMENTS,
For primary bibliographic entry see Field 8G.
W78-05338

ADSORPTION STUDIES USING GAS-LIQUID CHROMATOGRAPHY--II. COMPETITIVE ADSORPTION,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-05339

INDUSTRIAL FILTRATION, FUNDAMENTALS OF MEDIA SELECTION, FILTER DESIGN AND INSTALLATION.
Engineering Materials and Design, Vol. 21, No. 12, p 25-30, December, 1977. 12 fig.

Descriptors: *Filtration, *Porous media, *Membranes, *Absorption, *Filters, Oil wastes, Air pollution, *Industrial wastes, Separation techniques, Waste water treatment.

Effective filtration media and designs are examined with regard to the properties of various contaminants. Geometrical or surface media, and statistical or depth media, are the types of pore structures analyzed for filtration capabilities. Quantitative retention of solid particles requires use of a statistical medium in conjunction with a geometrical medium. Geometrical media are recommended for plastics and fibers which can pass through depth media. Synthetic membranes are more effective for the retention of microorganisms which are able to grow through small pores. Statistical media are recommended for process residues. Surface filters, constructed of woven metal, paper or cloth; edge filters, containing washers between metal or paper discs; and chemically active or inactive absorption filters are often used, especially in conjunction with wire mesh strainers, in lubrication, hydraulic, and fuel oil systems. Centrifugal filters and magnetic filters, which attract iron particles from the oil, are also employed in liquid filtration systems. Dry filters constructed of pleated paper or material, and oil bath filters have been found effective for air filtration in compressed air systems. (Lisk-FIRL)
W78-05340

DIRECT TREATMENT OF ORGANIC WASTEWATER BY TRICKLING FILTER (SANSUIROSHO NI YORU KONODO HAISUI NO CHOKUSETSU SHORI NI KANSURU KENKYU),
National Research Inst. for Pollution and Resources, Tokyo (Japan), and Agency of Industrial Science and Technology, Tokyo (Japan).
T. Ishihara, M. Tanaka, T. Tashiro, M. Hirai, and Y. Urushikawa.
Showa 51 Nendo Kankyo Hozen Kenkyu Seika Shu (I), (A Collection of Results on the 1976 Environmental Conservation Researches), Vol. 1, No. 43, p 1-8, 1976. 6 fig, 5 tab, 5 ref.

Descriptors: *Trickling filters, *Biomass, *Carbon, *Chromatography, *Biochemical oxygen demand, Organic substances, Waste water treatment, Municipal wastes, Waste water disposal, Treatment facilities.

Research on the kinetics of total organic removal by trickling filters and on the residual components on filtered effluents is described. Substrate removal kinetics of total organic carbon with concentrations up to 3,000 mg/liter of waste water were calculated using the Michaelis-Menten formula. Gel chromatograms were obtained for soluble starch and peptone-glucose synthetic wastes and for wheat starch production wastes. Common peaks at 220 and 254 nm were noted in all of the chromatograms. A mean molecular weight of 2,100 was calculated according to saccharide standard for the common peaks. Increased treatment time was found to correlate with the peak height, suggesting aromatization of new metabolites during treatment. Corn steep liquor with a high BOD was treated semicontinuously over a two-month period and analyzed for its biomass production. A mean biomass production ratio of 0.29 g dry matter/g BOD loaded was obtained along with a 60% mineralization rate for total organic carbon. (Lisk-FIRL)
W78-05341

TREATMENT OF WASTE WATER FOR EUTROPHICATION CONTROL (SANGYO HAISUI NO FUEIYOKASEIBUN NO SHORI NI KANSURU KENKYU),
Fermentation Research Inst., Tokyo (Japan) Div. of Microbe Engineering.
M. Dazai, E. Mikami, T. Hashinaga, N. Futai, and K. Nakamura.
Tsusansho Kogyogijutsuin Sangyokogai Kenkyuchoseikyoku 51 Nendo Kogaitokubetsu Kenkyu Hokoku, (Report of the 1976 Pollution Special Research, Industrial Pollution Research Coordination Bureau, Agency of Industrial Science and Technology), No 47, p 1-2, July, 1977.

Descriptors: *Eutrophication, *Biochemical oxygen demand, *Activated sludge, *Biological treatment, *Organophosphorous compounds, Denitrification, Nitrogen fixing bacteria, Methane bacteria, Waste water treatment, Industrial wastes.

The treatment of industrial waste waters to prevent eutrophication was attempted by biological methods to remove BOD, total organic carbon, organophosphates, and by nitrification. A total organic carbon removal rate of 93% was achieved for a daily carbon load of 4 kg/cu m of corn steep liquor with activated sludge treatment and millipore filtration. Anerobic digestion of high BOD effluent containing 44,000 ppm volatile solids resulted in acid fermentation at a volatile solids loadings of 26.4, 17.6, and 8.8 kg/cu m/day after 4, 8, and 25 days, respectively. Methane fermentation stabilized after 30 days at a loading rate of 4.4 kg/cu m/day. Higher volatile acid and hydrogen concentrations and lower BOD removal were observed during acid fermentation. A further test showed that gram positive bacterica S-1 in innoculated sludge consumed 100% of a 1,500 ppm load of dioctyl phthalate after three days. Organophosphate removal with activated sludge and aeration was incomplete. A 10% organic phosphate removal was achieved after 48 hrs aeration and 30% removal after 7 days. Nitrifying bacteria in three activated sludge systems were compared and evaluated for denitrification characteristics. The use of methane in the denitrification process was evaluated. (Lisk-FIRL)
W78-05342

CHOOSING AN APPROPRIATE WATER TREATMENT,
Agency for International Development, Manilla (Phillipines).
For primary bibliographic entry see Field 5G.
W78-05343

WORKSHOP PROCEEDINGS: RESEARCH NEEDS RELATED TO ACID MINE WATER.
West Virginia Univ., Morgantown. Water Research Inst.
For primary bibliographic entry see Field 5G.
W78-05345

COMMUNITY RESPONSE STRATEGIES FOR ENVIRONMENTAL PROBLEMS OF WATER SUPPLY AND WASTEWATER DISPOSAL IN FAIRBANKS, ALASKA,
Alaska University, College. Inst. of Water Resources.
For primary bibliographic entry see Field 5G.
W78-05357

ALTERNATIVES TO THE MANAGEMENT OF HAZARDOUS WASTES AT NATIONAL DISPOSAL SITES. VOLUME II. APPENDICES.
Little (Arthur D.) Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-05418

FOAM BREAKING -- KEY PROCESS IN DETOXIFICATION OF KRAFT MILL EFFLUENTS BY FOAM SEPARATION,
B. C. Research Ltd., Vancouver.
K. S. Ng, J. C. Mueller, and C. C. Walden.
The Canadian Journal of Chemical Engineering, Vol. 55, No. 4, p 439-444, August, 1977. 7 fig, 16 ref, 4 tab.

Descriptors: *Pulp wastes, *Bleaching wastes, Toxicity, *Foam separation, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Pulp and paper industry, Effluents, Turbines, Capital costs, Costs, Separation techniques, Water purification, Water quality control, Kraft mills.

Bleached kraft mill effluents were treated in a 0.38 cu m/min foam separation pilot plant to study the performance of a turbine foam-breaking system and to develop the design parameters for large-scale application. A 3-blade vaned-disk turbine was chosen for foam breaking. Major process variables controlling foam breaking were system design, tip velocity, rotation speed, and foam load. A foam breaking system with only restricted liquid draw-off performed 3-16 times better than a conventional flow-through system. A 38-cm diameter turbine operating at 1800 rpm (3600 cm/sec tip velocity) collapsed up to 1.2 cu m/min of foam. Design equations developed for sizing of foam breakers suggest that a 61-cm diameter 21-kw turbine will collapse 4.7 cu m/min of foam. For a 95,000 cu m/day foam separation plant, approximately 12 foam breakers are required at an estimated capital cost of $108,000. (Swichtenberg-IPC)
W78-05444

CLEVEPAK'S SUBMERGED AERATION SYSTEM CUTS ENERGY USE AT EATON CHIPBOARD MILL,
K. R. Boiko.
Paper Trade Journal, Vol. 161, No. 23, p 24-26, December 1, 1977. 4 illus, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Aeration, *Energy, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Aerated lagoons, Indiana, Pulp and paper industry, Effluents, Mixing, Pumps, Biochemical oxygen demand, Treatment facilities, Board mills.

The Aerocleve aeration system has been installed in the aeration lagoon (175-ft wide by 250-ft long, 8.5 ft water depth) at Clevepak Corp.'s 130 ton/day chipboard mill in Eaton, Indiana. The system consists of 2 Roots positive-displacement pumps and 4 Flygt submersible pumps which are located at 2 pump well stations near the bottom of the aeration basin. Vortex mixing chambers disperse low-pressure air into small bubbles which are distributed into he bottom region of the basin as a high-energy turbulent plume. Conservation of the thermal energy of the mixed liquor and adequate mixing are obtained with the Aerocleve system in contrast to conventional surface aerators. Effluent BOD averages 15 mg/liter, i.e., a 99% reduction over influent BOD, at the Eaton mill. (Swichtenberg-IPC)
W78-05446

NEW TYPE OF EFFLUENT TREATMENT IN CORRUGATED BOARD MANUFACTURE (NEUARTIGE ABWASSER-AUFBEREITUNG BEI DER WELLPAPPEN-FABRIKATION).
Allgemeine Papier-Rundschau, No. 44, p 1380, November 5, 1977. 1 tab.

Descriptors: *Waste water treatment, *Pulp wastes, Pulp and paper industry, Water pollution sources, Water pollution treatment, Wastes, Industrial wastes, Waste treatment, Adhesives, Oil, Flocculation, Flotation, Sludge, Hydrogen ion concentration, Dewatering, Chemical oxygen demand, Biochemical oxygen demand, Sludge treatment, *Paper converting industry, *Clarifiers, Printing inks, Corrugated board.

The ink, glue, and oil effluents obtained during the manufacture of corrugated board are reviewed, and the Serpaflo clarifier for treating such effluents is described. The clarifier includes a chamber for adding flocculating agents, a flotation chamber with sludge removal means, an overpressure station, a container for clarifier water, pH measuring and control means, sludge-dewatering box, and control panel. Test data involving ink and ink plus glue solutions show the clarifier to be capable to reducing solids by 98-98.5%, COD by 83-89%, and BOD by 43-82%. (Speckhard-IPC)
W78-05448

PURIFICATION OF EFFLUENTS AT THE SYAVA SILVICHEMICAL FACTORY (OCHISTKA STOCHNYKH VOD NA SYAVSKOM LESOKHIMICHESKOM ZAVODE),
Syavskii Lesokhimicheskii Zavod (USSR).
N. K. Molodtsov, M. F. Morozov, P. S. Fokin, and G. S. Kudryavtsev.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No. 5, p 5-6, 1977. 4 tab.

Descriptors: *Waste water treatment, *Chemical industry, *Wood wastes, Wastes, Industrial wastes, Waste treatment, Effluents, Water pollution sources, Foreign countries, Biological treatment, Neutralization, Municipal sewage, Sedimentation, Evaporation, Color, Biochemical oxygen demand, Phenols, Suspended solids, Water pollution treatment, Water pollution control, *Silvichemicals, Soviet Union(USSR), Tar.

At the Syava (USSR) wood-chemical plant, equipment for mechanical purification and neutralization of effluents began operating in 1969, and equipment for biological purification (jointly with municipal sewage) in 1973. Prior to the construction of this facility, the effluents that were discharged into the local river caused excessive pollution and fishkill. Presently the effluents are treated first at the plant, by a combination of sedimentation, evaporation, and neutralization, This reduces the color, BOD, and the contents of volatile phenols and tar. Subsequent mechanical and biochemical purification in equipment outside the plant further reduces the contents of pollutants. The river water near the discharge point meets sanitary standards (BOD not more than 6 mg/liter, phenols not more than 0.001 mg/liter, and suspended solids not more than 0.75 mg/liter). (Stapinski-IPC)
W78-05449

DETERMINATION OF RESINOUS SUBSTANCES IN EFFLUENTS FROM THE PRODUCTION OF WOOD ROSIN (OPREDELENIE SMOLISTYKH VESHCHESTV V STOKAKH KANIFOL'NO-EKSTRAKTSIONNOGO PROIZVODSTVA),
Tsentralnyi Nauchno-Issledovatelskii i Proektnyi Inst. Lesokhimicheskoi Promyshlennosti, Khimki (USSR).
For primary bibliographic entry see Field 5A.
W78-05450

PURIFICATION OF RESIDUAL LIQUOR FROM YEAST CULTIVATION WITH MOLD FUNGI (OCHISTKA POSLEDROZHZHEVOI BRAZHKI PLESNEVYMI GRIBAMI),
Vsesoyuznyi Nauchno-Issledovatelskii Inst. Gidroliznoi Promyshlennosti, Moscow (USSR).
T. V. Zharova, A. G. Zyryanova, and N. I. Novoselova.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No. 5, p 4, 1977. 2 tab

Descriptors: *Effluents, *Yeasts, *Waste water treatment, *Fungi, *Biological treatment, Wastes, Industrial wastes, Waste treatment, Cultures, Organic compounds, Biochemical oxygen demand, Water pollution treatment, Water pollution sources, Microorganisms, Molds, Biomass.

A process is described for the biological purification of residual liquor from yeast production. Following separation of the yeast cells, the residual liquor is pumped into the yeast-growing tanks where it is subjected to biological oxidation by the fungus Spicaria. The cultivation of the fungus to obtain the inocula for the oxidation tanks is similar to the cultivation of yeast inocula. The residual liquor flows through the oxidation tanks at a rate of 10 cu m/hr, and deposite the shore residence time (about 2 hr), the organic substances content is reduced 60-68%. The reduction of the 5-day BOD is up to 79%. The fungus suspension removed from the tanks yields an additional amount of biomass (about 1.5 tons/day). (Stapinski-IPC)
W78-05451

PURIFICATION AND UTILIZATION OF EFFLUENTS AND GASEOUS EMISSIONS FROM THE PRODUCTION OF MODIFIED CLARIFIED WOOD ROSIN (OCHISTKA I UTILIZATSIYA STOCHNYKH VOD I GAZOVYKH VYBROSOV PRI PROIZVODSTVE EKSTRAKTSIONNOI MODIFITSIROVANNOI OSVETLENNOI KANIFOLI),
Tsentralnyi Nauchno-Issledovatelskii i Proektnyi Inst. Lesokhimicheskoi Promyshlennosti, Khimki (USSR).
A. I. Firsov, G. A. Ishcherikova, Z. K. Kuptsova, M. N. Kosonogova, and G. M. Gaiduchenya.
Gidroliznaya i Lesokhimicheskaya Promyshlennost, No. 5, p 7-8, 1977. 5 ref, 2 tab.

Descriptors: *Effluents, *Waste water treatment, *Biological treatment, *Air pollution, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Chemical oxygen demand, Biochemical oxygen demand, Municipal wastes, Waste dilution, Organic compounds, Burning, Hydrogen sulfide, Adsorption, Chemical industry, Wood wastes, Sewage treatment, *Rosin, Maleic anhydride, Terpenes, Wood extractives.

Effluents from the batch production of modified and clarified wood rosin have a COD exceeding 20,000 and a 5-day BOD of up to 11,500 mg oxygen per liter, and contain 24,500 mg/liter of maleic anhydride. The corresponding figures for effluents from the continuous process are 4,700, 2,400, and 1,530 mg/liter, respectively. Studies to determine the possibility of biological oxidation of these effluents diluted with municipal sewage showed that the COD could be reduced by up to 80% and the BOD by up to 98%. The best results were obtained by diluting the effluents to a COD of 1000 mg oxygen per liter. Analysis of condensates of gaseous emissions showed them to contain about 20% volatile organic substances. Among these were terpene hydrocarbons, especially dipentene. The gaseous emissions containing terpenes, hydrogen sulfide, and maleic anhydride can be purified by adsorption or by burning in special furnaces with purification of flue gases. (Stapinski-IPC)
W78-05452

REDUCTION OF POLLUTION AND VOLUME OF EFFLUENTS FROM THE PRODUCTION OF WOOD CHEMICALS AT THE SOLOMBAL' KRAFT MILL (SNIZHENIE ZAGRYAZNENNOSTI I OB'EMA STOCHNYKH VOD LESOKHIMICHESKIKH PROIZVODSTV SOLOMBAL'SKOGO KOMBINATA),
Tsentralnyi Nauchno-Issledovatelskii i Proektnyi Inst. Lesokhimicheskoi Promyshlennosti, Khimki (USSR).
B. M. Malisov, and N. V. Galyanova.

Gidroliznaya i Lesokhimicheskaya Promyshlennost, No. 5, p 8-9, 1977. 2 tab.

Descriptors: *Effluents, *Waste water treatment, *Pulp wastes, Wastes, Industrial wastes, Waste treatment, Effluents, Pulp and paper industry, Lignins, Water pollution sources, Water pollution treatment, Chemical oxygen demand, Sedimentation, Biological treatment, Burning, Sludge, Water pollution control, Chemical industry, *Tall oil, Black liquor, Kraft mills, Sulfate soap.

To determine the degree of pollution caused by effluents from the production of tall oil at the Solombal' mill (USSR), analyses were made of effluents from the continuous process of sulfate soap decomposition and from crude tall oil rectification. The volume of the first effluent is about 112.8 cu m/day (2.17 cu m/ton crude tall oil); in contains tall oil, lignin products, fibers, and gypsum. This effluent is not purified presently. Effluents from rectification of crude tall oil have an average COD of 822 kg/day. These effluents are subjected to sedimentation and then to biological purification. Recommendations are made for reducing both volume and pollution load by burning of lignin products jointly with black liquor and by utilization of the liquid effluent after separation of the sludge for sulfate soap washing or for the preparation of sulfuric acid. This would reduce the volume of the effluent from sulfate soap decomposition by 98% and its pollution load by 99.8%. The most polluted effluent from tall oil rectification (the fraction from tall oil drying which has a high content of volatile phenols) should be burned jointly with mazout. (Stapinski-IPC)
W78-05453

PROPERTIES OF LIGNOSULFONATES FROM SPENT LIQUORS, WASH WATERS, AND BLEACHING EFFLUENTS FROM SULFITE PULP MANUFACTURE (EINIGE EIGENSCHAFTEN VON LIGNISULFONATEN AUS ABLAUGEN, WASCHWAESSERN UND BLEICHEREIAWAESSERN DER SULFITZELLSTOFFHERSTELLUNG),
Technische Hochschule, Darmstadt (West Germany). Inst. fuer Makromolekulare Chemie.
For primary bibliographic entry see Field 5A.
W78-05454

HYDROLYSIS LIGNIN AS A COAGULANT (GIDROLIZNYI LIGNIN KAK KOAGULYANT),
Arkhangelskii Lesotekhnicheskii Inst. (USSR).
S. B. Pal'mova, and E. D. Gel'fand.
Izvestiya V.U.Z., Lesnoi Zhurnal, Vol. 20, No. 1, p 161-162, 1977. 1 fig, 1 tab.

Descriptors: *Pulp waste, *Waste water treatment, *Lignins, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Biochemical oxygen demand, Chemical oxygen demand, Hydrogen ion concentration, Coagulation, Pulp and paper industry, Effluents, Color, Turbidity, *Black liquor, Kraft lignin, Semichemical pulp, Aluminum oxide.

A study of the effect of adding hydrolysis lignin (0.4-2.25 g/liter) to black liquor (2-2.5 g/liter 5-day BOD, 9-11 g/liter COD, 7.2-9.0 pH) which was chemically purified by acidification to pH 3.5 with sulfuric acid indicated that the hydrolysis lignin acted as a coagulant on the residual effluent, and reduced the amount of turbidity, opalescence, color, and dissolved organic materials. A comparison with alumina, using 1 g/liter of coagulant, indicated that the volume of the precipitate was 25% less when hydrolysis lignin was used. The use of semichemical pulp instead of hydrolysis lignin gave negative results, while kraft lignin proved to be considerably less effective. (Chern-IPC)
W78-05455

REMOVAL OF ROSINOUS MATERIALS FROM PAPER MILL EFFLUENT USING A HIGHLY ACIDIC CATION-EXCHANGE RESIN (MOZNOSTI ODSTRANENI PRYSKYRIC Z PAPIRENSKYCH VOD POMOCI SILNE KYSELEHO KATEXU),
Severoceske Papirni, Steti (Czechoslovakia).
M. Plsek.
Papir a Celuloza, Vol. 32, No. 6, p 171-172, 176, 1977. 2 fig, 4 ref, 3 tab.

Descriptors: *Pulp wastes, *Ion exchange, *Waste water treatment, Separation techniques, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Water reuse, Sands, Wood wastes, Activated carbon, Waste treatment, *White water(Paper machine), *Rosin, Abietic acid, Brass.

To facilitate the recycling of paper-machine effluent on the same machine, e.g., for felt washing, the rosin entering the system with size of wet-strength agent has to be removed. These rosinous materials usually contain isomers of abietic acid. Tests were carried out in the laboratory on the removal of the rosin by means of sand, brass shavings, wood shavings, activated carbon, and basic, acidic, and highly acidic Amberlite ion-exchange resins. The best result, i.e., 96% removal of the rosinous materials from paper-machine white water, was obtained with the highly acidic Amberlite IR-120 ion-exchange resin. The effects of column height and service life of the resin on the removal efficiency are also illustrated. (Trubacek-IPC)
W78-05458

PURIFICATION OF BLEACH PLANT EFFLUENT BY ADSORPTION ON CROSSLINKED POLYMERS,
Chalmers Univ. of Technology, Gothenburg (Sweden). Dept. of Chemical Engineering.
O. Samuelson, and B. Wennergren.
Svensk Papperstidning, Vol. 80, No. 15, p 477-479, October 25, 1977. 3 fig, 3 ref, 1 tab.

Descriptors: *Bleaching wastes, *Ion exchange, *Waste water treatment, *Color, Wastes, Industrial wastes, Pulp wastes, Waste treatment, Water pollution sources, Water pollution treatment, Pulp and paper industry, Effluents, Adsorption, Polymers, Anion exchange, Separation techniques, Water purification, Resins, Softwood, Wood extractives.

Effective color removal by adsorption on crosslinked polymers, including anion-exchange resins, requires and acidification of the effluent from the alkaline extraction stage. With the liquors studied (from sulfite pulping and bleaching of sprucewood), wood extractives were precipitated up on acidification. To avoid this complication, the alkaline liquor was passed through a column packed with a nonpolar resin before acidification. Among the resins studied for color removal, a better efficiency was obtained with a weakly basic anion-exchanger in bisulfite (hydrogen sulfite) form (Duolite A-4F) than with macroporous styrene-divinylbenzene polymers (Amberlite XAD-2 or XAD-4), acrylic acid esters (Amberlite XAD-7 and XAD-8), or crosslinked polyvinylpirrolidone. (Brown-IPC)
W78-05461

PRACTICAL EXAMPLES OF SPECIAL POSSIBILITIES FOR REDUCING EFFLUENT LOADS IN PAPER MILLS (PRAKTISCHE BEISPIELE FUER SPEZIELLE MOEGLICHKEITEN ZUR ABWASSERENTLASTUNG IN PAPIERFABRIKEN).
Erbsloeh and Co., Geisenheim (West Germany).
C. H. Moebius.
Wochenblatt fuer Papierfabrikation, Vol. 105, No. 18, p 733-734, 736-740, September 30, 1977. 2 fig, illus, 26 ref, 2 tab.

Descriptors: *Pulp wastes, *Water pollution control, *Montmorillonite, Water pollution sources, Pulp and paper industry, Dyes, Colloids, Waste water treatment, Lignins, Effluents, Water pollution treatment, Inorganic compounds, Clays, Retention aids, Titanium dioxide, Starch, Sodium silicate(Water glass), Waste paper.

The use of montmorillonite products for certain special effluent problems in paper mills is discussed. Four examples are considered for preventing too much material from entering the effluent stream. These deal with the use of altonite (formerly called sionite) as a retention aid for titanium dioxide and for dyestuffs, both acid and basic, and for handling problems with protective colloids such as starch and with sodium silicate. For purifying the mill effluents, the use of Flygtol A (another montmorillonite product) is suggested. Examples given are the treatment of effluent from hot water defibering of waste paper, the removal of lignin residues (a process still in the development stage), handling of dyestuffs and titanium dioxide, and the treatment of paper coating-plant effluents. (Ward-IPC)
W78-05462

NEW DEVELOPMENTS IN THE USE OF PEROXY COMPOUNDS. II. SULFITE PULP BLEACHING AND ITS EFFLUENTS (NEUE ENTWICKLUNGEN BEIM EINSATZ VON PERSAUERSTOFF-VERBINDUNGEN--TEIL II: SULFITZELLSTOFFBLEICHE UND DEREN ABWAESSER),
Deutsche Gold- und Silber-Scheideanstalt A.G., Franfurt-am-Main (West Germany).
H. Kruger, and H. Schwab.
Wochenblatt fuer Papierfabrikation, Vol 105, No 18, p 722-727, September 30, 1977. 5 fig, 9 ref, 5 tab.

Descriptors: *Bleaching wastes, *Water pollution, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Pulp wastes, Biochemical oxygen demand, Chemical oxygen demand, Oxygen demand, Activated sludge, Thermomechanical pulp, Beech trees(Fagus), Sulfite pulp.

In the Degussa-Ehingen bleaching method, the use of elemental chlorine is avoided, and the waste waters are passed in concentrated form to the spent pulping liquor evaporators. Several Degussa-Ehingen bleaching sequences, especially the P/D/H sequence (peroxide/chlorine dioxide/hyochlorite), are compared with the conventional C/E/H/D/H sequence in the bleaching of beech sulfite dissolving-grade pulp, especially with regard to BOD and COD of the bleaching effluents. There is mention, but not much discussion, of a rapid bleaching method for thermomechanical pulp. A study of the action of the different bleaching effluents on the oxygen consumption (breathing activity) of activated sludge indicated some advantage for the Degussa-Ehingen process. (Ward-IPC)
W78-05463

NEKOOSA (PAPERS INC.) CLEANS CONDENSATES WITH STEAM DISTILLATION.
Chemetics International Ltd., Vancouver (British Columbia).
T. L. Burgess, and D. Voight.
In: Canadian Pulp and Paper Association, Environment Improvement Conference, November 1-3, 1977, Moncton, New Brunswick, Preprints (CPPA Technical Section, Montreal), p 19-23. 1 fig, 3 tab.

Descriptors: *Pulp wastes, *Steam, *Distillation, *Water pollution treatment, Industrial wastes, Wastes, Industrial water, Water pollution sources, Waste treatment, Waste water treatment, Wisconsin, Pulp and paper industry, Effluents, Evaporators, Heat exchanges, Pollutants, Incineration, Water reuse, Water pollution control, Air pollution, Sulfur compounds, *Kraft mills, Condensates, Black liquor, Turpentine, Methanol.

Foul condensates are collected from digester blow gases, turpentine recovery operation, and black liquor evaporators at Nekoosa Papers Inc.'s kraft mill at Nekoosa, Wisconsin. The condensates are pumped to a feed tank and then through heat exchangers to a distillation column. The distillation column is integrated between the first and second effects of the old multiple-effect evaporators. Stripping steam comes from the first effect and removes total reduced sulfur, turpentine, and methanol from the foul condensates. These pollutants, as well as the noncondensible gases from the digester blows, turpentine recovery, and black liquor evaporators, are destroyed in a special fume incinerator. The stripped condensate is used to heat the incoming feed and then as wash water in the brown stock area. (Swichtenberg-IPC)
W78-05465

STATE OF THE ART REVIEW: AERATION SYSTEMS,
Beak Consultants Ltd., Montreal (Quebec).
K. Farrell, and S. Schneiderman.
In: Canadian Pulp and Paper Association, Environment Improvement Conference, November 1-3, 1977, Moncton, New Brunswick, Preprints (CPPA Technical Section, Montreal), p 39-44. 2 tab.

Descriptors: *Aeration, *Waste water treatment, *Biological treatment, *Reviews, Wastes, Waste treatment, Ice, Operation and maintenance, Mixing, Oxygenation, Costs, Equipment, Water pollution treatment, Water pollution control, Aerated lagoons.

Factors to be considered in selecting an aeration system for the biological treatment of effluents (viz., high- and low-speed surface aerators and submerged static air-gun aerators) include icing problems during cold weather, maintenance requirements, mixing criteria, standard oxygen transfer rates, and costs. Surface aeration continues to be an attractive method of aeration for shallow and medium-depth lagoons (less than 20-ft deep). Submerged aerators, particularly static air-gun tubes, can be competitive in medium-depth applications and are superior in deep basin lagoons (more than 25-ft deep) by virture of the fact that their oxygen transfer rate is enhanced and their mixing is not deteriorated by greater submergence. Surface aerators cannot adequately mix deep basins, even when equipped with draft tubes. (Swichtenberg-IPC)
W78-05466

EFFLUENT RECYCLE PRACTICES IN GROUNDWOOD/NEWSPRINT OPERATIONS,
Envirocon Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 3E.
W78-05468

REDUCTION OF SOLIDS AND FIVE-DAY BOD LOSSES THROUGH PROCESS MODIFICATION AND PHYSICO-CHEMICAL PRIMARY TREATMENT AT FRASER PAPER LTD,
Fraser Companies Ltd., Edmundston (New Brunswick).
D. L. Bishop, and D. J. Cannan.
In: Canadian Pulp and Paper Association Environment Improvement Conference, November 1-3, 1977, Moncton, New Brunswick, Preprints (CPPA Technical Section, Montreal), p 73-79. 3 fig, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Water conservation, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Suspended solids, Biochemical oxygen demand, Maine, Water pollution control, Water reuse, Recycling, Treatment facilities, Water purification, Sulfite liquors, White water(Paper machines), Starch, Aluminum sulfate, Sodium aluminate.

Solids and BOD losses in the effluent at Fraser Paper Ltd. in Madawaska were reduced to meet Maine's new environmental requirements. Water conservation measures (viz., a common white water collection system, recycling of vacuum pump seal waters, elimination of fresh water from headbox, deckle, and other showers, etc.) reduced the effluent flow to the primary clarifiers from 29 to 26 million gal/day (mgpd) and the solids loading from 89,400 to 48,000 lb/day by January 1976. Further process modifications are expected to reduce total effluent flow to 18 mgpd. Groundwater filtrate, unbleached sulfite water, and starch losses from the repulping of size-press and dry-end broke were identified as the major contributors to BOD. The primary clarification system is described in detail. The effluent is pretreated with 10 ppm alum and 15-20 ppm Na aluminate to improve settleability in the clarifiers. From January to July 1977, the reduction in solids in the clarified effluent averaged 91.5%. (Swichtenberg-IPC)
W78-05469

ENVIRONMENTAL DESIGN PARAMETERS FOR A MODERN SULFITE MILL,
Fraser Companies Ltd., Edmundston (New Brunswick).
P. W. Schriver.
In: Canadian Pulp and Paper Association, Environment Improvement Conference, November 1-3, 1977, Moncton, New Brunswick, Preprints (CPPA Technical Section, Montreal), p 81-85. 1 fig, 3 ref, 4 tab.

Descriptors: *Water pollution control, *Water conservation, *Pulp and paper industry, Water pollution sources, Wastes, Industrial wastes, Biochemical oxygen demand, Effluents, Evaporators, Bleaching wastes, Sulfite liquors, Cooling water, *Sulfite pulp mills, Closed system, Condensates, Spent pulping liquors, Sulfur dioxide, Acetic acid.

Environmental considerations are outlined from the conversion of Fraser Co. Ltd's ammonia-base sulfite pulp mill in Edmundston, New Brunswick, to a Mg-base bisulfite pulping operation with a 600-air-dry ton/day in a flow of 40.5 million gal/day (mgpd) to the primary and secondary effluent treatment facilities. Closing up of the bleach plant and boxboard machine are expected to reduce flow to the effluent treatment system to 21 mgpd. Neutralization of weak liquor at the evaporators (to decrease the volatility of acetic acid) and reuse of evaporator condensates (as quench water for cooking hot boiler gases and as makeup for the sulfur dioxide absorption system) are expected to reduce the BOD loading by 35%. (Swichtenberg-IPC)
W78-05470

DETOXIFICATION OF WOODROOM EFFLUENTS USING PHYSICAL-CHEMICAL TECHNIQUES,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong.
In: Canadian Pulp and Paper Association, Environment Improvement Conference, November 1-3, 1977, Moncton, New Brunswick, Preprints (CPPA Technical Section, Montreal), p 111-118. 4 fig, 9 ref, 12 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Toxicity, Wood wastes, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Bark, Ozone, Oxygen, Polyelectrolytes, Foreign countries, Canada, Biochemical oxygen demand, Suspended solids, Costs, Water pollution control, *Woodroom effluents, Newsprint mills, Aluminum sulfate.

The paper mill effluent is often nontoxic and woodroom effluent is extremely toxic in newsprint mills in eastern Canada with stone or refiner groundwood operations. Bark char from hog-fuel furnaces, alum, ozone, oxygen, and polyelectrolytes were used separately and in various combinations (e.g., alum and polyelectrolyte, bark char and polyelectrolyte, ozone and polyelectrolyte) to selectively treat samples of wood room effluents from Canadian mills. Toxicity, BOD and suspended solids were determined following treatment. Ozone, alum, and/or polyelectrolyte was more effective than bark char for the detoxification of woodroom effluent. Preliminary cost estimates for the ozone-polyelectrolyte approach gave an operating cost of ca. $0.45/metric dry ton of newsprint. (Swichtenberg-IPC)
W78-05472

STEAM STRIPPING OF CONDENSATES FOR REMOVAL OF ODOR, FIVE-DAY BOD, TOXICITY AND FISH TAINTING PROPENSITIES,
B. C. Research Ltd., Vancouver.
L. A. Gutierrez, J. C. Mueller, and C. C. Walden.
In: Canadian Pulp and Paper Association, Environment Improvement Conference, November 1-3, 1977, Moncton, New Brunswick, Preprints (CPPA Technical Section, Montreal), p 119-124. 18 ref, 8 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Odor, *Biochemical oxygen demand, *Taste, *Toxicity, *Fish, Wastes, Industrial waste, Water pollution sources, Waste treatment, Water pollution treatment, Phenols, Foreign countries, Canada, Steam, Sulfur compounds, Pulp and paper industry, Effluents, Water pollution effects, *Kraft mills, Condensates, Stream stripping.

Contaminated condensates contributed up to 20% of 5-day BOD, 20% of phenolic compounds, and 30% of toxicity to the total pollution load of an interior British Columbia bleached kraft mill. Steam stripping at low steam/condensate ratios (5.6%) effectively removed total reduced sulfur (95%), but 5-day BOD reductions were negligible (less than 5%). A survey of 5 mills operating steam strippers over a steam/condensate ratio range of 5.6-14.4% indicated great variability in phenolics removal (0.4-61%) and in toxicity removal (59-93%). This variability depended upon the design of the system (e.g., whether or not a rectification system was included). Steam stripping of contaminated condensates did not appreciably reduce the fish flesh-tainting propensities (due to phenolic loading) or the toxicity of total mill effluents. Coupled with poor phenolics removal from the condensates, appreciable phenolics loading was indicated in other process sewers (e.g., condensates from intermediate evaporator effects and brown stock washing losses). Observed toxicity removal was associated with total reduced sulfur removal. (Swichtenberg-IPC)
W78-05473

EVALUATION AND DESIGN OF MULTIPLE EFFECT EVAPORATION SYSTEMS FOR KRAFT BLACK LIQUOR,
Idaho Univ., Moscow. Dept. of Chemical Engineering.
L. Edwards, and R. Baldus.
In: TAPPI Engineering Conference, Atlanta, Georgia, September 19-22, 1977, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 141-145. 7 fig, 9 ref, 3 tab.

Descriptors: *Pulp wastes, *Evaporators, *Model studies, *Waste water treatment, Wastes, Industrial wastes, Water pollution sources, Design, Computer models, Computer programs, Steam, Pulp and paper industry, Effluents, Evaporation, Water pollution treatment, Dissolved solids, Temperature, Water conservation, Vapor pressure, *Black liquor.

Evaluation of the operating status of an existing evaporator plant (110 tons/hr capacity) was simplified by using the modular computer simulation system GEMS (acronym for General Energy and

Mateials-Balance System). The performance of each effect was determined from easily acquired mill data such as vapor temperatures and the dissolved solids concentration entering and leaving the plant. Parallel effects on the steam side presented no calculational problems. Modification of the existing evaporator plant by addition of another effect of equal area resulted in an increase in steam economy from 4.9 to 5.6 with little change in the capacity. Doubling the area of the additional effect resulted in a discharge concentration of 54.1%, a 4.5% increase in capacity. New technology such as vapor recompression and blow heat recovery was easily evaluated. An analysis of vapor recompression showed a steam economy of 8.2 when concentrating a stream from 13.9% to 18.3% solids. Plant expansions and new technology can be studied in detail eliminating costly trial and error methods in the mill. (Witt-IPC)
W78-05475

RECENT DEVELOPMENTS IN BLACK LIQUOR EVAPORATION (WITH 'REFERENCE TO INDIAN INDUSTRY',
Larsen and Toubro Ltd., Bombay (India).
K. Venkatramanan, and V. M. Mahagaonkar.
Ippta (Journal of the Indian Pulp and Paper Industry Technical Association), Vol. 13, No. 4, p 345-349, October/November/December, 1976. 2 fig.

Descriptors: *Evaporators, *Pulp and paper industry, *Pulp wastes, Equipment, Foreign countries, Research and development, Foreign research, Computer programs, Computer models, Water pollution sources, Wastes, Industrial wastes, Waste water treatment, Evaporation, Rheology, Physicochemical properties, Effluents, Hardwood, Grasses, Deciduous trees, *Black liquor, India, Kraft mills, Bagasse, Bamboo, Eucalyptus trees.

The research and development program at Larsen and Toubro Ltd., (Bombay, India) is attempting to determine the features of kraft mill black liquor evaporation which are unique to the Indian pulp and paper industry. Following studies of the physicochemical and rheological properties of black liquor, a computer program was developed to aid in the selection of evaporators. An evaporator with forced circulation was designed for high-viscosity black liquors, such as those derived from the sulfate digestion of grasses, bamboo, bagasse, eucalypts and mixed hardwoods. (Swichtenberg-IPC)
W78-05477

CONTRIBUTION TO THE DETOXIFICATION OF EFFLUENTS FROM THE SERIAL SYNTHESIS OF OXETANES, (IN FRENCH),
Paris-7 Univ. (France). Serv. Secur. Trav.
M. Halary-Marchat, and G. Casteignau.
Water Res 11 (1), p 57-64, 1977.

Descriptors: *Effluents(Detoxification), *Oxetanes synthesis, Biodegradation, *Waste water treatment, Acid hydrolysis, Kinetics, Toxicity, *Biological treatment.

The investigation concerns the purification of waste water from reactors where the -3.3 dialkyloxetanes are synthesized. After a study of the kinetics of acid hydrolysis of oxetane effluents, leading preferentially to formation of recyclable biodegradable diols-1,3 treatment is envisaged along 2 different processes, either biological or chemical-biological, with recovery of organic compounds and recycling with practically quantitative efficiencies. Copyright 1977 Biological Abstracts, Inc.
W78-05478

ECONOMIC ASSESSMENT OF WASTE WATER AQUACULTURE TREATMENT SYSTEMS,
Central State Univ., Edmond, OK. Dept. of Economics.
J. B. Henderson, F. S. Wert, and R. Jarman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 179, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-293, December, 1976. 107 p, 3 fig, 19 tab, 75 ref, 1 append. 1BC611, R803623.

Descriptors: *Cost-benefit analysis, *Feasibility, Aquatic animals, Southwest U.S., Municipal wastes, Waste water treatment, Tertiary treatment, Water quality, Sewage treatment, Aquiculture, Cost-effectiveness, Fish culture, Waste water utilization.

The economic viability of aquaculture as an alternative to conventional waste water treatment systems for small municipalities in the Southwestern region of the United States was investigated in a multiple water quality objective level cost-effectiveness model, which examined 15 waste water treatment strategies (11 with aquaculture systems and 4 without aquaculture). Estimates were made of the technical effectiveness and the present value of costs for all strategies. Estimates of the current value of revenues derived from sale of products produced in the aquaculture systems were made, and the impact of such revenues on total costs was analyzed. In all cases, when aquaculture was deemed capable of achieving a given water quality objective, the aquaculture system compared to a conventional system was cost effective. The cost differentials between aquaculture and conventional strategies were highly significant, ranging from 3.8% to 94%. While data limitations do exist, especially in the area of water quality estimates, it was concluded that aquaculture systems are low cost alternatives to conventional waste water treatment systems. The appendix contains schematics of treatment strategies. (Wares-IPA)
W78-05488

WASTEWATER SAMPLING, TRANSFER AND CONDITIONING SYSTEM,
Raytheon Co., Portsmouth, RI.
L. S. DiCola.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 906, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-146, October 1976. 70 p, 20 fig, 6 tab, 4 ref, 4 append. ROAP 21-ASC; 1BB043; Task No. 20, 68-03-0250.

Descriptors: *Waste water(Pollution), *Waste water treatment, *Sewage, *Sampling, *Transfer, Automation, Automatic control, Operations, Chemical analysis, Computers, Research equipment, Process control, Sample transport system, Waste streams.

The construction and field evaluation of an automatic on-line hardware system for reliably sampling, transferring, and conditioning various wastewater treatment process streams are described. The treatments were designed so that the resulting transferred and conditioned samples would be suitable for interfacing with automatic on-line colorimetric and total organic carbon analyzers. Process streams to which this hardware system was successfully applied include raw sewage, primary effluent, secondary effluent, aeration tank mixed liquor, and return activated sludge. Analytical parameters used to evaluate the hardware system included both total and soluble organic carbon, orthophosphate, total hydrolyzable phosphate, and ammonia nitrogen. Results indicated that various streams within a typical municipal wastewater treatment plant can be monitored remotely and reliably. Recommendations are made for including such hardware systems in future plant expansions, in new plants, and as a portable installation at existing plants. The appendices contain information on statistical analysis, operation and maintenance, design specification guidelines, and equipment lists for the system evaluated. (Wares-IPA)
W78-05489

VIRUSES IN WASTE, RENOVATED, AND OTHER WATERS, 1975 LITERATURE ABSTRACTS.
Environmental Monitoring and Support Lab. Office of Research and Development.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 907, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/9-76-019, October, 1976, G. E. Berg, Ed. 30 p.

Descriptors: *Viruses, *Abstracts, Wastewater, *Waste water treatment, *Public health, Microorganisms, Aquatic microbiology, Aquatic microbiology, Water sewage, *Renovated water.

Abstracts of 102 published papers and books on viruses in waste, renovated and other waters are presented. (Seip-IPA)
W78-05490

CATALYTIC OXIDATION OF SULFIDE WASTE WATER FROM A CELLULOSE SPONGE-MAKING OPERATION,
Minnesota Mining and Mfg. Co., St. Paul.
R. A. Paschke, Y. S. Hwang, and D. W. Johnson.
Journal Water Pollution Control Federation, Vol. 49, No. 12, p 2445-2452, December, 1977. 4 fig, 7 ref, 1 append.

Descriptors: *Oxidation, *Catalysts, *Treatment facilities, *Chemical wastes, *Sulfides, Hydrogen ion concentration, Industrial wastes, Waste water treatment, Pilot plants, Aeration.

Laboratory and field tests were conducted to evaluate various waste water treatment processes for spent rinse water from a cellulose sponge plant operated by the 3M Company which contained about 200-300 mg/liter of sulfides. A catalytic oxidation system in which the sulfides in the waste water were oxidized in the presence of a catalyst, such as manganese sulfate or potassium permanganate, was selected on the basis of test results. A full-scale sulfide oxidation system consisting of a 17,000-gal surge tank followed by two 15,000-gal aerated reactors was constructed. Full-scale operation since 1975 has verified that sulfide wastes from cellulose sponge manufacturing can be successfully treated by pH adjustment to 8.5 and aeration in the presence of a manganese salt catalyst for a 1-2 hour period. Under these conditions, 90% of the sulfide was oxidized, yielding a total concentration in treated effluent of less than 9 mg/liter. A procedure was developed for measuring sulfide concentrations in waste water. (Schulz-FIRL)
W78-05492

TREATING AQUEOUS EFFLUENT TO REMOVE MERCURY--BY OXIDISING TO DIVALENT STATE AND EXTRACTING WITH AN ORGANIC SOLUTION.
Netherlands Patent NL 7704-650. Issued November 1, 1977. Derwent Netherlands Patents Report, Vol. Y, No. 46, p 3, October-November, 1977.

Descriptors: *Mercury, *Patents, *Chlorides, *Industrial wastes, *Pulp and paper industry, Paints, Agricultural chemicals, Water pollution sources, Chemical wastes, Waste water treatment.

An oxidation process for the removal of mercury from industrial waste water has been patented. Mercury in waste water is first reduced to a divalent state with an oxidizing agent: a reducing agent is used to remove the remaining oxidizing solution. The waste is then treated with an organic solution which contains a mercury-extracting agent. After the treated water is discarded, an aqueous chloride solution is used to recover the mercury as a concentrated mercury (II) chloride solution. Although the process is particularly useful for waste water from chlorine manufacture by mercury cathode electrolysis of sodium chloride,

it may also be applicable to the pharmaceutical, agriculture, paper, and paint industries. (Lisk-FIRL)
W78-05493

REMOVALS OF NONIONIC SURFACTANTS IN WASTE-WATER (HAISUI CHU NO HIION KAIMENKASSEIZAI NO JOKYO),
F. Yokota.
Kogai (Pollution Control), Vol. 12, No. 6, p 1-6, 1977. 6 fig, 3 tab, 9 ref.

Descriptors: *Surfactants, *Clays, *Montmorillonite, *Diatomaceous earth, *Zeolites, Adsorption, Waste water treatment, Industrial wastes, Isotherms, Water pollution sources.

The adsorption properties of five varieties of clay were evaluated for their ability to remove nonionic surfactants from waste water. Surfactants used in batch tests included: polyethylene glycol monolaury ether, polyoxyethylene alkylphenol ether, and polyoxyethylene sorbitan monostearate. Clays included: acid clay, montmorillonite, diatomaceous earth, clinoptilolite, and P-zeolite. Acid clay and montmorillonite were more effective at adsorbing surfactants than other varieties of clay. Acid clay was found to have the fastest adsorption rate, requiring 10-20 min in batch tests for effective removal of surfactants from waste water. Results of Freundlich adsorption isotherm tests verified that acid clay would be an effective medium for adsorption treatment of industrial waste water. (Lisk-FIRL)
W78-05494

TECHNOLOGICAL ECONOMICS APPLIED TO WASTE RECOVERY AND TREATMENT PROCESSES,
Aston Univ., Birmingham (England). Dept. of Chemical Engineering.
A. V. Bridgewater.
Effluent and Water Treatment Journal, Vol 17, No 11, p 589, 591, 593, 595-597, November, 1977. 1 fig, 6 tab, 7 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Economic feasibility, *Capital costs, *Cost comparisons, Capital costs, Operating costs, Economic efficiency, Return(Monetary), Risks, Industrial wastes.

Methods for the economic evaluation of waste treatment plant construction and operation are discussed. Evaluation of alternate waste treatment facilities may be made by the comparison of capital outlay with the rate of return from the plant. Evaluation techniques based on return on investment, incremental return on investment, and payback time are considered unrealistic because they rely on a return income which a treatment facility does not supply. The evaluation method considered to the most feasible for financial consideration of alternate treatment plants is net present worth. Net present worth is calculated from a summation of the present worths of income and the expenditure. Present worths and expenditure values are extrapolated for the expected life span of the facility. The net present worth technique is applied to an industrial waste treatment system designed to recover up to 200 tons/yr of copper from waste electrolysis solutions. The net present worth system provides a basis for comparison of alternate waste treatment facilities in situations where no income will be realized. (Lisk-FIRL)
W78-05496

TREATMENT OF ELECTROLESS NICKEL PLATING RINSE WATERS,
Agricultural Research Service, Peoria, Il.. Regional Research Lab.
R. E. Wing, W. E. Rayford, and W. M. Doane.
Metal Finishing, Vol 76, No 1, p 54-57, January, 1978. 6 tab, 27 ref.

Descriptors: *Nickel, *Lime, *Sodium compounds, *Industrial wastes, *Waste water treatment, Flocculation, Chemical precipitation, Liquid wastes, Sludge treatment, Reduction(Chemical).

Various treatment processes for electroless nickel plating rinse waters were compared in studies with several synthetically prepared and commercial baths. Solutions containing 10-500 ppm N; were contacted for 30 min with various concentrations of sodium hydroxide and ime and analyzed for residual N; concentrations after flocculation with an anionic polymer. Treatment of rinse baths with sodium hydroxide or lime at low pH proved effective in nickel removal. The lowest residual nickel concentrations were obtained from combined caustic-nickel treatment at high pH. When both sodium hydroxide and lime were used in the rinse bath treatment, polymer-treated floc settled more readily. Lime also enhanced the removal of reducing agents used in the plating process. A plating plant using a vendor U electroless nickel plating bath containing Ni+2 hypophosphite, citrate, and ammonia has reduced nickel discharge from 3.2 kg/day to 0.014 kg/day using the caustic-lime treatment at pH 12.0-12.5. The treatment was shown in laboratory experiments to be 95-98% effective on new bath rinse waters. (Lisk-FIRL)
W78-05497

SOLVENT EXTRACTION KINETICS IN THE RECOVERY OF METALS FROM EFFLUENTS AND OTHER SECONDARY SOURCES,
Leeds Univ., (England).
N. M. Rice, and M. Nedved.
Resource Recovery and Conservation, Vol 2, No 4, p 349-353, November, 1977.

Descriptors: *Separation techniques, *Kinetics, Interfaces, *Mass transfer, *Boundary processes, Solvent extractions, Industrial wastes, Chemical reactions, Waste water treatment, Copper, Iron, Nickel, *Metals recovery.

Reaction rates and extraction kinetics of the recovery of metals from waste by solvent extraction are examined. Extraction rates are limited by a slow reaction step in the process. The extraction mechanism is explained as a series of five consecutive steps occurring at the interface, including: reactant diffusion, reactant adsorption, chemical reaction, product desorption, and product diffusion. The five consecutive reactin steps are analyzed in an attempt to determine which step might be the rate controlling step. Expressions are presented for extraction kinetics where mass transfer and interfacial area do not control the rate. The effect of mass transfer is eliminated through the relaxation method. The effect of interfacial area is eliminated by operation at lower extractant concentration levels. The relaxation method allows a reaction to reach equilibrium. The equilibrium is then disturbed by a temperarure change or the addition of reactant and the rate at which equilibrium is again reached is measured. The order of reaction, the rate constant, and the rate-limiting step may be determined from analysis of these measurements. (Lisk-FIRL)
W78-05498

PURIFICATION OF WASTE WATERS WITH BIGUANIDE POLYMER--OR SALT THEREOF AS FLOCCULANT.
French Patent FR 2340-274. Issued October 7, 1977. Derwent French Patents Abstracts, Vol Y, No 47, p 4-5, January, 1978.

Descriptors: *Flocculation, *Pulp and paper industry, *Oil industry, *Chemical industry, *Patents, Industrial wastes, Solid wastes, Waste water treatment, Municipal wastes, Separation techniques, *Polymers, Salts.

A waste water treatment system using a biguanide polymer or a biguanide salt has been patented. Waste water containg suspended solids and microorganisms is treated with a biguanide polymer or salt to being about flocculation and precipitation of solids Polymer chains of different lengths are combined to form the biguanide polymer. A flotation technique is used to remove the flocculted and precipitation solids. Depending on the waste water, relatively small amounts of the biguanide polymer, as little as 0.001-0.0001%, may be effective. This method of separation is effective in the treatment of domestic wastes as well as paper, chemical, pharmaceutical, and oil industry wastes. (Lisk-FIRL)
W78-05499

ULTRAFILTRATION OF BLEACH EFFLUENTS AS AN EXAMPLE OF WASTE-WATER TREAMENT BY ULTRAFILTRATION,
Danish Sugar Corp., Nakskov. Krifttenknisk Lab.
R. F. Madsen, and W. K. Nielsen.
Desalination, Vol 24, No 1-3, p 141-154, January, 1978. 8 fig, 10 tab.

Descriptors: *Filtration, *Membrane processes, Pulp and paper industry, *Lignins, *Sulfite liquors, *Pulp wastes, Bleaching wastes, Sulfates, Separation techniques, Waste water treatment, Industrial wastes, Design data, Membranes, Equipment.

The Danish Sugar Corporation has developed a membrane filtration system that can be used in the filtration of lignosulfonates from spent sulfite liquors and for colored compounds from bleach effluents from the pulp and paper industry. Ultrafiltration was used to fractionate glue-lignosulfonate, dispersing means, and raw materials from spent sulfite liquor. Combined ultrafiltration and diafiltration produced a very pure lignosulfonate. Hyperfiltration of dilute spent sulfite liquor at low concentrations reduced by the BOD by 94%. An integrated ultrafiltration-hyperfiltration-biological treatment system was devised. Ultrafiltration of bleach effluent was effective in reducing color by 95%, BOD by 30-40%, and COD by 90%. The membrane filtration system developed by the Danish Sugar Corporation contains plate-and-frame ultrafiltration modules which can be connected in series to provide large-scale, continuous treatment. Cost estimates for the treatment of 10 cu m of waste water per con of pulp were projected at $58,000 for equipment acquisition at an operating cost $2.80/ton. (Lisk-FIRL)
W78-05500

PAPER MILL WASTE PURIFICATION--BY PASSING THROUGH FILTRATION MATERIAL CONTAINING POSITIVELY CHARGED PERLITE PARTICLES.
Soviet Patent SU-544-450. Issued February 2, 1977. Derwent Soviet Inventions Illustrated, Vol Y, No 47, p 5, January, 1978.

Descriptors: Pulp and paper industry, *Filtration, *Patents, *Waste water treatment, *Polyelectrolytes, Industrial wastes, Cations, *Pulp wastes, Separation techniques, Water purification.

A treatment process for the filtration of paper mill waste water has been patented. Perlite, used in the filter, positively charged by treatment with a cation-active polyelectrolyte. The filter media is composed of 40-60% charged perlite and 60-40% uncharged perlite. This charged perlite filter system has been found effective in the separation of finely dispersed suspensions produced by the paper industry which contain differently charged particles at less than 0.5 millimicrons in diameter. This process can be conducted in one step and has been shown to be more effective than untreated perlite alone. The filtration rate and degree of clarification were improved in laboratory experiment with a 1% iron oxide pigment suspension when the positively and negatively charged perlite filtration media were used. (Lisk-FIRL)
W78-05501

HYGIENIC ASSESSMENT OF THE USE OF PURIFIED WASTE-WATERS IN CLOSED WATER CYCLES IN CARDBOARD FACTORIES (SANITARNOGIGIENICHESKAIA OTSENKA ISPOL'ZOVANIIA OCHISHCHENNYKH STOCHNYKH VOD V ZAMKNUTYKH TSIKLAKH VODOSNABZHENIIA KARTONOVYKH FABRIK),
G. V. Seliuzhitskii, L. V. Vorob'eva, and V. A. Zhigalov.
Gigiena i Sanitariia, No. 10, p 82-85, 1977. 1 fig.

Descriptors: *Sewage bacteria, *Industrial water, *Industrial wastes, *Water reuse, *Disinfection, *E. coli, On-site data collections, Pulp and paper industry, Pulp wastes, Chlorination, Waste water treatment, Waste water disposal, Biological treatment, *Recycling.

Results of bacteriological analyses of biologically treated waste water used in a closed-loop water system in a cardboard box manufacturing operation are presented. The waste water generated by the cardboard pressing machines was treated along with other waste water streams at the plant. Treatment included primary and secondary settling, followed by chlorination. E. coli, Enterococcus, and saprophytes were constantly present in the closed-loop system, indicating that disinfection by chlorination was inadequate. The overall bacteria count ranged 10,000-100,000/ml. Cardboard produced with recycled waste water was also contaminated with E. coli. The findings indicated the need for a more efficient method of disinfection within the biological treatment process. (Takacs-FIRL)
W78-05503

APPLICATION OF HIGH-TEMPERATURE HYPERFILTRATION TO UNIT TEXTILE PROCESSES FOR DIRECT RECYCLE,
Clemson Univ., SC. Dept. of Mechanical Engineering.
C. A. Brandon, and M. Samfield.
Desalination, Vol. 24, No. 1-3, p 97-112, January, 1978. 4 fig, 3 tab, 11 ref.

Descriptors: *Textile industry, *Membrane processes, *Filtration, *Waste water treatment, *Separation techniques, Toxins, *Recycling, Organic compounds, Industrial wastes, Chemical wastes.

Membrane processes were evaluated for the recovery of textile industry waste water and chemicals and for toxic emissions control. The recovery of waste water and chemicals which reach temperatures of 100C can be accomplished with high-temperature ultrafiltration and hyperfiltration. Savings of up to 50% in the energy costs for a textile industry operation were possible with hot water recycling. On-line techniques for the separation of toxins by ultrafiltration and hyperfiltration membrane processes produced effective waste treatment and recovery. A closed-loop water system using ultrafiltration and hyperfiltration was developed for a continuous textile dyeing process. The study indicated that several varieties of membranes were capable of removing 98-99% of the toxic elements which had a molecular weight greater than 90. Membrane processes were also shown to require less energy than other separation techniques and substantial savings were realized through heat recovery. (Lisk-FIRL)
W78-05505

OPTIMIZATION OF POLYMER FLOCCULATION OF HEAVY METAL HYDROXIDES,
McMaster Univ., Hamilton (Ontario). Dept. of Chemical Engineering.
P. M. Huck, K. L. Murphy, C. Reed, and B. P. LeClair.
Journal Water Pollution Control Federation, Vol. 49, No. 12, p 2411-2418, December, 1977. 5 fig, 8 tab, 8 ref.

Descriptors: *Mine water, *Flocculation, *Polymers, *Mixing, *Heavy metals, Mine wastes, Chemical precipitation, Chemical properties, Iron, Zinc, Copper, Optimization, Alkalis(Bases), Industrial wastes, Acid mine drainage, Waste water treatment.

The polymer properties and mixing conditions required for optimum flocculation of metal hydroxides from acid mine drainage were investigated in laboratory experiments with mine water containing various concentrations of iron, zinc, and copper. Simulated mine drainage and water obtained from a mine in New Brunswick, Canada, were used to examine flocculation efficiency with respect to polymer hydrolysis and concentration, heavy metal type, sulfate concentration, and the time and speed of dispersion and flocculation. Response surface analyses were used to determine the optimum parameter values. Mixing conditions had a greater effect than polymer properties on flocculation of mine drainage which had been neutralized to pH 9.5 with lime. The degree of polymer hydrolysis did not influence the level of treatment achieved with metal-bearing mine water. The minimum required reaction time decreased substantially as the waste strength increased. Residual metal concentrations under predicted optimum conditions for flocculation were similar for simulated and natural mine waters. The optimum polymer dosage was controlled by the metal:sulfate ratio, yielding a value of .0005 times the sulfate concentration at a metal:sulfate ratio of 0.3 by weight. (Schulz-FIRL)
W78-05506

POSSIBILITIES FOR ECONOMIC RECOVERY OF METALS FROM MINE DRAINAGE AND TAILINGS IN THE FRONT RANGE, COLORADO,
Colorado School of Mines, Golden. Dept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
For primary bibliographic entry see Field 5G.
W78-05507

TREATING AQUEOUS EFFLUENT CONTAINING DISSOLVED OR DISPERSED DYE--BY ADDING MAGNESIUM OXIDE THEN SEPARATING.
Belgian Patent BE-854-688. Issued May 20, 1976. Derwent Belgian Patents Abstracts, Vol Y, No 47, p 2, November, 1977.

Descriptors: *Textiles, *Tannery wastes, *Dye dispersion, *Magnesium compounds, *Patents, Industrial wastes, *Separation techniques, Filtration, Centrifugation, Waste water treatment.

A patent has been issued for a treatment process for effluent from the textile dyeing and tanning industries. Aqueous effluent containing dissolved or dispersed dye is treated with magnesium oxide, preferably after the pH of the effuent has been adjusted to pH 6-8. A process such as decantation, filtration, or centrifugation is then used to separate the solid wastes from the liquid. The addition of magnesium oxide has also been found to be effective in the treatment of effluent from printing industries. When applied to effluent from this industry, the process has yielded favorable result in removing waxes, pastes, or vegetable oils from the waste liquid. The magnesium oxide treatment is considered more effective at color removal than conventional treatment processes. (Lisk-FIRL)
W78-05508

POLLUTION CONTROL IN TEXTILE DYEING INDUSTRY (SENSHOKU HAISUI ODOKU BOSHI GIJUTSU NI KANSURU KENKYU),
S. Owawa, T. Shirota, N. Aizaka, A. Shibuya, and J. Namiki.
Tsusansho Kogyogijutsuin Sangyo Kogai Kenkyu Choseikyoku 51 Nendo Kogai Tokubetsu Kenkyu Hokoku, Report of 1976 Pollution Special Research by Industrial Pollution Research Coordinative Bureau, Agency of Industrial Science and Technology, p 46-1 - 46-11, 1977. 17 fig, 2 tab, 13 ref.

Descriptors: *Textiles, *Dye dispersion, *Industrial wastes, *Solvent extractions, *Waste water treatment, Cellulose, Resins, Waste water disposal, Dyes, *Recycling, Model studies.

Methods of closed system, non-aqueous dyeing and pollution control for the textile industry have been examined by the Research Institute for Polymers and Textiles in Japan. A system model characterizing pollution sources in waste water based on input and output factors was devised. The model established patterns of variation of dyeing wastes in the water. Simulation tests with the model, waste water control could be accomplished by scheduling of dyeing processes. The properties of organic solvents used in the dyeing of synthetic fibers were studied and proper dyeing procedures were established. It was discovered that concurrent dyeing and finishing of cellulosic fibers could be achieved through the application of new reactive dyes and finishing resins in conjunction with high-frequency heating. (Lisk-FIRL)
W78-05509

KINETICS AND MECHANISM OF PHENOL ADSORPTION OF FLYASH,
Roorkee Univ., (India). Dept. of Civil Engineering.
P. Khanna, and S. K. Malhotra.
Indian Journal of Environmental Health, Vol 19, No 3, p 224-237, 1977. 11 fig, 1 tab, 11 ref, 1 append.

Descriptors: *Activated carbon, *Fly ash, *Industrial *Waste treatment, *Adsorption, *Phenols, Oil industry, Chemical wastes, Silicas, Aluminum, *Kinetics.

The kinetics and mechanisms of flyash removal of phenols from industrial effluents were investigated in batch studies which considered the phenol concentration in solution, the quantity of flyash added, the time of contact between adsorbate and adsorbent, and the pH of the solution. Phenols are found in wastes from industries such as synthetic rubber plants, oil refineries, steel mills, plastic plants, and coking plants. Activated carbon has been shown to be an effective adsorbent of phenol, but it is difficult to obtain and prohibitively priced in India. Flyash contains oxides of silica, aluminum, iron, and unincinerated carbon as a waste of thermal power production. The adsorptive capacity of flyash was found to increase at pH<10. Comparisons of the adsorption properties of activated carbon and flyash revealed carbon to be 3.6 times more adsorbent than flyash. The surface area of activated carbon was more than three times that of flyash. The maximum adsorption capacity of activated carbon would be 500-700 times greater than that of flyash, although activated carbon was about 20 times more expensive than flyash. (Lisk-FIRL)
W78-05510

TREATMENT OF PULP MILL EFFLUENTS,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec). (Assignee).
A. Wong, S. Prahacs, and J. Dorica.
United States Patent 4,008,161. Issued February 15, 1977. Official Gazette of the United States Patent Office, Vol. 955, No. 3, p 937, February, 1977.

Descriptors: *Pulp wastes, Pulp and paper industry, *Oxidation, *Clarification, *Patents, Industrial wastes, Chemical precipitation, Sludge treatment, Effluents, Activated carbon, Waste water treatment.

A patent has been issued for a multistep physical-chemical method for the treatment of pulp mill effluents. The process involves adsorption, catalytic

oxidation, and chemical precipitation of kraft pulp mill effluent which contains undesirable solid materials in suspended and/or dissolved form. Catalytic oxidation is brought about by passing oxygen-containing air through the waste water at a rate of 0.05-5.0 scfh/liter while the waste water is in contact with fine activated carbon at a concentration of 10-8000 mg/liter. A clarifying agent in the form of a coagulant, flocculant, and/or a polyelectrolyte is then added to produce chemical precipitation of undesirable materials. The polyelectrolyte concentration should be in the range of 0.1-20 mg/liter, while the coagulant and/or flocculant should be in the range of 10-2000 mg/liter. Gravitation, flotation, or centrifugation can then be used to separate out the suspended solids in the form of sludge. (Schulz-FIRL)
W78-05525

SELF-MONITORING PROCEDURES: BASIC PARAMETERS FOR MUNICIPAL EFFLUENTS.
Environmental Protection Agency, Cincinnati, OH. Municipal Permits and Operations Div.
For primary bibliographic entry see Field 5A.
W78-05528

WASTE WATER VALVE,
M. Varis, and K. Nordberg.
United States Patent 4,057,076. Issued November 8, 1977. Official Gazette of the United States Patent Office, Vol. 964, No. 2, p 428, November, 1977. 1 fig.

Descriptors: *Hydraulic valves, *Patents, *Equipment, *Sewage disposal, *Valves, Design data, Conveyance structures, Sewage treatment, Waste water treatment.

A patent has been issued for a waste water valve arrangement to be used in conjunction with a vacuum sewage disposal system. The valve arrangement includes a waste water collection chamber having: a waste water inlet; a closure member, to close the outlet passage and connect the collection chamber and the vacuum system; and a pressure-controlled device for operation of the closure system. A float, which is displaced by liquid level variations in the collection chamber, controls a pilot valve. The pilot valve is then used to control the vacuum in the sewage disposal system. (Schulz-FIRL)
W78-05529

NATIONAL WATER SUPPLY AND IMPROVEMENT ASSOCIATION (NWSIA): WATER REUSE AND DESALINATION FOR THE FUTURE.
National Water Supply and Improvement Association, Ipswich, MA.
For primary bibliographic entry see Field 3A.
W78-05532

SLUDGE CONCENTRATOR AND CONDITIONER,
A. Blok.
United States Patent 4,062,776. Issued December 13, 1977. Official Gazette of the United States Patent Office, Vol. 965, No. 2, p 638-639, December, 1977. 1 fig.

Descriptors: *Sludge treatment, *Filtration, *Flocculation, *Separation techniques, *Patents, Design data, Equipment, Liquid wastes, Polymers, Waste water treatment.

A device for sludge concentration and conditioning has been patented. Sludge and a flocculating polymer are introduced into the large inlet of a conical contact chamber. The contact chamber includes baffles mounted lengthwise on the inside of the chamber and weirs set end-to-end around the inside wall of the cone. The chamber rotates to mix the sludge and polymer, producing floc and filtrate. The mixture passes through a small outlet and into a conical screen drum through a large inlet. The conical screen drum, or concentrator chamber, rotates on a slightly inclined vertical support. The mixture's movement through the concentrator is slowed by a helical vane mounted on the inside of the drum. As the mixture moves toward the restricted outlet, the filtrate escapes through the screen of the chamber and floc is conveyed to the outlet by the drum's rotation and angle. A conduit connects the outlet of the contact chamber to the inlet of the concentrator. (Lisk-FIRL)
W78-05535

TRANSLATION OF REPORTS ON SPECIAL PROBLEMS OF WATER TECHNOLOGY, VOLUME 9 - ADSORPTION.
Karlsruhe Univ., (West Germany). Dept. of Water Chemistry.
For primary bibliographic entry see Field 5F.
W78-05544

PILOT-PLANT DEMONSTRATION OF WET OXIDATION FOR TREATMENT OF SHIPBOARD WASTEWATERS,
Barber-Colman Co., Santa Ana, CA. Resource Recovery Systems Div.
D. W. Bridges, and W. M. Fassel.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-028 812, Price codes: A18 in paper copy, A01 in microfiche. Report No CG-D-34-76, November, 1975. 398 p, 54 fig, 92 tab, 49 ref, 10 append. 4322.2.2. DOT-CG-31323-A.

Descriptors: *Oxidation, *Sewage treatment, *Waste water treatment, Ships, Prototypes, Research and development, Testing, Evaluation, Ammonium compounds, Water pollution control, Coast Guard, *Wet oxidation of waste water, Flushants, Pilot systems.

Two evaluation processes for the feasibility of wet oxidation for shipboard waste water treatment are demonstrated: (1) acidic wet oxidation of waste water and direct discharge of the effluent; and (2) ammoniacal wet oxidation and recycling of toilet flushings. Fifty gallon batches of waste water were treated in a full-scale (20-man) prototype system. Wet oxidation was effected in a continuous flow horizontal autoclave in which waste water and air were reacted concurrently in a series of stirred chambers. Percentage reduction in chemical oxygen demand ranged from about 65 to 95 in tests conducted on body sewage and simulated wastewaters from the galley and bilge. Laundry water proved indestructible; sodium lauryl sulfate, the most prevalent detergent, was unaffected. An engineering design is presented for a 20-man shipboard waste treatment system in which body sewage and solid galley waste are conducted through the reactor in an ammoniacal liquor which is recycled as flushant to recirculating toilets. Residual inorganic solids are removed by filtration. Steam is vented continuously to maintain a constant volume, and heat to sustain the process is drawn from exhaust gases from the ship's engines. The system can be operated for 60 days before the flushant must be changed and the accumulated solids removed from the filter. Appendices contain data on waste treatment test evaluation, batch data from experiments, estimation of performance, and demonstration of the system. (Wares-IPA)
W78-05545

HANDBOOK OF PROCEDURES, CONSTRUCTION GRANTS PROGRAM FOR MUNICIPAL WASTEWATER TREATMENT WORKS.
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 649, Price codes: A03 in paper copy, A01 in microfiche. EPA Handbook, February, 1976. 178 p, 3 fig, 4 append.

Descriptors: *Federal Water Pollution Control Act, *Water quality standards, *Regulation, *Standards, *Waste water treatment, Water policy, Legal aspects, Legislation, Grants, Planning, Design, Construction, Water quality, Water pollution, Public Law 92-500(PL 92-500), Public Law 84-660(PL 84-660), Construction grants program

This handbook identifies and explains in sequence the many procedures to be followed by Regional Offices and States in bringing municipal wastewater treatment projects from their conception to completion. The Handbook establishes uniform national operating standards which can be readily adopted and delineates specific tasks to be carried out in processing applications and monitoring grantee efforts. It describes actions necessary to the administration of the construction grants program under Public Law 92-500 of 1972 (a law which supersedes and augments the Federal Water Pollution Control Act of 1956) and other pertinent laws, rules, and regulations. The Handbook begins functionally with recommendations for the preapplication conference and proceeds through the completion of construction, including start-up and operation and maintenance requirements. Review procedures are separated into administrative and technical requirements and grouped together wherever possible. Chapters IV-VI describe the processing procedure for grant applications for Step 1 (Planning), Step 2 (Design), and Step 3 (Construction) projects. Chapter VII deals with financial considerations and information common to the processing of each category of grant, including eligibility costs and the processing of payment requests. (Seip-IPA)
W78-05546

DETECTION AND INACTIVATION OF ENTERIC VIRUSES IN WASTEWATER,
Hebrew Univ., Jerusalem (Israel). Environmental Health Lab.
H. I. Shuval, and E. Katzenelson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 210, Price codes: A14 in paper copy, A01 in microfiche. Report No. EPA-600/2-77-095, May 1977. 287 p, 39 fig, 31 tab, 246 ref. S-800990 (formerly 17060 EAM).

Descriptors: *Viricides, *Viruses, *Ozone, *Waste water treatment, Assay, Analytical techniques, Laboratory tests, Spectrophotometry, Water quality, Chlorine, Effluents, *Virus assay, *Enteric viruses, *Virus inactivation, Concentrating techniques, Fluorescent antibody technique, Cellulose nitrate membranes, Aluminum hydroxide, PE-60, Hollow fiber membranes.

Studies conducted between October 1969 and January 1975 on the development and evaluation of methods for concentrating and assaying low levels of viruses in large volumes of water as well as studies on the use of ozone in inactivating viruses in water and wastewater are reported. Of the eight virus concentration methods evaluated, filtration with cellulose nitrate membranes, aluminum hydroxide and PE-60 proved most promising. The feasibility of using hollow fiber membranes was demonstrated. A rapid method capable of detecting viruses in water in less than 24 hours using fluorescent antibodies was developed. A spectrophotometric method of detecting low concentrations of ozone in small (10 ml) samples of water was developed. Kinetic studies show that ozone inactivates enteroviruses more rapidly than chlorine under comparable conditions. With a 0.3 ppm residual, ozone inactivates 99% of seeded poliovirus in clean water in less than 10 seconds as compared to 100 seconds for chlorine. Although no detectable dose-response relationship could be demonstrated for ozone contact times greater than 10 seconds, preliminary studies indicate that such a relationship may exist for shorter contact times. The kinetic curve of virus inactivation having a rapid first stage lasting seconds followed by a slower stage lasting minutes may be associated

with virus clumping phenomenon. Ozone has been shown to kill viruses rapidly and effectively in wastewater effluent. (Seip-IPA)
W78-05548

DESIGN PROCEDURES FOR DISSOLVED OXYGEN CONTROL OF ACTIVATED SLUDGE PROCESSES,
Brown and Caldwell, Walnut Creek, CA.
M. J. Flanagan, and B. D. Bracken.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 960, Price codes: A11 in paper copy, A01 in microfiche. Report No. EPA-600/2-77-032, June, 1977. 217 p, 86 fig, 31 tab, 47 ref, 1 append. 68-03-2130.

Descriptors: *Dissolved oxygen, *Activated sludge, *Sludge treatment, *Aeration, *Automation, *Cost analysis, Economics, Costs, Operating costs, Capital costs, Maintenance costs, Manual control, Automatic control, Control systems, Equipment, Performance, Operations, Design, Maintenance, Application methods, Waste water treatment, Waste treatment, Sewage treatment, Water purification, Instrumentation, *Aeration equipment, *Activated sludge treatment plants, *Cost effectiveness, Economic analysis, Manual dissolved oxygen control, Automatic dissolved oxygen control, Control equipment.

Design procedures and guidelines for the selection of aeration equipment and dissolved oxygen (DO) control systems for activated sludge treatment plants are presented. Process configurations and design parameters are reviewed to establish system requirements. Aeration methods, equipment and application techniques, design systems, and control system selection procedures are examined. Recommendations for system applications to various aeration equipment types and process configurations are described. Performance, operational and maintenance data for aeration equipment and DO control systems for 12 activated sludge plants are presented in the appendix. Automatic DO control systems for various size hypothetical activated sludge system configurations are presented to develop an economic analysis of manual and automatic DO control. Conclusions indicate that capital and operating costs of automatic DO control systems are justified for activated sludge plants larger than 1 mgd (44 dm3/s) only if equipment is selected and applied in accordance with guidelines of the design manual and a power cost is applicable which is equal to or greater than the national average power rate. Areas in which further research is indicated are discussed. (Seip-IPA)
W78-05549

INVESTIGATION OF A HONEYWELL DISSOLVED OXYGEN PARAMETRIC SYSTEM,
Environmental Monitoring and Support Lab., Cincinnati, OH. Instrumentation Development Branch.
A. F. Mentink, J. O. Patterson, and T. E. Hickman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 564, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-600/4-77-023, April, 1977. 111 p, 49 fig, 17 tab, 43 ref, 2 append.

Descriptors: *Dissolved oxygen, *Activated sludge, *Sludge treatment, *Instrumentation, *Testing, *Theoretical analysis, *Measurement, Water pollution, Waste water treatment, Waste treatment, Sewage treatment, Water purification, *Honeywell DO Parametric System, Millivolt to voltage converter function transmitter, Sensor, Aeration tank.

A Honeywell dissolved oxygen parametric system (consisting of an in situ sensor assembly, 50 feet (15 m) of four-conductor shielded cabling and a millivolt to voltage converter function transmittor was investigated for possible application in EPA's research on sewage treatment. Functional layout and circuit diagrams and accumulated laboratory and field data are presented. Sensor and MV/V problems and maintenance requirements are described; manufacturer, prospective and final user recommendations are made. Summaries on selected background and theoretical aspects of the measurement are included. The system is functionally adequate and can be productively employed in a treatment process provided the manufacturer's instructions are followed. (Seip-IPA)
W78-05552

AIR MOBILE WASTEWATER RECLAMATION UNIT - 200 HOUR SERVICE TEST,
Army Mobility Equipment Research and Development Center, Fort Belvoir, VA. Sanitary Sciences Div.
J. G. Vlahakis.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A007 006, Price codes: A03 in paper copy, A01 in microfiche. Final Report No. AFCEC-TR-75-5, February 1975. 24 p, 7 fig, 5 tab, 4 ref. 64721F/2054/02 04, MIPR No. FICECS 4108.

Descriptors: *Laundering, *Water reuse, *Recycling, *Waste water treatment, Domestic waste, *Water purification, Waste water, Filtration, Liquid wastes, Hydrogen ion concentration, Turbidity, Biochemical oxygen demand, Detergents, Conductivity, Activated carbon, Diatomaceous earth, *Biological oxygen demand, *Total organic carbon, ERDLator, Waste water recycling unit, Cationic polyelectrode feeder, Jar tests, Air mobile.

In order to test the feasibility of treating laundry wastewater, such water was synthesized from several commercial laundry detergents and lubricating oil. A 200-hour service test was conducted on a 10,000 gallon-per-day prototype air mobile wastewater reclamation and recycling unit utilizing powdered activated carbon and cationic polyelectrode feeders, a mixing tank, a modified standard military water purification unit, and a diatomaceous earth filter. Adsorption-coagulation jar tests were performed to determine optimum type and dosages of carbon and polyme to be used in the unit; procedures, results, and data are presented. Treated wastewater was tested for turbidity, pH, detergent level, biochemical oxygen demand (BOD), conductivity, total organic carbon (TOC), and heavy metals; data are presented in tabular form. Conductivity, phosphate, and sulfate accumulations occur in feed and product water as a function of number of times water is recycled. Turbidity, detergent level, TOC, and BOD build-up in the product do not occur. Unit cost, based on a production buy of 10 to 25 units, is $30,500 to $28,500, respectively. It is concluded that this unit provides an effective method of treating and recycling synthetic cold laundry wastewater. (Seip-IPA)
W78-05553

ECOLOGICAL AND AESTHETIC IMPLICATIONS FOR THE MERRIMACK ESTUARY OF THE MERRIMACK BASIN WASTEWATER MANAGEMENT ALTERNATIVES,
Massachusetts Univ., Gloucester, Marine Station.
For primary bibliographic entry see Field 5C.
W78-05554

DEVICE FOR THE PURIFICATION OF WASTE WATER,
Landustrie Sneek Machinefabrik Elektrotechnik B.V. (Netherlands). (Assignee).
R. Pepping.
United States Patent 4,062,911. Issued December 13, 1977. Official Gazette of the United States Patent Office, Vol 965, No 2, p 671, December, 1977. 1 fig.

Descriptors: *Aeration, *Waste water treatment, *Activated sludge, *Patents, *Design data, Equipment, Sludge treatment, Water purification, Water treatment.

A patent has been issued for a waste water aeration device using the activated sludge method. The aeration device consists of a rectangular tank which has a partition placed parallel to and equidistant from the two longer walls of the tank. The partition should be shorter than the two long walls, thus forming a loop through which the waste liquid is moved. One or more surface aerators are installed near one of the longer walls. The body of the aerator rotates on a vertical axis, causing the waste water to flow around the loop formed by the tank walls and the partition. Baffles upstream of the aerator are positioned perpendicular to the longer walls. The baffles are of a length that will not obstruct the flow of the waste liquid when the baffles are in position. (Lisk-FIRL)
W78-05563

PROCESS FOR THE RECOVERY OF PRODUCTS FROM A WASTE STREAM IN THE MANUFACTURE OF ACRYLONITRILE,
Du Pont de Nemours (E. I.) and Co., Wilmington, DE. (Assignee).
J. A. Thorpe, and H. F. Porter.
United States Patent 4,065,486. Issued December 27, 1977. Official Gazette of the United States Patent Office, Vol 965, No 4, p 1512-1513, December, 1977.

Descriptors: *Waste water treatment, *Industrial wastes, *Ammonia, *Nitrogen, *Separation techniques, Heat treatment, Synthesis, Vapor compression distillation, Waste water disposal, Treatment.

A patent has been issued for a process that recovers reactants and products contained in the waste water from acrylonitrile production. The acrylonitrile is produced through the ammoxidation of propylene. The dilute aqueous stream contains hydrogen cyanide, acrylonitrile, ammonia, ammonium sulfate, and high-boiling nitrogen. A portion of the dilute waste water is first concentrated by partial extraction of water. This waste is mixed with dilute waste from the same stream and the mixture is heated. The liquid reaches a temperature of 105C as it passes through a heat exchanger at the rate of 6 ft/sec. At this temperature, the liquid is vaporized through a reduction in pressure. The vapor is returned to the acrylonitrile production process while a portion of the dilute waste stream is removed. (Lisk-FIRL)
W78-05599

METHOD OF TREATING WASTEWATER CONTAINING EMULSIFIED OILS,
Chrysler Corp., Detroit, MI. (Assignee).
D. D. Davidson.
U.S. Patent No. 4,040,955, 5 p, 3 ref; Official Gazette of the United States Patent Office, Vol 961, No 2, p 756, August 9, 1977.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, Industrial wastes, *Oil pollution, *Flocculation, Separation techniques, *Emulsified oils, Alum.

A floating oil adsorbing floc is formed in a batch of wastewater containing emulsified oils, separating most of the resulting clarified water from the oil laden floc, leaving a slurry or a relatively small quantity of the water plus the floc and the oil. The pH of the slurry is adjusted to cause a substantial portion of floc to dissolve in the retained water. In the case of alum, the pH is adjusted by a pH of about 3 or less. Consequently, the remaining floc becomes oil enriched. An addition quantity of wastewater to be treated is added to the slurry and floc reforms breaking the emulsion in the added wastewater. If pH adjustment is necessary at this point it is accomplished by appropriate acid or caustic addition. The oil laden floc is removed and the water if not clarified is subjected to additions

of more alum. In such a case, lesser amounts of alum will be required than was necessary in the first batch. The treatment may be carried on through a continuing series of successive batches of wastewater. (Sinha-OEIS)
W78-05600

METHOD OF AND APPARATUS FOR DIGESTING ORGANIC WASTE AND/OR SEWAGE SLUDGE,
Gebruder (Weiss K. G.), Dillenburg (West Germany). (Assignee).
F. X. Kneer.
United States Patent 4,062,770. Issued December 13, 1977. Official Gazette of the United States Patent Office, Vol. 965, No. 2, p 636-637, December, 1977. 1 fig.

Descriptors: *Aeration, *Digestion, *Aerobic treatment, *Patents, *Digestion tanks, Sludge digestion, Biodegradation, Design data, Organic wastes, Equipment, Sludge disposal, Sludge treatment, Waste water treatment.

An aeration unit for the continuous digestion of organic waste has been patented. The organic waste or sewage sludge is fed through an inlet to the upper portion of a vertically-positioned closed tank. The waste moves through the digestion tank in a continuous, single mass toward the outlet at the lower end of the tank. It is aerated along the entire cross-section of its mass as it passes toward the lower end of the tank. Sensors in the tank compare the moisture content, temperature, and air pressure in the waste with a predetermined set of desired values. The air, which moves in the opposite direction of the downflowing waste mass, is removed by a vacuum from the upper end the tank analyzed for carbon dioxide and oxyen content. The air removal system also controls the pressure of the air released into the waste mass. Monitors in the upper and lower portions of the tank compare the moisture content of the air with a predetermined set of values. The air moisture is controlled by the injection of a fine spray of water; the air temperature is maintained between 30 and 50C. A distributor, controlled by a blower, regulates the flow of air through the lower portion of the closed reactor tank. (Lisk-FIRL)
W78-05602

RECREATIONAL VESSEL WASTE POLLUTION,
Coast Guard, Washington, DC.
W. C. Bertges.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A000 453, Price codes: A07 in paper copy, A01 in microfiche. Report No. CG-D-112-74, June, 1974 138 p, 24 fig, 4 tab, 16 ref, 6 append. 744326.2.1.

Descriptors: *Recreation wastes, Recreation facilities, Water pollution sources, *Waste disposal, Water sports, Boating, Legislation, *Sewage treatment, Evaluation, Waste water treatment, *Marine sanitation devices, Marine pollution, Pumpout facilities.

The recreational vessel waste pollution problem is examined in light of a literature survey, the current state-of-the-art technology (including Federal research and development activities), and existing marine pollution legislation. All aspects governing the design, construction, installation, and operation of marine sanitation devices for recreational watercraft are covered, including the impacts on the public, the boat owner, the marine operators, and the boating industry. Marine sanitation devices are described and evaluated as to their applicability and feasibility for installation onboard recreational watercraft; evaluations are based on the respective operational and vessel characteristics and/or constraints that are necessitated by marine sanitation device engineering design criteria. A comparative analysis of the various sanitation system concepts is presented as to suitability for use on certain types of vessels. Shoreside pumpout facilities are also discussed. Conclusions indicate that recreational vesel statistics and information on their waste characteristics are inadequate. Three marine sanitation device concepts (maceration/disinfection, holding tank, and recirculating toilet) most effectively satisty restrictive conditions such as economics, operational and vessel limitations, and existing and pending pollution legislation. A general lack of shoreside receiving facilities is accompanied by a dearth of data. Expansion of the recreational vessel and vessel waste data base and study methods of treatment for such wastes is recommended. The appendices contain information onsanitation legislation and sanitation devices. (Wares-IPA)
W78-05621

PROTECTION OF SHELLFISH WATERS.
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W78-05622

AUTOMATIC SLUDGE EXTRACTION AND WASHING DEVICE FOR USE IN A WATER TREATMENT SETTLING APPARATUS,
Societe Degremont Paris (France). (Assignee).
J. Tardivel.
United States Patent 4,059,531. Issued November 22, 1977. Official Gazette of the United States Patent Office, Vol. 964, No. 4, p 1266-1267, November, 1977. 1 fig.

Descriptors: *Sewage sludge, *Sludge treatment, *Sludge disposal, *Patents, *Separation techniques, Settling basins, Design data, Equipment, Waste water treatment, Municipal wastes.

An automatic method for the washing and extraction of sludge during settling treatment has been patented. The washing and extracting device is installed in a sludge settling bed contained in a decanter which has a sludge concentrator for removing settled sludge. One end of a siphon is introduced into the concentrator of the tank; the other end is connected to a manifold conduit which transports fluid to a sludge removal station. A valve connecting the siphon with a vacuum source controls the opening and closing of this channel. A second valve connects the siphon to the atmosphere; a third valve controls the opening and closing of the channel between the manifold conduit and the fluid source; a fourth valve opens or closes the channel between the manifold and the sludge removal station. When the first and fourth valves are in the open position and the second and third are in the closed position, a vacuum is used to extract the sludge from the concentrator into the siphon. The sludge is then transported through the manifold conduit to the sludge removal station. The washing process is achieved by reversing the extraction process. The first and third valves are set in the open position while the other two valves are closed. Fluid is introduced into the manifold conduit where it is drawn by the vacuum into the siphon. The fluid passes through the siphon into the concentrator where the fluid washes the concentrator and overflows, washing the bottom of the decanter. (Lisk-FIRL)
W78-05653

OZONE DISINFECTION AND OXIDATION IN A MODEL OZONE CONTACTING REACTOR,
Olin Corp., Brandenburg, KY.
J. Perrich, J. McCammon, L. Cronholm, M. Fleishman, and J. Pavoni.
AIChE Symposium Series, Vol. 73, No. 166, p 225-229, 1977. 5 fig, 5 tab.

Descriptors: *Oxidation, *Disinfection, *E. coli, *Ozone, *Viruses, *Sewage bacteria, Waste water treatment, Public health, Biocontrol, Microorganisms, Design criteria.

A semiflow batch reactor was used in laboratory studies to investigate ozonation mechanisms and rates and to evaluate the use of ozone for the inactivation of poliovirus and E. coli in waste water. Pseudo first-order kinetics were observed during the inactivation studies. The data suggested that there is no threshold ozone dose for viral or bacterial inactivation. Extremely low dose rates of ozone in buffered deionized water, 0.009 and 0.0008 mg O3/liter-min, produced significant inactivation of poliovirus and E. coli. The experimental data also suggested that standard laboratory frits and diffusers may catalytically decompose ozone in the gas phase. The addition of a nonnitrogenous carbonaceous compound in the form of dextrose enhanced virus inactivation. The addition of a non-nitrogenous carbonaceous compound in the form of dextrose ednhanced virus alanine had no effect on inactivation. In general, poliovirus was not as susceptible to inactivation by ozone than E. coli. Studies on inactivation mechanisms were inconclusive, although the data suggested that cell wall lysis did not occur in E. coli inactivation by ozonation. (Schulz-FIRL)
W78-05670

SEWAGE PURIFICATION SYSTEM.
United States Patent 4,059,521. Issued November 22, 1977. Official Gazette of the United States Patent Office, Vol. 964, No. 4, p 1263, November, 1977. 1 fig.

Descriptors: *Digestion, *Aeration, *Suspended solids, *Sludge treatment, *Patents, Design data, Sludge disposal, Waste water treatment, Equipment, Biological treatment.

A waste treatment system which combines aeration, digestion, and settling has been patented. Untreated liquid waste is passed through a series of closed, elongated tanks having horizontal axes placed end-to-end. Digestion of sludge in the first tank is accomplished through agitation of the waste and a separate aeration device. The treated sewage then passes into the second tank where solids are settled. A third closed collection tank is positioned at the lower portion of the second tank to receive the settled sludge. Suspended solid waste materials are further removed from the settled sewage in the third tank and are returned with the suspension component to the first tank for reagitation, reaeration, and continued digestion. The purified liquid separated from the settled sludge in the third tank is collected in another elongated tank from which the liquid is discharged into the ground. (Lisk-FIRL)
W78-05671

METHOD AND APPARATUS FOR WASTE WATER TREATMENT.
United States Patent 4,064,047. Issued December 20, 1977. Official Gazette of the United States Patent Office, Vol. 965, No. 3, p 1050-1051, December, 1977.

Descriptors: *Ozone, *Electrical grounding, *Electric conductance, *Patents, *Design data, Waste water treatment, Equipment, Waste water disposal, Municipal wastes, Treatment facilities.

A patent has been issued for an ozone absorption chamber and process for the treatment of waste water. The closed ozonization tank is equipped with a spray nozzle and outlet which connects the interior of the chamber with the exterior. The nozzle is installed in an electrically grounded interior wall with a conductive surface. A waste water inle attached to the spray nozzle conveys waste water to the chamber under controlled pressure. Before the waste water is released into the chamber, it receives an electrical charge. The water is distributed over the grounded inner wall in the form of a nonatomized spray which transfers its electrical charge to the electrically grounded wall upon contact. Pressurized ozone is then pumped through an inlet from the exterior of the chamber

into the waste water for thorough mixing. After ozonization is completed, waste water is removed from the chamber through an outlet. (Lisk-FIRL)
W78-05672

TOTAL WASTE RECYCLE SYSTEM FOR WATER PURIFICATION PLANT USING ALUM AS PRIMARY COAGULANT,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
L. K. Wang, and J. Y. Yang.
Resource Recovery and Conservation, Vol. 1, p 67-84, 1975. 4 fig, 10 tab, 34 ref. W/A 85-188 W/A 86-361.

Descriptors: *Flocculation, *Recycling, *Coagulation, Silts, Water purification, Waste water treatment, Sewage treatment, Water quality control, Water pollution, Wastes, Hydrogen ion concentration, Lime, Hydrogenated lime, *Alum recovery, *Alum, *Coagulant, Caustic soda, *Sodium hydroxide, *NaOH, *Sulfuric acid, *H2SO4, *Floc, *Waste recycle system, Zero waste discharge, Solubilization, Reuse, Reagents, pH, pH control.

A systems study of the feasibility of total recycle of wastes was conducted using actual wastewater and alum sludge collected from a water purification plant. Alum, used as a coagulant in raw wastewater flocculation and treatment, can be effectively recovered from waste sludge and reused when alum floc is solubilized with either sulfuric acid or caustic soda reagents. The solubilized reagent must be subjected to pH adjustments to regenerate alum for effective use as coagulant. However, if sufuric acid-regenerated filter alum and caustic soda-regenerated soda alum are used in combination as coagulant, the need for pH adjustment is eliminated. With elevation of treatment temperature and minimization of waste sludge aging, alum recovery efficiency is improved. Reuse of regenerated alum for water treatment does not give rise to contaminant build-up in the finished water. Optimum alum recovery process design parameters must be established before cost-effectiveness can be assessed. System flow charts and test data are presented in figures and tables. (Seip-IPA)
W78-05674

DISINFECTION WITH QUARTERNACY AMMONIUM COMPOUNDS,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5F.
W78-05677

TREATMENT OF TANNERY EFFLUENTS BY SURFACE ADSORPTION,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
L. K. Wang, D. B. Dahm, R. E. Baier, and R. C. Ziegler.
Journal of Applied Chemical Biotechnology, Vol 25, p 475-490, 1975. 2 fig, 9 tab, 12 ref, 2 append.

Descriptors: *Foam separation, *Adsorption, *Flotation, *Suspended solids, *Activated carbon, *Surfactants, Effluents, Waste water treatment, Water quality control, Water pollution, Water pollution treatment, Biochemical oxygen demand, Chemical oxygen demand, *Adsorbing colloid flotation, *Tannery effluent treatment, *Carbon adsorption and flotation, *Surface adsorption, Dimethyldihydrogenated-tallow ammonium chloride(DDAC), Carbon adsorption, Dissolved organics, Physiochemical.

Several types of surface adsorption for treating tannery effluents which contain such dissolved organics and suspended solids as: tannin, dissolved proteins, detergents, lime, dyestuffs, manure, chromium, sulphate, sulphide, chloride, ammonia, and particles of flesh are investigated. The processes studied include: (1) foam separation without additives, (2) adsorbing colloid flotation (foam separation using the colloidal surfactant dimethyldihydrogenated-tallow ammonium chloride (DDAC) as collector, (3) carbon adsorption, and (4) concurrent carbon adsorption and flotation. Results indicate that foam separation without additives is infeasible for the removal of either dissolved organics or suspended solids. Adsorbing colloid flotation is inefficient for the removal of dissolved organics but efficient for suspended solid removal provided that DDAC is used as a collector; this process is a good primary treatment step. Secondary treatment of tannery wastewater with carbon adsorption alone is not sufficient. The combination of carbon adsorption and flotation in one process, called adsorption flotation, is an effective means of treating the multicomponent dissolved and suspended wastes. Adsorption flotation followed by sedimentation or sand filtration can increase fractional reductions of suspended solids and turbidity to above 0.90. Foam separation apparatus design and operational details are presented. Effects of changes in parameters such as pH, gas flow rate, and DDAC dosage and treated effluent quality data are tabulated. (Seip-IPA)
W78-05680

STATE-OF-THE-ART: MILITARY EXPLOSIVES AND PROPELLANTS PRODUCTION INDUSTRY, VOL. I - THE MILITARY EXPLOSIVES AND PROPELLANTS PRODUCTION INDUSTRY,
American Defense Preparedness Association, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-05684

PROCEEDINGS OF THE NATIONAL CONFERENCE ON SOLID WASTES MANAGEMENT, HELD AT UNIVERSITY OF CALIFORNIA, ON APRIL 4 AND 5, 1966.
Environmental Protection Agency, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 376, Price codes: A10 in paper copy, A01 in microfiche. April 1966, 214 p, 35 fig.

Descriptors: *Solid wastes, *Systems analysis, *Management, *Waste disposal, Waste treatment, Systems, *Solid waste management.

The problems of solid waste management are reviewed. Topics addressed include: urbanization, waste identification and characterization, technoloical and educational deficiencies, and economic and research restrictions. Detailed analyses of primary methods of disposal and waste composition are presented. Systems analysis is discussed in detail and is presented as a logical approach to complicated multi-variable problems in solid waste disposal. Problems in the application of systems analysis are due to a lack of generalized analytical models and pertinent data and to inadequate environmental objectives. Recommendations include: (1) appointment of a waste management coordinator; (2) establishment of environmental objectives; and (3) application of a systems approach to a specific problem. Facets which must be integrated into a management-science approach are discussed in detail and include legal, engineering, planning, political, business, refuse industry, and government issues. A Michigan solid waste management system is outlined and Los Angeles County's activities are described. Papers are presented on: (1) solid waste research using management science; (2) the coordination of management science with other solid waste research; and (3) the future of solid waste management. (Seip-IPA)
W78-05685

DEVELOPMENTS AT EIGHTH INTERNATIONAL CONFERENCE ON WATER POLLUTION RESEARCH.
Environmental Protection Agency, Washington, DC. Office of Research and Development.
For primary bibliographic entry see Field 5E.
W78-05686

WASTEWATER: IS MUSKEGON COUNTY'S SOLUTION YOUR SOLUTION,
Environmental Protection Agency, Chicago, IL. Office of Research and Development.
J. M. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 865, Price codes: A01 in paper copy, A01 in microfiche. Report No EPA-905/2-76-004, September, 1976. 51 p, 34 ref.

Descriptors: *Return flow, *Waste water, *Water reuse, *Michigan, *Irrigation systems, *Irrigation design, *Operating, Tertiary treatment, Crop production, Agriculture, Corn, *Waste water use, *Muskegon County Wastewater Management System(MICH), Crop yield, Spray irrigation.

The Muskegon County (Michigan) Wastewater Management System, which utilizes and renovates wastewater by land treatment, is described. The system consists of collection, transmission, aeration, storage, disinfection, spray irrigation, soil, crop, drainage, and monitoring components and is implemented on sandy, formerly unproductive soil to grow corn. The irrigation-soil-cropping phase of the wastewater treatment system is providing needed crop nutrients and advanced (tertiary) wastewater treatment. In 1975, over $100,000 worth of nitrogen, phosphorus, and potassium from the wastewater was utilized to improve soil and grow corn; from 0-89 pounds per acre of nitrogen fertilizer was added to the fields because of insufficient nitrogen content in the irrigation wastewater. The sale of corn reduced the $1.9 million operating cost for 1975 by about one-third. Operating costs for 1975 and 1976 were $0.24 per thousand gallons of wastewater. Average corn yields on 5,000 acres for 1974, 1975, and 1976 were 28, 60, 81 bushels per acre, respectively. Detailed information on capital and operating costs, land usage, irrigation systems, soil permeability, wastewater application, drainage systems, crop yields, planning and construction timetables, wastewater nutrient application, labor, and treatment performance is presented. (Seip-IPA)
W78-05687

CRITERIA FOR THE ESTABLISHMENT AND MAINTENANCE OF TWO YEAR POST HIGH SCHOOL WASTEWATER TECHNOLOGY TRAINING PROGRAMS, VOLUME I: PROGRAM CRITERIA.
Clemson Univ., SC. Dept. of Environmenta' Systems Engineering.
For primary bibliographic entry see Field 5G.
W78-05688

LABORATORY EVALUATION OF THE GATX EVAPORATIVE TOILET SYSTEM,
Naval Ship Research and Development Center, Annapolis, MD.
W. van Hees, and L. C. Gills.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-029 530, Price codes: A03 in paper copy, A01 in microfiche. Report No 3948, July, 1973. 53 p, 7 fig, 9 tab, 4 ref, 3 append. Task Area S4657 Prog. E1.63721N.

Descriptors: *Evaporation, *Sewage treatment, *Sewage sludge, *Ships, *Testing, *Evaluation,

*Maintenance, Waste treatment, Operations, Installation, *Evaporative toilet, Maximum repair time.

The evaporative toilet system (GATX) manufactured by General American Transportation Corporation, was evaluated in operation for 1853 hours for ocean-going mobile noise barge, MONOB YAG 61. A mean time between failures (MTBF) of 477 hours was demonstrated at a 90% confidence level. One critical failure, caused by the plumbing arrangement, occurred after 703 hours of operation. If this installation-related failure is not attributed to the GATX system, the MTBF is in excess of 800 hours. A maintainability demonstration involving 22 activities was unsuccessful due primarily to the design and installation locations of macerator/transfer pump and the evaporator/holding tank subsystems. The specified maximum repair time of 5 hours was exceeded by one hour; the excessive time is attributed to inaccessibility of the evaporator tank for maintenance. The specified 1 hour maximum repair time for the transport function was exceeded on two maintenance events. Installation problems, which could be avoided in future programs, are the main cause for one critical system failure and the failure to achieve maximum repair time of 5 hours. The odor of the water vapor released from the evaporator vent stack is the principal user objection to the system. Recommendations are made on ways to improve the reliability, maintainability, habitability, and performance of the GATX system. Use of the GATX system aboard Navy ships is recommended. (Seip-IPA)
W78-05691

BAFFLE FOR WATER OR SEWAGE SETTLING TANKS,
Sybron Corp., Rochester, NY. (Assignee).
R. F. McGivern.
United States Patent 4,059,529. Issued November 22, 1977. Official Gazette of the United States Patent Office, Vol 964, No 4, p 1266, November, 1977. 1 fig.

Descriptors: *Settling basins, *Waste water treatment, *Sludge disposal, *Patents, *Design data, Waste treatment, Sewage sludge, Sewage treatment, Waste water disposal, Equipment.

A baffle unit for waste water or sewage settling tanks has been patented. The baffle consists of an upright panel with a spacer extension installed on the wall of the settling tank where the waste inlet is located. One or more deflectors, afixed to the upright panel below the spacer, extend out from the panel toward the spacer. The deflector or deflectors direct the flow of waste upwards in the direction of the spacer. The upright panel is solid between the spacer and the deflector. Below the deflector, the upright panel contains a series of horizontal and vertical openings which allow the waste liquid to flow through the upright panel for settling treatment. (Lisk-FIRL)
W78-05693

METHOD FOR TREATING A WASTE WATER CONTAINING A NONIONIC SURFACE ACTIVE AGENT,
Lion Fat and Oil Co., Ltd., Tokyo (Japan). (Assignee).
M. Kinoshita, A. Okabe, and S. Ando.
United States Patent 4,057,495. Issued November 8, 1977. Official Gazette of the United States Patent Office, Vol 964, No 2, p 569, November, 1977. 1 fig.

Descriptors: *Foam fractionation, *Surfactants, *Foam separation, *Patents, *Separation techniques, Salts, Chemicals, Water reuse, Recycling, Industrial wastes, Waste water treatment.

A patent has been issued for a method of recovering a nonionic surface active agent from treated waste water. Foam separation is first used to produce two waste water fractions, one which contains more than 500 ppm of the nonionic surface active agent and one which contains less than 3 ppm. The initial concentration of the surfactant in waste water should be less than 500 ppm and preferably in the form of a polyoxyethylenealkylether, polyoxyethylenealkylphenylether, or fatty ester of polyethyleneglycol. An inorganic electrolyte, such as Na2SO4, K2SO4, Al2(SO4)3, Fe2(SO4), NaCl, KCl, CaCl2, FeCl3, or AlCl3, is added to the concentrated waste water fraction to yield an electrolyte concentration of more than 50 ppm. The solution is then heated to 100-200C under a pressure of 2-5 kg/cu cm to further concentrate the nonionic surface active agent. The purified water is then recycled to the foam separation step. (Schulz-FIRL)
W78-05694

APPARATUS FOR THICKENING AND EXTRACTING THE LIQUID FROM A SLUDGE,
Ichikawa Woolen Textile Co., Ltd., Chiba (Japan). (Assignee).
S. Nakamura, and S. Sasaki.
United States Patent 4,062,779. Issued December 13, 1977. Official Gazette of the United States Patent Office, Vol 965, No 2, p 639-640, December, 1977. 1 fig.

Descriptors: *Sludge treatment, *Dewatering, *Coagulation, *Equipment, *Patents, Screens, Filters, Industrial wastes, Waste water treatment.

A patent has been issued for a belt filter press to be used in sludge thickening and dewatering. The sludge thickening assembly used to coagulate the sludge includes two mesh-covered screen rolls connected by a conduit. The outer surface of each screen roll is covered with a reticulate material. The mesh covering the second screen roll is finer than that used on the first screen roll. The screen roll body consists of a number of wire rods in a cylindrical form, supported by an additional spirally-wound wire rod. The second screen roll is equipped with a press roll for extracting the liquid from the sludge. The press roll includes an endless, moving filter belt containing fibers which are aligned in a direction opposite to that of the filter belt's travel path. A cylinder is positioned to compress the sludge material against the moving filter belt, producing a dehydrated cake. (Schulz-FIRL)
W78-05695

PURIFICATION OF WASTE WATER FROM HYDRAZINE PRODUCTION,
Bayer A. G., Leverkusen (West Germany). (Assignee).
K-W. Eichenhofer, and R. Schliebs.
United States Patent 4,056,469. Issued November 1, 1977. Official Gazette of the United States Patent Office, Vol 946, No 1, p 213, November, 1977. 1 fig.

Descriptors: *Chemical wastes, *Patents, *Chemical reactions, *Oxidation, *Ammonium compounds, Chlorination, Organic compounds, Waste water treatment, *Hydrazine production.

A patent has been issued for a method to treat waste water produced during the manufacture of hydrazine. The waste water, contaning small amounts of hydrazine and organic hydrazine derivatives, is produced during the oxidation of ammonia or amine in the presence of ketone or an aldehyde. It is then intensively mixed with chlorine or a hypochlorite at a temperature of approximately 10-110C and a pH of 5-10 until the waste water's redox potential to platinum, relative to Ag/AgCl, is about -400 mV to +800 mV. (Schulz-FIRL)
W78-05696

ACTIVATED SLUDGE PROCESS,
Seisuikogyo Co. Ltd., Osaka (Japan). (Assignee).
T. Hasegawa, and S. Hasegawa
United States Patent 4,055,490. Issued October 25, 1977. Official Gazette of the United States Patent Office, Vol 963, No 4, p 1323, October, 1977. 1 fig.

Descriptors: *Activated sludge, *Aeration, *Patents, Equipment, *Design data, Sludge treatment, Aeration, Waste water treatment.

A patent has been issued for an activated sludge process which employs an aeration tank having a narrowed, discharge conduit at its upper end. Waste water is introduced into the tank, and an oxygen-containing gas is added at the bottom of the tank. The gas flows up through the tank to the discharge conduit and in the process agitates and aerates the waste water. The activated sludge adheres to a number of free-floating, spongy particles in the tank. An air lift effect causes the particles to be lifted toward the discharge conduit. The spongy particles are periodically allowed to exit the tank via the discharge conduit. The spongy pieces then pass to a head tank equipped with pressing rolls. The sludge is extracted and the spongy pieces are prepared for recycling to the aeration tank. (Schulz-FIRL)
W78-05697

METHOD OF DEWATERING MATERIAL CONTAINING SOLID MATTER AND BOUND AND UNBOUND WATER,
Resources Conservation Co., Renton, WA. (Assignee).
H. H. Peters.
United States Patent 4,056,466. Issued November 1, 1977. Official Gazette of the United States Patent Office, Vol 964, No 1, p 212, November, 1977. 1 fig.

Descriptors: *Dewatering, *Sludge treatment, *Organic compounds, *Patents, Chemical reactions, Coagulation, Separation techniques, Waste water treatment.

A chemical process for dewatering sludge has been patented. The dewatering process is based on the mixture of an amine with the sludge. The amine consists of nitrogen, hydrogen or alkyl, and two alkyl radicals having from one to six carbon radicals or alkenyl radicals which have from two to six carbon atoms, yielding a total of three to seven carbon atoms in the molecule. The amine should also have an inverse critical solution temperature in a two phase system with water. The temperature of the mixture is adjusted to below the critical solution temperature to yield a liquid and a solid phase. The solid material can then be separated from the liquid phase, with improved results if the inverse critical temperature is maintained until the separation is complete. (Schulz-FIRL)
W78-05698

PRODUCTION OF NON-BULKING ACTIVATED SLUDGE,
Air Products and Chemical Products, Inc., Allentown, PA. (Assignee).
M. L. Spector.
United States Patent 4,056,465. Issued November 1, 1977. Official Gazette of the United States Patent Office, Vol 964, No 1, p 212, November, 1977. 1 fig.

Descriptors: *Activated sludge, *Biochemical oxygen demand, *Patents, *Anaerobic conditions, *Sludge treatment, Aeration, Waste water treatment.

A patent has been issued for a process which inhibits the proliferation of filamentous biomass in the activated sludge process. Recycled activated sludge is mixed with BOD-containing influent in an initial contact zone. Anaerobic conditions are maintained in the contact zone to provide an environment which is essentially free of nitrogen oxides and contains less than 0.7 ppm dissolved ox-

ygen. The growth of nonfilamentous organisms which sorb BOD is thus favored. The mixed liquor then passes to an oxygenated zone where the dissolved oxygen content is at least 1 ppm to facilitate oxidation and removal of the BOD. The waste water then passes to a settling zone where the purified supernatant liquid is separated from the settled sludge. A portion of the settled sludge is returned to the initial contact zone for mixing with the BOD-containing influent. (Schulz-FIRL)
W78-05699

APPARATUS FOR TREATING SEWAGE SLUDGE,
Orgonics, Inc., Slatersville, RI. (Assignee).
J. M. O'Donnell.
United States Patent 4,057,392. Issued November 8, 1977. Official Gazette of the United States Patent Office, Vol 964, No 2, p 536, November, 1977. 1 fig.

Descriptors: *Sludge treatment, *Patents, *Fertilizers, *Drying, *Equipment, Sludge disposal, Heat treatment, Sewage treatment, Waste water treatment.

A patent has been issued for a sludge treatment apparatus designed to produce a granular, high nitrogen product for use as animal feed or fertilizer. The particle size of the sludge filter cake is reduced on a continuous moving bed. A rotating raking reel shreds the filter cake; a rotating levelling reel evens out the bed of shredded sludge material; and the sludge is transported to a mixing area. A rotating shaft within an elongated vessel is used to agitate and homogenize the shredded sludge material. The vessel has inlet and outlet sections and the shaft is equipped with a number of paddles. Acidic material can be introduced into the reaction chamber of the mixing vessel and the temperature can be controlled within the range 30-80C. An aqueous condensable methylol-prepolymer solution can also be added to the reaction vessel. The moisture content of the discharged reaction product is reduced to less than 10%. The mixture can be screened to the desired particle size. (Schulz-FIRL)
W78-05700

5E. Ultimate Disposal Of Wastes

MICROBIAL AEROSALS FROM FOOD-PROCESSING WASTE SPRAY FIELDS,
Army Dugway Proving Ground, UT.
D. T. Parker, J. C. Spendlove, J. A. Bondurant, and J. H. Smith.
Journal Water Pollution Control Federation, Vol. 49, No. 12, p 2359-2365, December, 1977. 4 tab, 3 fig, 6 ref.

Descriptors: *Food processing industry, *Coliforms, *Aerosols, *Sprays, *Waste water disposal, Potatoes, Mathematical models, Environmental effects, Analytical techniques, Bacteria, Model studies, Organic wastes, Waste water treatment.

Studies were made of microbial aerosals from spray fields used for the disposal of potato processing waste water. Samples of the aerosals collected downwind from the spray-fields contained predominately starch fermenters. Coliforms comprised about 0.07% of the total microbial population. Less than 10% within this fraction was of the Escherichia coli variety, as determined by growth on Endo's agar. The coliform population appeared to originate from soil removed from the potatoes during washing; the starch fermenters were apparently derived from the waste water settling tanks. The concentration of assessable microbial aerosol particles was estimated to be 127 particles/cu m of air at 10 m downwind of the spray field when meterological conditions favored downwind transport. With the multi-stage sampling procedure used, this concentration could not be distinguished from background levels at distances less than 2 kilometers from the spray field. An area source model was developed for calculation of the ground-level concentration of the aerosol at a given distance from the downwind edge of an area source. (Baker-FIRL)
W78-05290

FISH BY-PRODUCTS--FISH MEAL AND FISH SILAGE,
Ministry of Agriculture, Fisheries and Food, Hull (England). Humber Lab.
D. P. Potter, I. N. Tatterson, and J. Wignall.
Process Biochemistry, Vol 13, No 1, p 22-23, 26, January, 1978. 6 fig, 3 tab, 7 ref.

Descriptors: *Fishing, *Demersal fish, *Feeds, *Eels, *Food processing industry, Proteins, Vitamins, Calcium, Phosphorous, Potassium, Magnesium, Trace elements, Enzymes, Byproducts, Waste water treatment, Industrial wastes.

Raw material sources and process methods for the production of protein-rich fish meal and fish silage from the waste waters and byproducts of the fishing industry are reviewed. Diminishing supplies of edible-fish waste for the production of fish meal have prompted an increase in industrial fish catches to supplement condemned fish and fish processing wastes. Industrial fish, usually inedible or found in large quantities, are used in England for the production of fish meal and include sand eels, Norway pout, sprats, mackeral, and blue whiting. Fish meal production from industrial fish requires an additional oil extraction process not required for white fish meal containing less than 6% oil. Coagulation of the protein in the industrial fish is accomplished by cooking; oil and water are removed in the form of a press cake. Press liquor is screened and centrifuged for oil removal; the remaining stickwater, containing dissolved and suspended protein solids, is concentrated by evaporation and returned to the press cake for drying. The fish meal has a high protein and amino acid content and is rich in minerals, vitamins, and trace elements. Fish silage production, an alternative use for fish wastes, involves liquifying the wastes, with indigenous proteolytic enzymes in an acidic environment. The fish silage production method is adaptable for processing of catches at sea. (Lisk-FIRL)
W78-05291

OMC-LINCOLN MEETS TOUGH DISCHARGE ORDINANCE.
For primary bibliographic entry see Field 5G.
W78-05300

PILOT-SCALE STUDIES OF THE LEACHING OF INDUSTRIAL WASTES IN SIMULATED LANDFILLS,
For primary bibliographic entry see Field 5B.
W78-05303

INVESTIGATIONS INTO DEHYDRATION OF DEPOSITS FROM THE PURIFICATION PLANT FOR GRINDING WASTE MATERIAL OF CRYSTAL GLASS MANUFACTURING PLANTS (BADANIA NAD ODWADNIAMIEM OSADOW Z OCZYSZCZALNI SCIEKOW POSZLIFIERSKICH Z HUT SZKTA KRYSZTATOWEGO),
Technical Univ. of Warsaw (Poland). Inst. of Environmental Engineering.
S. Guberski, K. Badowska, and L. Stefanska.
Gaz, Woda i Technika Sanitarna, Vol. 51, No. 5, p 136-138, 1977. 5 fig, 4 tab, 7 ref.

Descriptors: *Settling basins, *Filtration, *Dewatering, Industrial wastes, Metals, Lead, Silica, Centrifugation, Waste water treatment.

Results of studies on the dewatering of sludges generated during the treatment of waste water from grinding and polishing operations in crystal and glass manufacturing are presented. The solids, consisting mainly of particles of glass, metal, felt, cork, and processing discs, were first washed into settling tanks. The waste water was then coagulated, yielding a sludge with a high moisture content in the secondary settling tanks. Samples of waste water were collected from various locations within the plant and sludge was obtained from the initial settling tanks. The samples were dried at 105C to constant mass and weight-proportioned composites were analyzed. Analyses indicated that the waste materials consisted primarily of SiO2 (40.1%), Pb (16%), Na (11.5%), Ba (8%), and Al (8%). Preliminary tests indicated that the sludges could be successfully dewatered by air drying, vacuum filtration, belt filter pressing, or centrifugation. (Tallert-FIRL)
W78-05310

THE PRODUCTION OF CHEMICALS FROM PULPING WASTE,
Swedish Forest Products Research Lab., Stockholm.
K. Kringstad.
Tappi, Vol. 61, No. 1, p 49, January, 1978. 1 tab.

Descriptors: Pulp and paper industry, *Sulfite liquors, *Pulp wastes, *Lignins, *Carbohydrates, Chemicals, Oil, *Industrial wastes, Softwood, Waste water treatment.

A cost analysis of chemical production from pulping industry wastes was performed. A comparison with costs of petroleum produced chemicals was also included. Based on pulping wastes produced in Sweden in 1973, kraft liquor yielded 3 million tons of lignins and sulfite liquor produced 1 million tons. Production costs for lignins were comparable to or lower than amino resin production costs and were lower than phenolic resin production costs. Petrochemical production of formic, acetic, lactic, and isosaccharinic acids was found to be less costly than the production of these acids from spent kraft liquors. Ethanol production from the fermentation of sulfite liquor carbohydrates required three to four times more energy than petrochemical ethanol production. Bark and foliage from softwoods were found to contain phenolic material, lignin-like material, carbohydrates, protein, chlorophyll, and certain extractives. Hardwoods yielded betulinol and suberin, used for the production of polyesters. None of these raw materials as potential chemical sources were found to be as cost effective as petrochemical sources at the present time. (Lisk-FIRL)
W78-05316

PULP AND PAPER RESEARCH AT UQTR--RELIEF FOR AN EMBATTLED INDUSTRY,
M. Brochu.
Science Dimension, Vol 9, No 5, p 28-29, 1977.

Descriptors: *Pulp and paper industry, *Industrial wastes, *Recycling, *Feeds, *Poultry, *Pulp wastes, Waste disposal, Nutrient removal, Biological treatment, Waste water treatment, Waste water disposal.

Pulp mills are a major source of water pollution in the province of Quebec, Canada. A medium-sized mill can use as much water and pollute a river to the same degree as does a small city. A cheap, efficient biological method has been sought for treating effluents from sulfite pulp mills. Biological treatment is a relatively simple process. Residual liquor is mixed in a tank with a small quantity of chemical fertilizer and specially-selected bacteria. These microorganisms remove carbohydrates from the residual liquor and produce a sediment scientists call biomass. Biomass solids, which contain 38% protein, 47% carbohydrates as well as some vitamins, appear promising as a food supplement. Well balanced chicken feeds have been prepared by combination of biomass with a

vitamin supplement. Biomass-fed chickens are reported to have a normal growth rate and tase. Experiments with larger animals are planned. The economic feasibility of biomass exploitation is being studied. Possible uses for the other major component of pulp effluent, lignosulfonates, are also being investigated. (Baker-FIRL)
W78-05321

IS CHEAP RECOVERY IN SIGHT FOR SULFITE.
Canadian Chemical Processing, Vol 61, No 11, p 32-33, November, 1977. 1 fig, 1 tab.

Descriptors: *Sulfite liquors, *Incineration, *Separation techniques, *Pulp and paper industry, *Industrial wastes, Recycling, Evaporation, Water reuse, Chemical wastes, Waste water treatment.

Waste stream incineration is considered as a method for recovery of chemicals in sulfite pulp mill waste water. Advanced evaporator/incinerator systems is now available at lower capital cost than was previously possible. Before the waste liquor can be incinerated, it must be concentrated . Ion exchange and electro-dialyis have been successfully used on a limited basis, but it appears that evaporation is clearly the best general method of concentrating sulfite waste liquor. Various systems, including the fluidized bed reactor, have recently been introduced for incineration of concentrated pulping liquor and recovery of the pulping base. In nearly all cases, combustion of the liquor provides most of the heat required for the evaporators. Specific processes are briefly discussed. (Baker-FIRL)
W78-05322

MINI-SYMPOSIUM ON EFFLUENT CONTROL 'UPDATE 1976--GROUP IV',
Waste Water Engineers, Inc., Nashville, TN.
For primary bibliographic entry see Field 5D.
W78-05329

TREATMENT PLANT AT REDBOURN.
For primary bibliographic entry see Field 5G.
W78-05331

COMMUNITY RESPONSE STRATEGIES FOR ENVIRONMENTAL PROBLEMS OF WATER SUPPLY AND WASTEWATER DISPOSAL IN FAIRBANKS, ALASKA,
Alaska University, College. Inst. of Water Resources.
For primary bibliographic entry see Field 5G.
W78-05357

ABATEMENT OF MALODORS AT CONFINED DREDGED MATERIAL DISPOSAL SITES,
Argonne National Lab., IL.; and Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5A.
W78-05360

BIOLOGICAL ASSESSMENT OF THE SOLUBLE FRACTION OF THE STANDARD ELUTRIATE TEST,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5A.
W78-05366

PRELIMINARY DESIGN OF OCEAN OUTFALL AT SYDNEY: PROTECTION OF BATHING WATERS,
Caldwell Connell Engineers, Melbourne (Australia).
For primary bibliographic entry see Field 5B.
W78-05377

SOLID WASTE MANAGEMENT PLAN, (LEHIGH-NORTHAMPTON COUNTIES JOINT PLANNING COMMISSION).
Weston (Roy F.) Inc., West Chester, PA.
For primary bibliographic entry see Field 5G.
W78-05395

SOLID WASTE MANAGEMENT PLAN-1977 SUPPLEMENT (LEHIGH-NORTHAMPTON JOINT PLANNING COMMISSION),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, PA.
For primary bibliographic entry see Field 5G.
W78-05396

ALTERNATIVES TO THE MANAGEMENT OF HAZARDOUS WASTES AT NATIONAL DISPOSAL SITES. VOLUME II. APPENDICES.
Little (Arthur D.) Inc., Cambridge, MA.
For primary bibliographic entry see Field 5G.
W78-05418

APPLICATION OF THERMAL IMAGERY AND AERIAL PHOTOGRAPHY TO HYDROLOGIC STUDIES OF KARST TERRANE IN MISSOURI,
Geological Survey, Rolla, MO. Water Resources Div.; and Missouri Dept. of Natural Resources, Rolla. Div. of Geology and Land Survey.
For primary bibliographic entry see Field 5G.
W78-05441

ST. LOUIS REFUSE PROCESSING PLANT: EQUIPMENT, FACILITY AND ENVIRONMENTAL EVALUATIONS,
Midwest Research Inst., Kansas City, MO.
L. J. Shannon, D. E. Fiscus, and P. G. Gorman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 634, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-650/2-75-044, May 1975. 110 p, 15 fig, 58 tab, 1 ref, 1 append. 1AB013; ROAP-21AQQ-010, 68-02-1324, Task 4.

Descriptors: *Air pollution, *Water pollution, Wastes, Waste treatment, Waste disposal, Environmental effects, Evaluation, Operations research, Municipal wastes, Chemical analysis, Equipment, Missouri, St. Louis(MO), *Refuse processes, Combustion, Particulates.

Partial results of tests and evaluations of the St. Louis, Missouri refuse processing plant's equipment, facilities, and environmental impacts are reported. Studies were made on plant mass and energy balances, equipment and plant performance, and plant operating costs. Particulate emission tests were performed on the hammermill and air classification system dust collection cyclones; a pollution evaluation of plant washdown water and a plant sound survey were carried out. The plant operated satisfactorily during the evaluation period, with about 80% of the incoming refuse converted to refuse fuel, on both a mass and energy basis. No major equipment breakdowns occurred. Plant operating and maintenance costs ranged from $2.58 to $14.80/ton of refuse produced, with costs varying primarily as a function of tonnage. Particulate emissions from the hammermill cyclone discharge were less than 0.01 g/dscf; those from the air classifier cyclone discharge averaged 0.209 g/dscf (about 1.25 lb/ton of refuse processed). Over 80% by weight of these particles had mean diameters greater than 10 micrometers. Washdown water samples showed significant increases in total suspended solids, biological oxygen demand, and chemical oxygen demand; however, the small quantity of effluent could be handled easily by the average municipal waste treatment facility. At eight of the 17 plant positions where sound measurements were taken, sound levels were over 90 dBA (the maximum OSHA level for continuous eight hour exposure). The appendix presents data on equipment and analysis of refuse samples. (Wares-IPA)
W78-05487

ECONOMIC ASSESSMENT OF WASTE WATER AQUACULTURE TREATMENT SYSTEMS,
Central State Univ., Edmond, OK Dept of Economics.
For primary bibliographic entry see Field 5D.
W78-05488

HEAVY METAL ENRICHMENT IN MINE DRAINAGE: IV. THE ORANGE FREE STATE GOLDFIELD,
Pretoria Univ., (South Africa). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-05491

ANALYSIS OF ORGANIC MATTERS IN KRAFT PULP MILL EFFLUENT IN HIRO BAY (HIROWAN KURAFUTO PARUPU KOJO HAISUIKO FUKIN NO YUKIBUTSU NO BUNSEKI),
Government Industrial Research Inst., Hirohata (Japan).
For primary bibliographic entry see Field 5A.
W78-05502

PILOT-PLANT DEMONSTRATION OF WET OXIDATION FOR TREATMENT OF SHIPBOARD WASTEWATERS,
Barber-Colman Co., Santa Ana, CA. Resource Recovery Systems Div.
For primary bibliographic entry see Field 5D.
W78-05545

DESIGN PROCEDURES FOR DISSOLVED OXYGEN CONTROL OF ACTIVATED SLUDGE PROCESSES,
Brown and Caldwell, Walnut Creek, CA.
For primary bibliographic entry see Field 5D.
W78-05549

COMPREHENSIVE SUMMARY OF SLUDGE DISPOSAL RECYCLING HISTORY,
Metropolitan Denver Sewage Disposal District No. 1, Commerce City, CO.
J. C. Baxter, W. J. Martin, B. R. Sabey, W. E. Hart, and D. B. Cohen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 352, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/2-77-054, April, 1977. 85 p, 19 fig, 32 tab, 6 ref, 1 append. 68-03-2064.

Descriptors: *Sludge disposal, *Sludge treatment, *Sludge, *Pollutant identification, Waste disposal, Sewage disposal, Plant growth, Germination, Bacteria, Coliform, Aerobic digestion, Incineration, Drying, Biodegradation, Colorado, *Land application, *Plant emergence, *Microbial count, *Sludge application, Denver.

Since 1971 the only mode of sludge disposal used by the Metropolitan Denver Sewage Disposal District No. 1 has been land application. The development of methodology and problems (heavy metal buildup in soils and plants, pathogen dissemination, nitrate pollution of groundwater) associated with each of the several different procedures which have been implemented over the intervening years since 1971 are discussed. Continuous excessive applications of sludge to the soil at the Lowry Bombing Range since 1969 have raised the concentration of nutrients, metals, salts and organic matter; the effects on soil, crops and environment are evaluated. The effects of various sludge applications to soil on germination, emergence, subsequent plant growth and heavy metals uptake are discussed. Low germination and emergence rates were found when crops were planted immediately after sludge incorporation. Increased soil sludge incubation periods resulted in decreased germination inhibition, possibly attributable to the influence of salts or some volatile component of the sludge. Microbial counts

showed that sludged plots had an appreciable increase in total aerobic, total coliform, and fecal streptocci bacteria. Counts of fecal coliform bacteria showed no appreciable differences from control plots after a 6-month incubation period. Air drying of liquid sludge in shallow earthen drying basins showed that water is lost through soil percolation in addition to evaporation and that about half of the nitrogen content of sludge is lost during the drying process. Future research needs are discussed. (Seip-IPA)
W78-05550

SITE SPECIFIC BURIAL OF UNFIXATED FLUE GAS SLUDGE,
Research-Cottrell, Inc., Bound Brook, NJ.
R. W. Goodwin.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 103, No EE6, p 1105-1114, December, 1977. 2 fig, 4 tab, 14 ref.

Descriptors: *Leaching, *Sludge disposal, *Path of pollutants, *Thermal power plants, *Landfills, Pollutant identification, On-site data collections, Industrial wastes, Environmental effects, Soil contamination, Aquifers, Waste water disposal, Waste water treatment, Costs.

The sludge resulting from flue gas desulfurization generally contains solid calcium salts and a variety of trace elements. A pilot-scale flue gas desulfurization (FGD) plant was operated at a 436 MW lignite-fired power plant in North Dakota in a study to provide information on various methods of sludge disposal. The cost-effectiveness of fixated and nonfixated sludge disposal were compared; the environmental feasibility of land burial of nonfixated sludge was exmined. Laboratory analyses of the chemical and physical characteristics of FGD sludge revealed that the sludge contained calcium sulfite hemihydrate, quartz, and calcite, with a moisture content ranging 17.5-40.0% of the total wet weight. Chemical characteristics of the sludge supernatant and filtrate were compared with those of a lignite aquifer. Geological, stratigraphic, and pedological investigations were carried out at the proposed sludge disposal site. The laboratory and field data suggested that downward and laterial migration of ions from the unfixated sludge burial site would be minimal. The site was considered feasible in terms of general soil conditions, permeability, ion exchange capacity, and aquifer locations. (Schulz-FIRL)
W78-05555

VARIABLE THICKNESS TRANSIENT GROUNDWATER FLOW MODEL THEORY AND NUMERICAL IMPLEMENTATION,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 2F.
W78-05584

CATCH BASIN PROCESSING APPARATUS,
LRS Research Ltd., Broomall, PA. (Assignee).
For primary bibliographic entry see Field 5G.
W78-05601

RECREATIONAL VESSEL WASTE POLLUTION,
Coast Guard, Washington, DC.
For primary bibliographic entry see Field 5D.
W78-05621

POLLUTION FROM DREDGING OPERATIONS,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-05673

TOTAL WASTE RECYCLE SYSTEM FOR WATER PURIFICATION PLANT USING ALUM AS PRIMARY COAGULANT,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W78-05674

HAZARDOUS MATERIALS WASTE DISPOSAL (A BIBLIOGRAPHY WITH ABSTRACTS).
National Technical Information Service, Springfield, VA.
Available from the National Technical Information Service, Springfield, VA 22161 as PS-770421, Price codes: N01 in paper copy, N01 in microfiche. Report No NTIS/PS-76/0333, May 1976, M.F. Smith, Ed. 157 p.

Descriptors: *Bibliographies, *Hazards, *Toxins, *Toxicity, *Disposal, *Waste disposal, Pesticides, Pesticide removal, Explosives, Chemicals, Chemical wastes, Industrial wastes, Chemical warfare, Chemical industry, Waste disposal wells, Pollution, Solid waste disposal, Water pollution, Water pollution control, *Hazardous materials disposal, Chemical industrial wastes, Chemical warfare wastes, Waste disposal sites, Management planning.

An updated bibliography and abstract guide contains 157 abstracts, 65 of which are new entries to the previous edition (NTIS/PS-75/285). Topics include disposal of pesticides, explosives, chemical warfare agents, dangerous industrial chemicals, and other types of hazardous materials. Citations include research on management planning, disposal, pollution, toxicity, and National Disposal Sites. Radioactive wastes are not included. (Seip-IPA)
W78-05675

PROCEEDINGS OF THE NATIONAL CONFERENCE ON SOLID WASTES MANAGEMENT, HELD AT UNIVERSITY OF CALIFORNIA, ON APRIL 4 AND 5, 1966.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5D.
W78-05685

DEVELOPMENTS AT EIGHTH INTERNATIONAL CONFERENCE ON WATER POLLUTION RESEARCH.
Environmental Protection Agency, Washington, DC. Office of Research and Development.
Report No EPA-600/9-77-015, Conference Report, Sydney, Australia, October 17-22, 1976. February, 1977. 211 p, 4 fig, 1 tab, 16 ref, 4 append. R-804288010.

Descriptors: *Conferences, Water pollution, *Australia, *Water pollution treatment, *Water pollution control, *Water pollution sources, Pollutant identification, *International Association on Water Pollution Research, *Sydney(AUS).

Seventy-two pages, presented at the International Association of Water Pollution Researchers (IAWPR) Conference, are reviewed, discussed, and critiqued; their significance and value are assessed by participants in the Conference. Papers were presented in discussion sessions according to the following themes: (1) general, (2) spray irrigation with wastewater and virus removal, (3) lakes, reservoirs, and surface water quality, (4) groundwater pollution, (5) chorination, flocculation, and adsorption, (6) coastal pollution, (7) dynamics of biological nitrification, (8) ultimate disposal of sludges; (9) sludge thickening and dewatering, (10) pyrolysis of sewage sludge and refuse, (11) sludge thickening, (12) aeration ponds, (13) advanced waste treatment and physicochemical treatment of wastewaters, (14) stabilization ponds, (15) sulfide attack on sewers, (16) automation and aerobic and anaerobic digestion, (17) industrial wastewater management, (18) monitoring of waste discharges, (19) water resources quality management, (20) toxicity of industrial wastes, (21) stream oxygen balance and bioassays, (22) land treatment, (23) removal of organics and tertiary wastewater, (24) ion exchange, (25) fixed film biological contractors, and (26) uptake, exchange kinetics, and transport. An overview of pertinent informal and formal conference developments is presented. (Seip-IPA)
W78-05686

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALINATION PLANTS. PART I, FLUME STUDY OF THE MIXING CHARACTERISTICS OF DENSE JETS DISCHARGED INTO A FLOWING FLUID, VOL I, MAIN TEXT. APPENDIX A: NOTATION. APPENDIX B: CONDUCTIVITY PROBE CALIBRATION AND DATA REDUCTION,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5B.
W78-05689

MODEL STUDIES OF OUTFALL SYSTEMS FOR DESALINATION PLANTS, PART II. TESTS OF EFFLUENT DISPERSION IN SELECTED ESTUARY MODELS, VOLUME I. MAIN TEXT,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 5B.
W78-05690

5F. Water Treatment and Quality Alteration

WATER-PURIFYING APPARATUS,
Sachs-Systemtechnik G.m.b.H., Schweinfurt (West Germany).
V. Eibl, and A. Reis.
U.S. Patent No. 4,048,044, 4 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 962, No 2, p 741, September 13, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Disinfection, Electrolysis, Electrochemistry, Anodes, Cathods, Oxidation, Silver anodes.

The invention relates to improvements in an apparatus for purifying water contaminated with microorganisms. The apparatus is constituted by an electrolytic cell comprising a silver-containing anode and a cathode, and the water to be purified flows substantially parallel to the anode and cathode surfaces through a space between them. The anode may be of a material containing metallic silver or of substantially pure (99%) silver. The apparatus of this invention avoids the need for disinfective additives whose exact amounts are often difficult to determine and which are frequently inadmissible for the consumption of the water. The water is not only disinfected but also decontaminated and detoxicated, bacteriological contaminations being converted into non-toxic compounds. These objects are accomplished by this invention and water purification may be substantially completed during the passage of the water through the cell. (Sinha - OEIS)
W78-05224

WATER FILTRATION MODULE,
L. Obidniak.
U.S. Patent No. 4,049,550, 6 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 962, No 3, p 1237, September 20, 1977.

Descriptors: *Patents, *Water treatment, *Water pollution treatment, *Water purification, Filtra-

tion, Membrane processes, Reverse osmosis, Equipment, Domestic water, Ultra-filtration.

A water filter unit particularly adapted for filtration of small quantities of raw water as required in homes and the like is described. The unit includes a molded rigid plastic base and hinged cover which is mounted on a filter module containing ultra-filtration or reverse osmosis membrane, a sterilization tank fitted to the base of the unit, and a quick water tap connector for attachment to the raw water tap which is generally equipped with a special adaptor to connect and release the connector. One flexible hose from the quick water tap connector supplies raw water to the top of the filter module and a second flexible hose connects the drain from the bottom of the filter back to the quick water tap connector, while a third flexible hose carries the filtered water from the bottom of the filter module for delivery of purified water as required. All three flexible hoses are contained within a flexible sleeve which is clipped to the base of the unit when the unit is not in service. When the apparatus is not in use, the quick water tap connector is lowered into the sterilization tank so that air is kept from entering the filter unit thus preventing drying out of the filter element and bacteria contamination. (Sinha-OEIS)
W78-05230

PROCESS FOR PURIFYING WATER,
Degremont, Rueil-Malmaison (France). (Assignee).
F. M. Fiessinger.
U.S. Patent No. 4,051,028, 4 p, 3 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 962, No 4, p1722, September 27, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, *Water pollution treatment, *Waste water treatment, Flocculation, Coagulation, Chemical precipitation, Separation techniques.

In a process for coagulating and flocculating water reagent used is prepared on site and injected directly into the water to be treated in proportion at it is formed. The object of the invention is a process for the purification of water containing dissolved and/or suspended material which comprises adding a polymeric aluminum hydroxide solution prepared by treating slowly and under vigorous agitation a solution containing up to 2.5 moles/liter of an aluminum salt with a solution containing an amount of an alkaline or alkaline-earth hydroxide such that in the resulting solution the molar ratio of hydroxide to aluminum is from 2.3 to 2.7 and the concentration of aluminum s from 0.025 to 0.40 mole liter. The process allows both organic and inorganic material in suspension in the water to be eliminated, and therefore the cloudiness and the oxidizable materials to be simultaneously eliminated, which makes it clean for use in drinking water. (Sinha-OEIS)
W78-05236

WATER DISTILLER,
R. McFee.
U.S. Patent No. 4,052,267, 12 p, 10 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 963, No 1, p 245, October 4, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, *Distillation, Condensation, Demineralization, Equipment, Domestic water.

The invention provides a water distiller comprising a housing, a heater and a cap. The housing is sized to define a raw water storage space and has a suitable inlet for the introduction of raw water as well as a suitable outlet for removing brine or unused water. The heater is placed in the housing for vaporizing the water in the raw water storage space. The cap which is removably mounted on the housing has a radiator as well as a fan. The raiotor is connected in communication with the raw storage space in order to receive a flow of vapor while the fan serves to blow air over the radiator to cool the radiator and thus condense the vapor to water. The cap also has an outlet connected to the radiator for dispensing the distilled water. (Sinha - OEIS)
W78-05241

SUBMERGED ENCLOSURES MAY HELP SINK PLANT PROBLEMS,
H. F. Instruments, Ltd., Bolton (Ontario).
For primary bibliographic entry see Field 5D.
W78-05333

THE USE OF MEMBRANE FILTERS TO PRODUCE BACTERIA-FREE WATER TO BE USED IN A SPF-LABORATORY, (IN GERMAN),
Schering A. G., Berlin (West Germany). Dept. fuer Tierzucht Haltung.
U. Zillmann, R. Nehls, and K. Schwartz.
Z Versuchstierkd 18(5/6), p 324-336, 1976.

Descriptors: *Bacteria, *Filters, Laboratory tests, *Membrane filters, Microbes, *Pathogens, Water pollution, Potable water, Water treatment, Waste water treatment, *Filtration.

Membrane filters were tested with the intention of producing bacteria free water to be used as drinking water for SPF (Specific Pathogen Free)-laboratory animals. Tests were run to determine the effectiveness and the clogging time of the filters when using demineralized water. It is possible to produce bacteria free water with the filtration systems used. It seems necessary to acidify the water additionally in order to reduce the growth of microbes within the filter system and to prevent a recontamination. The sterile filtration technique proved to be more economical than thermic sterilization in this case and was chosen for this reason.--Copyright 1977 Biological Abstracts, Inc.
W78-05335

CUTTING (WATER) CONSUMPTION BY 95 PERCENT BY RECYCLING,
For primary bibliographic entry see Field 3E.
W78-05445

HEALTH EFFECTS OF NITRATES IN WATER,
Hebrew Univ., Jerusalem (Israel). Environmental Health Lab.
For primary bibliographic entry see Field 5C.
W78-05543

TRANSLATION OF REPORTS ON SPECIAL PROBLEMS OF WATER TECHNOLOGY, VOLUME 9 - ADSORPTION.
Karlsruhe Univ., (West Germany). Dept. of Water Chemistry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 359, Price codes: A20 in paper copy, A01 in microfiche. Report No EPA-600/9-76-030, December, 1976. Conference held in Karlsruhe, Federal Republic of Germany, 1975. Sontheimer, H., Ed. 454 p, 187 fig, 39 tab, 290 ref. Volume 9 of 9. ICC614.

Descriptors: *Adsorption, *Water treatment, *Potable water, *Filtration, *Activated carbon, Water purification, Water treatment, Conferences, Technology, Evaluation, Ozone, Ion exchange, Organic compounds, Performance, Translations, *Reactivation, Aluminum oxide, Engler-Bunte-Institute.

Translations of twenty-four papers on adsorption and reactivation as a water treatment unit process are presented. Topics include adsorption processes in drinking water treatment, properties and use of activated carbon in water treatment, practical experience in pretreatment and treatment of water, and test and evaluation methods for water treatment. Investigations of bacteria in activated carbon filtration treatment systems and products, the use of ozone and aluminum oxide for water purification, and the use of microporous ion exchangers for drinking water purification were reported. Because of the practical problems involved in adsorption processes for water treatment, some criteria were listed as important for the evaluation of activated carbon filters. (1) control of organic substances in effluent water as compared to influent water; (2) reserve capacities; (3) determination of presence of nonpolar organochloro compounds; and (4) performance parameters relating to taste, odor, heavy metals concentration, biological performance, and concentration of dissolved organics. It was concluded that the practical aspects of water treatment by adsorption must be considered with basic process data in order to achieve better results in drinking water treatment. (Wares-IPA)
W78-05544

DETECTION AND INACTIVATION OF ENTERIC VIRUSES IN WASTEWATER,
Hebrew Univ., Jerusalem (Israel). Environmental Health Lab.
For primary bibliographic entry see Field 5D.
W78-05548

METHOD AND APPARATUS INTEGRATING WATER TREATMENT AND ELECTRICAL POWER PRODUCTION,
M. R. Jeppson.
U.S. Patent No. 4,052,858, 20 p, 13 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 963, No 2, p 441, October 11, 1977.

Descriptors: *Patents, *Water conservation, *Water reuse, *Water utilization, *Steam, Water treatment, Impaired water use, Water cooling, Irrigation water, Reclaimed water, Geothermal studies, Equipment.

Practical and economically feasible methods and apparatus, which utilize steam energy for such operations as sterilization of fresh or sewage water, electrical power generation and the large scale pumping of water and includes systems which may combine two or more of these operations to transform former waste products into valuable commodities are described. The energy requirements for such systems may be derived from steam sources which have heretofore presented heat disposal problems such as the discharge from generating station turbines, or from sources formerly considered unusuable such as low energy or corrosive steam wells. In one embodiment of the invention, discharge steam from a power generating station is used to heat and sterilze contaminated sewage water which may then be used for agricultural irrigation or other purposes. In another embodiment, fresh city utility water is sterilized by a heat exchange with the discharge steam of electrical generation facilities thereby reducing or eliminating chlorination requirements while also eliminating the need for conventional condensation structures and cooling water at the power station. In another instance, geothermal steam is utilized to lift water, which may be waste water that is sterilized in the process, to an elevated reservoir from which it may be caused to operate hydroelectric generators before being utilized for crop irrigation or the like. The invention may take a variety of forms which all have in common the utilization of steam energy and may combine some or all of these operations in one facility. (Sinha-OEIS)
W78-05604

PROCESS FOR THE PURIFICATION OF WATER,
Battelle Memorial Inst. (Switzerland). (Assignee).
J. F. Courvoisier, J. Meylan, and J. P. Fournier.
U.S. Patent No. 4,053,368, 7 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 963, No 2, p 613, October 11, 1977.

Descriptors: *Patents, *Water treatment, *Desalination, *Desalination processes, *Water purification, Water quality control, Distillation, Evaporation, Solar radiation, Separation techniques, Desalination apparatus.

A process for the purification of water comprises a step-wise procedure for heating and evaporating water to be purified and then condensing the water thus evaporated. The water to be treated is held in the form of a sheet on a surface having the property of absorbing solar radiation by accumulating external energy. This sheet of water is covered by a layer of liquid material, permeable to solar radiation, immiscible with water and having a vapour pressure less than that of water. The assembly thus formed is submitted to irradiation by solar rays so as to increase the temperature of the water. At least a part of the water thus heated is removed, a part of the water thus removed is evaporated and at least a part of the water vapour thus formed is recovered in the liquid state. The components assuring the heating function by means of solar energy are thus separated from those which effect the distillation operation. This separation renders possible the utilization of a very economical form of pan in which is effected the heating by irradiation by solar rays. This pan not only requires reduced upkeep and is hardly sensitive to the influence of wind, sand dust etc, but enables the use of a refrigerant other than atmospheric air to cause the condensation of the water vapour, permits the surface of each condensation unit to be reduced considerably and the yield to be improved. (Sinha-OEIS)
W78-05607

WATER PURIFICATION METHOD AND APPARATUS,
Westinghouse Electric Corp., Pittsburgh, PA. (Assignee).
K. Moeglich, and G. L. Hodgetts.
U.S. Patent No. 4,053,378, 11 p, 14 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 963, No 2, p 615, October 11, 1977.

Descriptors: *Patents, *Water purification, *Water treatment, *Electrolysis, Electrodes, Electrochemistry, Alternating current, Agglomeration, Flow, Descaling.

If an aqueous solution containing solids to be agglomerated is passed between electrodes on a continuous basis in the presence of a fluidized bed of conductive particles, vastly improved agglomeration or flocculation of the solids results from the multiplicity of electrolytic cells presented in the collapsing field of alternating current. In addition by utilizing conductive particles which are substantially resistent to attrition, a mechanical scrubbing effect will be exerted upon the electrodes which will tend to keep the electrodes clean during continuous operation and thereby avoid frequent shut downs for descaling. The fluidized bed may be established in the cell of this invention with the process water alone, or with the process water augmented by a gas such as air injected into the vessel. Once a fluidized state has been established, the likelihood of bridging, short circuits and the like between the electrodes is eliminated. Increased turbulence then increases the efficiency of the process. (Sinha-OEIS)
W78-05608

DRINKING WATER SYSTEMS FOR THE TRAVELING PUBLIC: A STATUS REPORT.
Environmental Protection Agency, Washington, DC. Office of Water Supply.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 304, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA/430/9-73/009, November, 1973. 13 p, 5 fig, 6 ref.

Descriptors: *Water supply, *Water quality, *Potable water, *Public health, Safety, Sampling, United States, Reservoirs, Groundwater, Wells, Bacteria, Water treatment, Travel(Recreation), Surface water.

The quality of water available to the traveling public at small water systems throughout the United States was assessed through study of selected water supply systems. Pilot studies assessed water quality, construction, maintenance, and operation of 233 systems, at public reservoirs, along interstate highways, and in state and national recreational sites. The majority used wells or springs (ground water) as a water source, and approximately 20% used lakes or rivers (surface water); only a few systems purchased treated water from nearby municipal systems. Of the ground water systems, 87 percent provided no treatment, despite the frequent lack of a good historical record of bacteriological quality. While nearly all surface systems provided treatment, one-third relied only on disinfection without clarification. Sixty-seven percent of those studied did not meet at least one recommended limit, and 24 percent distributed water that did not meet at least one mandatory chemical or bacteriological limit. Most frequent problems related to excessive levels of iron, maganese, and total dissolved solids; over 20% of the systems showed coliform contamination. Bacteriological surveillance varied widely, with only 10 percent sampled frequently enough to meet drinking water standards. Operation and control of the systems was generally poor, particularly at commercial water systems. Source protection throughout the studies was good, with 94 percent of the systems judged adequate. Higher priority on providing sanitary water supplies for travelers both by local and regulatory agencies is recommeded. (Wares-IPA)
W78-05623

DESIGN FOR CORROSION CONTROL OF POTABLE WATER DISTRIBUTION SYSTEMS,
Naval Civil Engineering Lab., Port Hueneme, CA.
For primary bibliographic entry see Field 8G.
W78-05624

STATISTICAL SUMMARY OF MUNICIPAL WATER FACILITIES COMMUNITIES OF 25,000 POPULATION AND OVER, AS OF JANUARY 1, 1960.
Public Health Service, Rockville, MD.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 753, Price codes: A04 in paper copy, A01 in microfiche. January 1960, 56 p.

Descriptors: *Water supply, *Water treatment, *Cities, *Municipal water, Water sources, Water storage, Water quality, Water purification, *Treatment facilities.

Tables summarize the information collected by the Public Health Service in the biennial inventory of water supply facilities in the country's larger cities. Tables 1 through 3 present data in terms of numbers of communities served, with the 1950 Census population of these communities. The rest of the tables pertain to water producing facilities. The data are grouped by community sizes according to 1950 Census data. All tables show data by population size groups and major drainage basins. A map showing drainage basins has been included. (Zayac-NC)
W78-05656

OZONE DISINFECTION AND OXIDATION IN A MODEL OZONE CONTACTING REACTOR,
Olin Corp., Brandenburg, KY.
For primary bibliographic entry see Field 5D.
W78-05670

DISINFECTION WITH QUARTERNACY AMMONIUM COMPOUNDS,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering; and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
L. K. Wang, and G. G. Rerry, III.
Water Resources Bulletin, American Water Resources Association, Vol 11, No 5, p 919-932, October, 1975. 4 fig, 7 tab, 28 ref.

Descriptors: *Disinfection, *Surfactant, *Water purification, *Chlorination, Coliforms, E coli, Water treatment, Chemical reactions, Waste water treatment, *Cationic surfactant, *Quaternary ammonium compounds, *Cetlydimethylbenzylammonium chloride(CDBAC), *Cetyltrimethylammonium bromide(CTAB), *Dialkyldimethylammonium chloride(DDAC), *Surface-active agent, *Disinfectant, Membrane filtration technique, Chemical process, Most probable number(MPU), Ozonation.

The nature, bactericidal properties, and potential field applications of three cationic surfactants, classified as quaternary ammonium compounds, (cetyltrimethyl-ammonium bromide (CTAB), ceyldimethylbenzylammonium chloride (CDBAC), and dialkyldimethylammonium chloride (DDAC) were tested to assess their effectiveness in replacing chlorine as water bactericidal agents. Administration of all three surfactants at over-dosages of 2.5-10.0 mg/l, at room temperature, at neutral pH, and at 10-minute contact time resulted in zero or near-zero coliform counts. CDBAC was more extensively tested and the afore mentioned parameters were varied. It was found that a dosage of 1.0 mg/l CDBAC was effective in destroying all coliform present (approximately 4500) in 100 ml of water within 10 minutes at neutral pH and at room temperature. The experimental effectiveness of cationic surfactants (specifically DCBAC) as recyclable bactericidal agents warrants thorough investigation of long-term effects on human health, and mechanism of surfactant disinfection, surfactant recovery technologies, and capital, overhead, and maintenance costs. (Seip-IPA)
W78-05677

5G. Water Quality Control

MNO2 DEPOSITION IN FEEDLOT WATER LINES IN SOUTH DAKOTA,
South Dakota State Univ., Brookings. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-05202

PRODUCTIVITY AND NITROGEN BALANCE IN LARGE SCALE PHYTOPLANKTON CULTURES,
Woods Hole Oceanographic Institution, Woods Hole, MA.
For primary bibliographic entry see Field 5D.
W78-05205

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XIV. TRANSPORT.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05219

OIL AND WASTE WATER RECEPTION FACILITY AND PROCESS,
C. F. Propp.
U.S. Patent No. 4,048,070, 6 p, 4 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 962, No 2, p 750, September 13, 1977.

Descriptors: *Patents, *Waste water treatment, *Oil pollution, *Separation techniques, Water pollution treatment, Oily water, Water pollution control, Bilge water.

A system and process are employed that are particularly useful for receiving waste water from ships and for recovering the oil. The system utilizes an initial holding tank for the waste water, and this tank has an outlet for directing the water to one or more decantation tanks which may have heating means for cooking the waste water to increase the efficiency of oil and water separation. The decantation tanks are set at varying levels and are connected in series for concentrating the oil product to be collected. A lower portion of the tanks have outlet means leading to open top separator tanks. These separator tanks have pivotal skimming means and also have one or more baffles producing agitation of the water for further separating the oil. The separator tanks also have a partition over which water flows into a second tank portion from which the substantially oil free water is directed through a filter into an open top inspection tank. The pH of the effluent may be adjusted at the inspection tank. The inspection tank has an outlet for directing the substantially oil free water to disposal means such as a public sewer. The system employs manifold means for bypassing and recirculating if necessary. (Sinha - OEIS)
W78-05225

WATER POLISHING MEANS FOR REMOVING OIL AND OTHER FLOTSAM FROM WATER,
G. B. Stebbins, and J. F. Stebbins.
U.S. Patent No. 4,049,553, 8 p, 5 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 962, No 3, p 1238, September 20, 1977.

Descriptors: *Patents, Water quality control, *Water pollution treatment, *Oil pollution, *Separation techniques, Flotsam, Oily water, Skimming, Flow control.

The object of the invention is to provide a water polishing apparatus which is particularly suitable, effective and efficient for removing flotsam such as oil, paper fibers, wood particles, chopped vegetables and/or meat particles from water. The apparatus contains flow control means for controlling the flow of a mixture of flotsam and water in a manner which is highly effective to cause the flotsam and water to be separate and which includes skimming means associated or in combination with the flow control means which is effective to skim flotsam for the surface of the water as it rises to and accumulates on the surface of the water. (Sinha-OEIS)
W78-05231

OIL SPILL CLEANUP SYSTEM,
Shell Oil Co., Houston, TX. (Assignee).
R. R. Ayers.
U.S. Patent No. 4,049,554, 11 p, 14 fig, 15 ref; Official Gazette of the United States Patent Office, Vol 962, No 3, p 1238, September 20, 1977.

Descriptors: *Patents, *Oil pollution, *Water pollution control, *Water pollution treatment, *Oil spills, Skimming, Equipment, Separation techniques, Booms.

A skimmer for removing oil from the surface of a body of water is articulated from front to rear to be wave comformable and/or has a quiescent collection zone formed by bottom/or forward baffles.A flexible skimming head for use with or independently of the skimmer is composed of a foraminous sheet having an integral chevron flow pattern on its upper surface. An alternate floating skimmer head for use similar to the preceeding head has a central, axially vertically movable cone or other configuration forming a suction mouth. A boom for use with or independently of the skimmer is composed of converging double booms. Storage capacity for oil collected is provided by onboard and/or offboard membranes (Sinha-OEIS)
W78-05232

OIL RECOVERY APPARATUS AND METHOD,
Lowe Engineering Co., Lincoln Park, NJ. (Assignee).
J. G. Lowe, and R. I. Butler.
U.S. Patent No. 4,051,024, 9 p, 7 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 962, No 4, p 1721, September 27, 1977.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, Water quality control, *Separation techniques, Equipment, *Oil recovery apparatus.

The oil recovery apparatus of this invention includes a simple frame upon which is mounted a motor which by a belt or chain drives a shaft on which is mounted a series of like disks. These disks are most efficient if they are made of a plastic which has a particular affinity for oil and petroleum products. Particularly effective in the pickup of oil has been polyethylene. The scrapers associated with the disks are ribbons of Nylon strips which are bent to provide scraping edges which are pressed against the sides of the rotating disks. In use the disks are rotated in a partly immersed condition and as they are rotated are sequentially lifted from the contaminated fluid and they are returned to an immersed condition. The scraped residue of oil removed just prior to reimmersion is fed to a conductor and then to an accumulator. The Nylon ribbons are of sufficient stiffness to provide the bias necessary to retain the bent ribbons in tight engagement with the sides of the disks to be scraped. They are readily removable and replaceable. (Sinha-OEIS)
W78-05235

FLOW CONTROL VANE FOR A SKIMMER-TYPE OIL BOOM,
National Marine Service, Inc., St. Louis, MO. (Assignee).
C. in't Veld.
U.S. Patent No. 4,051,038, 6 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 962, No 4, p 1725, September 27, 1977.

Descriptors: *Patents, *Oil pollution, Water quality control, *Water pollution treatment, *Skimming, Flow control, Equipment.

This invention is based on the discovery that a floating weir suction-type oil skimmer operates more efficiently if the level of the water surface directly in front of the skimmer is relatively stable, particularly when the skimmer is subject to an oncoming surface current having appreciable velocity. The invention comprises a flow control vane element inclined in a forward direction with respect to an oncoming surface current, with the top edge of the web located slightly below the surface of the water. The flow control vane is particularly useful in connection with a skimmer of the floating weir type where a buoyant lip section floats just below the surface of the water to allow a thin surface layer to overflow the lip into a sump from which the liquid is continuously removed by suction. With such a skimmer, the oil floating on the surface of the water can be removed with a minimum of underlying water being removed and processed in a separator unit. (Sinha-OEIS)
W78-05239

OIL SWEEP,
Minnesota Mining and Mfg. Co., St. Paul.
M. G. Schwartz, A. P. Lorentzen, and D. J. Bucheck.
U.S. Patent No. 4,052,306, 6 p, 5 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 963, No 1, p 256-257, October 4, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution treatment, Water quality control, Floating, Absorption, Barriers, Separation techniques, Containment(Oil spills).

A floatable oil sweep useful in controlling an oil spill on a moving body of water comprises an elongated web of oil sorbent adapted to float on the body of water with its large-area faces parallel to the waterline, and a weighted open-mesh netting attached to the web and adapted to be suspended below the floating web when the oil sweep is deployed. Use of the netting has been found to significantly extend the period of time before oil droplets are carried under the oil sweep by movement of the body of water. (Sinha - OEIS)
W78-05243

HYGENIC ASSESSMENT OF THE THERMAL DECOMPOSITION OF THE ACRYLATES PRODUCTION WASTES,
For primary bibliographic entry see Field 5D.
W78-05275

ALONG THE WATER CLEANUP ROAD.
Environmental Science and Technology, Vol 11, No 13, p 1150-1152, December, 1977.

Descriptors: *Chemical wastes, *Municipal wastes, *Activated sludge, *Sewerage, Biological treatment, Sewage treatment, Equipment, Industrial wastes, Waste water disposal, Waste water treatment.

As of July 1, 1977, approximately 3400 of 4000 industrial plants were in compliance with 'best practical' waste treatment requirements. Pretreatment of industrial wastes discharged to sewers is being required more often. One new technology uses specially developed bacterial strains to degrade lubricating and vegetable oils, animal fats, and greases. An activated carbon-activated sludge process is being used to treat effluent containing acids, heavy metals, organic dyes, and background solids and salts at the Du Pont Chambers Works at Deepwater, New Jersey. Techniques being studied for sludge disposal include land disposal, fluidized-bed combustion, and co-pyrolysis with refuse. A vortex Clarifier is available from Bird Machine Company, Inc., of South Walpole, Massachusetts, for removing fine suspended solids rapidly. A rugged monitor for total organic carbon which is claimed to be free of dissolved solids problems is available from Envirotech/Dohrmann, Santa Clara, California. Possible new software includes computers to control and simulate treatment systems. (Snyder-FIRL)
W78-05276

MEETING 1983 EFFLUENT REQUIREMENTS.
Food Engineering, p 69-70, 73, July, 1977. 1 fig, 1 tab.

Descriptors: *Water quality standards, *Industrial wastes, *Food processing industry, *Waste water treatment, *Treatment facilities, Activated sludge, Costs, Design data, Waste water disposal.

The Hillshire Farm waste water treatment plant in Wisconsin, installed in 1973 at a cost of $350,000, is discussed as one company's solution to meeting the 1983 effluent requirements. This meat packing plant realized capital cost savings of up to $400,000 and yearly savings in operating costs of up to $40,000 by installing their own treatment system, rather than discharging into the local municipal sewer system. The present waste water treatment plant consists of a rotary screen for kill flow wastes, a lift station, dissolved-air flotation, complete-mix activated sludge, chlorine contact, and final detention in a pond filled with marsh vegetation. The slection criteria and design are described for each of the unit processes. (Baker-FIRL)
W78-05299

OMC-LINCOLN MEETS TOUGH DISCHARGE ORDINANCE.
Industrial Finishing, Vol. 54, No. 1, p 36-37, January, 1978.

Descriptors: *Oil wastes, *Chromium, *Cadmium, *Zinc, *Separation techniques, Treatment facilities, Industrial wastes, Nebraska, Waste water treatment, Waste water disposal.

Waste water treatment processes used by Cushman Division of Outboard Marine Corporation in Lincoln, Nebraska, are outlined. Wastes treated at the industrial plant include: cyanide from zinc and cadmium plating and treating; chromium from paint line rinse waters, paint booth washes, and paint hook striping tanks; and aqueous oil from washer operations. Local discharge limits are set at 0.5 mg/liter for chromium and cadmium, 1.0 mg/liter for zinc, and 2.0 mg/liter for cyanide. Waste water containing chromium is pumped from a sump to a reduction tank where the pH is reduced to 2 with sulfuric acid. Sodium metabisulfite is added to produce trivalent chromium. Lime is then used to raise the pH in the coagulation-neutralization tank to 8.5. Clear liquid is discharged to the sewer system and sludge is transported to a holding tank after the solution settles overnight. Strong and weak cyanide solutions are mixed in a mobile storage tank where they are chlorinated after removal to the treatment plant. Oil is skimmed from aqueous wastes in a holding tank and pit and pumped to a collection barrel. The pH of the water is adjusted in a treatment tank where the emulsion-breaking process is accelerated with calcium chloride additions. After stirring and settling, the discharged water contains approximately 2 ppm of oil. (Lisk-FIRL)
W78-05300

GUIDELINES ISSUED FOR METAL FINISHING EFFLUENTS.
Water and Pollution Control, Vol. 116, p 21, January, 1978.

Descriptors: *Water quality standards, *Water pollution control, *Metals, *Suspended solids, *Cadmium, *Chromium, Copper, Lead, Zinc, Nickel, Waste water disposal, Waste water treatment, Treatment facilities, Industrial wastes.

Metal finishing plant effluent guidelines have been adopted by Fisheries and Environment Canada for the control of plating wastes. The elimination of raw waste disposal was effected by maximum limits for metal plating wastes. The maximum allowable concentrations include: 30.0 mg/liter total suspended matter, 1.5 mg/liter cadmium, 1.0 mg/liter total chromium, 1.0 mg/liter copper, 1.5 mg/liter lead, 2.0 mg/liter zinc, and 2.0 mg/liter nickel. Permissible levels of oxidizable and total cyanide are 0.1 mg/liter and 3.0 mg/liter, respectively. The guidelines also established a pH range of 6.0-9.5 for discharged waste. An estimated 70% reduction in raw waste loading is expected by the metal and pH limits. The treatment before disposal of emulsion cleaners, chlorinated hydrocarbons, effluent treatment sludges, and other processing solutions is required by the guidelines and a resulting 20% waste load reducion is expected. The treatment of concentrated wastes by metal plating and finishing plants may cost from $15,000-100,000, according to a study by the Water Pollution Control Directorate. (Lisk-FIRL)
W78-05308

THE INTEGRATED STEELWORKS OF SOLMER AT FOS-SUR-MER.
Steel Times, Vol. 205, No. 10, p 1030, 1032, 1034-1036, 1038-1041, October, 1977. 15 fig, 3 tab.

Descriptors: *Steel, *Industrial plants, *Industrial wastes, *Water pollution control, *Design data, Industries, Metals, Waste water treatment.

The steelworks of SOLMER at Fos-sur-Mer in France are described in detail. Major topics considered in the paper include: the site, ore reception and stocking, sinter plant, the cokemaking plant, the blast furnaces, the LD steelworks, slabbing mill, the continuous strip mill, the soaking pits, the hot mill, the finishing facilities, metallurgical control of quality, materials handling and transport, pollution control, energy and other supply networks, information management and process control, and works safety service. In the area of water pollution control, sophisticated waste treatment plants have been installed to ensure that the amounts of suspended solids, hydrocarbons, various toxins, dissolved salts, and organic pollutants that might occur in effluent from various processes are removed to within the statutory limits. (Baker-FIRL)
W78-05312

POSSIBILITIES AND MEASURES TAKEN BY THE PULP INDUSTRY FOR THE PROTECTION OF THE ENVIRONMENT (MOEGLICHKEITEN UND MASSNAHMEN DER ZELLSTOFFINDUSTRIE IM INTERESSE DES UMWELTSCHUTZES).
Umweltschutz, Vol. 14, No. 12, p 304-310, 1977.

Descriptors: Pulp and paper industry, *Pulp wastes, Foreign countries, *Industrial wastes, *Water consumption, Water pollution control, Separation techniques, Bleaching wastes, Biological treatment, Chemical precipitation, Oxidation, Recycling, Water reuse, Waste water treatment, Waste water disposal.

A survey of environmental protection measures being used by pulp and paper mills in Austria is presented. Emphasis has been placed on the reduction of air and water pollution by technological improvements, closed cycle processes, and other measures which permit partial recovery of chemicals, rather than on the treatment of effluents. In sulfite pulping operations, the switch from the calcium disulfite to the magnesium disulfite process has led to the greater recovery of process chemicals. The amount of organic waste generated during pulp cooking has been reduced from 1,000-1,5000 kg/ton of pulp to 8-15 kg/ton. Black liquor is concentrated to 55% of its initial volume prior to incineration. Magnesia, sulfur dioxide, sodium carbonate, and sodium sulfate are recovered. Volatile organic substances and methanol, present in the vapor condensate generated during the concentration of sulfite liquors, are also vacuum-stripped and incinerated. Oxygen and hydrogen peroxide are being considered as alternatives to chlorine for bleaching operations. Bleaching waste waters have been treated experimentally by chemical precipitation in addition to biological treatment, catalytic oxidation, wet oxidation, reverse osmosis, activated carbon adsorption, wet incineration, gamma irradiation, and ion-exchange processes. (Takacs-FIRL)
W78-05318

PULP INDUSTRY AND PROTECTION OF SURFACE WATERS (ZELLSTOFF-INDUSTRIE UND GEWAESSERSCHUTZ),
H. Fleckseder.
Umweltschultz Vol 14, No 12, p 288-293, 1977. 4 fig, 1 tab.

Descriptors: *Recycling, Pulp and paper industry, *Water consumption, *Biochemical oxygen demand, Industrial wastes, Sulfite liquors, Toxicity, Water reuse, *Pulp wastes, Waste water treatment.

Various aspects of water pollution control for Austrian cellulose-manufacturing plants are discussed, including waste water characteristics, effects of pollutants on surface waters, waste water treatment methods. Information on the BOD, COD, total organic carbon, color intensity, and toxicity of sulfite-cellulose manufacturing effluents is presented. The production of alcohol and yeast from sugars in sulfite boiling wash waters and evaporation of volatile organics have been used to reduce the total organic load from pulp mills. Nine of eleven pulp mills operating without chemical recovery were responsible for the discharge of approximately 480-600 million lbs of BOD/day. Renovation of waste waters from the cellulose-manufacturing industry would involve straining, filtration, flotation, sedimentation, flocculation, adsorption, and biological treatment. (Tallert-FIRL)
W78-05323

EFFLUENT TREATMENT IN THE TEXTILE INDUSTRY,
Shirley Inst., Manchester (England).
G. J. Parish.
Review of Progress in Coloration and Related Topics, Vol. 7, p 55-69, 1976. 105 ref.

Descriptors: *Textiles, *Biochemical oxygen demand, *Chemical oxygen demand, Legislation, Analytical techniques, Operations, Biodegradation, Toxicity, Sampling, Biological treatment, Adsorption, Filtration, Activated carbon, Oxidation, Recycling, Waste water treatment, *Industrial wastes.

Pollution control legislation, standard testing and analytical procedures, sampling methods, and treatment processes are reviewed for textile industry effluent. Pollution regulatory responsibilities in England have been given to the 10 Regional Water Authorities created by the 1974 Control of Pollution Act. Advancements in the development of analytical techniques, such as pH, flow, and oxygen concentration monitoring devices, and operational procedures for analyzing biodegradability were evaluated. Alternatives to the BOD test, such as COD, total organic carbon, total oxygen demand, and permanganate and dichromate values, were examined. Alternative treatment methods beyond the range of the conventional biological treatment of textile wastes were proposed. These included: physical separation through screening, sedimentation, flotation, and filtration; adsorption on activated carbon and ion exchange resins; oxidation with ozone or chlorine; membrane processes; and methods of color removal. The recycling of waste water from the textile industry is considered possible with flocculation, filtration, and adsorption or filtration with reverse osmosis. Tubular and plate heat exchangers are suggested for the recovery of up to 75% of the heat used in the manufacture of textiles and discharged in the textile mill effluent. (Lisk-FIRL)
W78-05327

TREATMENT PLANT AT REDBOURN.
Water and Waste Treatment, Vol. 20, No. 11, p 18, November, 1977.

Descriptors: *Industrial wastes, *Toxins, *Waste water treatment, *Treatment facilities, *Waste water disposal, Municipal wastes, Environmental sanitation, Sanitary engineering, Waste treatment.

An industrial waste treatment plant that was initially rejected by the District Council of St. Albans, England, has been approved with certain technical modifications. A plant will be built on a little more than five acres in an abandoned chalk quarry in Redbourn, England, to treat toxic and non-toxic wastes produced by Contract Gully Cleansing Limited. An appeal to the Secretary of State for the Environment to override the first decision to the St. Albans Council was denied due to the failure of planning conditions to meet certain technical safety requirements. These conditions were modified and the second application for the waste treatment facility was approved with provisions for screening foliage to be planted and suitable access routes to be constructed. The treatment plant will be conveniently located to provide

service for London and other areas without comprehensive facilities. (Lisk-FIRL)
W78-05331

TREATMENT OF WASTE WATER FOR EUTROPHICATION CONTROL (SANGYO HAISUI NO FUEIYOKASEIBUN NO SHORI NI KANSURU KENKYU),
Fermentation Research Inst., Tokyo (Japan) Div. of Microbe Engineering.
For primary bibliographic entry see Field 5D.
W78-05342

CHOOSING AN APPROPRIATE WATER TREATMENT,
Agency for International Development, Manilla (Phillipines).
R. A. Luken, and Y. Unkulvasapaul.
Environmental Science and Technology, Vol. 11, No. 13, p 1156-1159, 1977. 5 tab.

Descriptors: *Aerated lagoons, *Settling basins, *Activated sludge, *Cost comparisons, *Separation techniques, Industrial wastes, Waste water treatment, Waste water disposal, Sludge disposal, Treatment facilities.

Cost-effective waste treatment alternatives available to the tapioca s tarch industry for compliance with proposed effluent standards in Thailand were reviewed. Starch plants were categorized according to production size: first-grade starch with a daily capacity of 40-120 tons; second-grade starch with a capacity of 3-9 tons/day; and second-grade strach with a capacity of less than 3 tons/day. Two sets of effluents standards have been proposed, referred to as 1977 and 1979; it was recommended that Thailand adopt both standards for the first-grade starch plants. The more restrictive 1979 standards were not recommended for the second-grade plants because of the plants' economic instability and questionable future viability. The four waste water treatment methods examined are secondary to a primary classification pond treatment. The first process reviewed, a facultative oxidative pond, was practical where inexpensive, large land areas were available. Aerated lagoons were more appropriate where land was limited and expensive. The third process was a rotating biological drum filter for areas with limited, costly lands. An activated sludge lagoon on limited, very expensive land was the fourth alternative considered. Economic and social consideration of the four processes indicated that aerated lagoons were the most practical and economic processes for the tapioca starch industry in Thailand. (Lisk-FIRL)
W78-05343

WORKSHOP PROCEEDINGS: RESEARCH NEEDS RELATED TO ACID MINE WATER.
West Virginia Univ., Morgantown. Water Research Inst.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 807, Price codes: A07 in paper copy, A01 in microfiche. Proceedings: Northeast Water Institute Directors, November 10-12, 1976, held in Morgantown, West Virginia. M.C.L. Akamatsu, Ed. 1977. 118, 2 fig, 6 tab, 73 ref. OWRT B-061-RI(3), 14-31-0001-3953.

Descriptors: *Acid mine water, *Acid mine drainage, *Mine drainage, *Mine wastes, *Planning, *Management, *Research and development, *Mining, *Methodology, *Treatment, *Waste water treatment, Biology, *Biological communities, *Chemical analysis, Balance of nature, Ecology, Oxidation, Control, Water pollution sources, Water quality, Water pollution, Environmental control, Water pollution control, Standards, Priorities, *Refuse treatment, Biological impact, *Effluent guidelines, *Effluent standards.

Acid mine water research was discussed in this workshop from five standpoints: planning and management, mining methodology, treatment, biological aspects, and physiochemical aspects. Research needs in each category are specified and prioritized; participant presentations are included. An overview of current research summarizes 16 active EPA Technology Branch projects which address specific aspects of acid water control. (Seip-IPA)
W78-05345

PESTICIDES IN IOWA SURFACE WATERS: SUMMARY OF A WORKSHOP HELD MARCH 1977.
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 5B.
W78-05349

NON-POINT SOURCES OF WATER POLLUTION.
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W78-05352

MINUTES - IOWA STATE WATER RESOURCES RESEARCH INSTITUTE ADVISORY BOARD AND COUNCIL TENTH ANNUAL MEETING.
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 6B.
W78-05353

COMMUNITY RESPONSE STRATEGIES FOR ENVIRONMENTAL PROBLEMS OF WATER SUPPLY AND WASTEWATER DISPOSAL IN FAIRBANKS, ALASKA,
Alaska University, College. Inst. of Water Resources.
D. W. Smith, and R. W. Pearson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 030, Price codes: A03 in paper copy, A01 in microfiche. IWR Report No. 66, June, 1975. 28 p, 3 fig, 1 tab, 39 ref. OWRT A-048-ALAS(1).

Descriptors: *Water supply, *Water demand, Water supply development, *Sewage treatment, *Waste water treatment, *Water resources development, Water quality control, Planning, Management, Economic impact, Alaska, Water quality standards, Fairbanks(Alas), 'Boom' economy.

The history of the response strategies of the Fairbanks, Alaska, community to problems of water supply and wastewater disposal is examined; long-term problems which have been altered or modified, but not solved, by past strategies are discussed. Community water supply and sewage systems have lagged behind population and area growth. Planning for water and sewage systems has been hindered by rapid and largely unanticipated economic 'boom' periods and by pressure exerted on limited community services by World War II, by the Korean War, and by Alaskan oil pipeline construction. The Fairbanks area and its water and sewage systems developed in a dispersed and fragmented settlement pattern, causing high per capita treatment and supply costs. Special sewage and water system design and building considerations are required because of the severe subarctic climate. Near-crisis environmental quality conditions existed until state and federal actions were initiated in the late 1960's. It is suggested that environmental quality/health laws should not be waived or ignored for 'national emergencies' or for other reasons, e.g., the anticipated economic booms associated with mineral explorations. Small settlements with poor wastewater treatment facilities could, if expanded rapidly, present serious health problems. (Seip-IPA)
W78-05357

ABATEMENT OF MALODORS AT CONFINED DREDGED MATERIAL DISPOSAL SITES,
Argonne National Lab., Il., and Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab.
For primary bibliographic entry see Field 5A.
W78-05360

HYDRODYNAMICS OF BUBBLE PLUMES AND OXYGEN ABSORPTION IN STRATIFIED IMPOUNDMENTS,
College of Petroleum and Minerals, Dharan (Saudi Arabia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-05371

SEDIMENTATION OF DISPERSED OIL IN SURFACE WATERS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Inst. of Aquatic Sciences.
For primary bibliographic entry see Field 5B.
W78-05373

PILOT PLANT INVESTIGATION OF THE EVOLUTION OF VARIOUS POLLUTANTS DURING ARTIFICIAL RECHARGE OF AN AQUIFER BY A BASIN,
Societe Lyonnaise des Eaux et de l'Eclairage (France).
For primary bibliographic entry see Field 5B.
W78-05374

THE APPLICATION OF A TWO-LAYER TIME-DEPENDENT MODEL TO POLLUTION ASSESSMENT AND CONTROL IN A SHORT STRATIFIED ESTUARY,
Sydney Univ. (Australia). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W78-05375

NATURAL LAKE WATER TEMPERATURES IN THE NEARSHORE WATERS OF SOUTHEASTERN LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 2H.
W78-05391

SOLID WASTE MANAGEMENT PLAN, (LEHIGH-NORTHAMPTON COUNTIES JOINT PLANNING COMMISSION).
Weston (Roy F.) Inc., West Chester, PA.
Prepared for Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, PA, August 1971. 245 p, 190 tab, 18, 3 append, 18 plates.

Descriptors: *Solid wastes, *Management, *Waste disposal, Landfills, Administration, Municipal wastes, Regional analysis, *Pennsylvania, Waste water treatment, *Lehigh County(PA), Northampton County(PA).

The Plan deals with the generation, storage, collection, transportation, processing and disposal of solid wastes. The study area for the Plan consists of Lehigh and Northampton Counties, containing 62 municipalities and with a 1970 population of 469,672. Study objectives included delineation of waste management systems, the provision of those systems in accordance with air and water pollution and public nuisance ordinances, projection of a time schedule and cost estimates for the implementation of the systems, and provisions for periodic review. Existing solid waste generation practices and management systems were summarized. These data then provided the base for solid waste projections, a discussion of the applicability of available technology and determination of proposed transfer and disposal facilities. Recommendations included: solid waste be transferred by the collection vehicle in most areas; the

delineation of refuse areas for 1975-1980, 1980-1985 and 1985-1990; that solid waste be disposed of by sanitary landfill, the sites of which should be limited in number by each serving a number of municipalities; and the establishment of either a Bi-County Solid Waste Authority or one Authority for each county to implement the plan and to maintain an overview of state and local developments. (Zayac-NC)
W78-05395

SOLID WASTE MANAGEMENT PLAN-1977 SUPPLEMENT (LEHIGH-NORTHAMPTON JOINT PLANNING COMMISSION),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, PA.
T. D. Keene, and A. R. O'Dell.
Annual supplement to the JPC Solid Waste Management Plan (August 1971). 44 p, 2 maps, 1 chart. 03-00-1092-14.

Descriptors: *Solid waste, *Waste disposal, *Management, Administration, Municipal wastes, Landfills, *Pennsylvania, Lehigh County(PA), Northampton County(PA), Resource recovery projects.

This report contains a reevaluation of some of the major goals outlined in the 1971 regional solid waste management plan. It includes a status report and an analysis of landfills and other solid waste disposal activities in the region. Solid waste generation estimates and projections from the 1971 plan are analyzed, and the new Federal Resource Conservation and Recovery Act of 1976 is briefly summarized and analyzed. An extensive status report of some of the major resource recovery demonstration projects is presented. Finally, findings and recommendations based on the data collected are presented, the major recommendation being that solid wastes continue to be disposed of by sanitary landfill until resource recovery can begin to compete on a cost basis and can be implemented with a good degree of reliability. (Zayac-NC)
W78-05396

REGIONAL STORM DRAINAGE PLAN, (LEHIGH-NORTHAMPTON JOINT PLANNING COMMISSION).
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, PA.
For primary bibliographic entry see Field 6F.
W78-05397

REGIONAL STORM DRAINAGE PLAN-1977 SUPPLEMENT, (LEHIGH-NORTHAMPTON JOINT PLANNING COMMISSION),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, PA.
For primary bibliographic entry see Field 6F.
W78-05398

ALTERNATIVES TO THE MANAGEMENT OF HAZARDOUS WASTES AT NATIONAL DISPOSAL SITES. VOLUME II. APPENDICES.
Little (Arthur D.) Inc., Cambridge, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-237 264, Price codes: A11 in paper copy, A01 in microfiche. Report EPA/530/SW-46c.1, Prepared for Office of Solid Waste Management Programs, Environmental Protection Agency, Washington, D.C., 1973. 235 p, 54 tab, 29 fig.

Descriptors: *Hazards, Wastes, *Waste disposal, *Management, *Planning, Waste treatment, Waste storage, Organic wastes, Radioactive wastes, Explosives, Water pollution, Institutional constraints, Legal aspects, Safety, Risks, Economic justification, Inorganic wastes, Off-site treatment, Pretreatment, Risk analysis, Hazardous wastes.

The hazardous wastes with which this study is concerned include organic wastes, inorganic wastes, explosive wastes, and radioactive wastes. The various alternatives for managing hazardous wastes are defined and evaluated on technical, economic, legal, and risk grounds. The alternative approaches that are considered include: on-site processing; off-site processing; and on-site pretreatment with off-site treatment and disposal. The major emphasis of the study is the assessment of differences among these alternative approaches in the economics associated with waste treatment, the probability of immediate risk to human safety, as compared to other risks to which the population is exposed, the eventual water pollution hazard, and the legal and institutional issues on the Federal and state levels that would have an impact on a national treatment system. The major conclusion of this report is that on economic grounds alone, off-site treatment facilities will be preferred by a majority of producers of industrial hazardous wastes, with the possible exception of those who handle explosives and dilute aqueous wastes. Although the shape and form of the processing system may vary because of differing needs, this conclusion will be true for all regions of the United States. (Nessa-NC)
W78-05418

APPLICATION OF THERMAL IMAGERY AND AERIAL PHOTOGRAPHY TO HYDROLOGIC STUDIES OF KARST TERRANE IN MISSOURI,
Geological Survey, Rolla, MO. Water Resources Div.; and Missouri Dept. of Natural Resources, Rolla. Div. of Geology and Land Survey.
E. J. Harvey, J. H. Williams, and T. R. Dinkel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 816, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-16, September 1977. 58 p, 26 fig, 5 tab, 12 ref.

Descriptors: *Waste disposal, *Surveys, *Remote sensing, *Karst hydrology, *Missouri, Aerial photography, Infrared radiation, Evaluation, Green and Reynolds Counties(Mo), Salem Plateau, Springfield Plateau, Karst terrane.

Planning waste-disposal facilities and impoundments is complicated by karst carbonate terrane in the Ozarks. Thermal imagery (8-13 micrometer wavelength) and color infrared photography aid in identifying losing streams, sinkholes and hydrologic conditions encouraging collapse. Imagery and photography were acquired in Greene and Reynolds Counties, Mo., in March 1972 and June 1973. Differences in thermal levels correlating with losing and gaining reaches of Logan Creek Valley, Reynolds County, were not visually apparent in predawn March imagery but statistical analysis of predawn magnetic-tape data indicated greater variance in emitted energy from the losing reach than from the gaining reach. In June, the gaining reach of Logan Creek was darker (cooler) on thermal imagery than the lighter (warmer) losing reach at postsunset and predawn. Overflights between May and June 1973, using a raidometer strengthened the visual interpretation of the imagery. Spring and autumn are poor times to collect thermal data for this purpose while midday in later summer may be a very good time. (Woodard-USGS)
W78-05441

PRACTICAL EXAMPLES OF SPECIAL POSSIBILITIES FOR REDUCING EFFLUENT LOADS IN PAPER MILLS (PRAKTISCHE BEISPIELE FUER SPEZIELLE MOEGLICHKEITEN ZUR ABWASSERENTLASTUNG IN PAPIERFABRIKEN).
Erbsloeh and Co., Geisenheim (West Germany).
For primary bibliographic entry see Field 5D.
W78-05462

NEKOOSA (PAPERS INC.) CLEANS CONDENSATES WITH STEAM DISTILLATION.
Chemetics International Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5D.
W78-05465

ENVIRONMENTAL DESIGN PARAMETERS FOR A MODERN SULFITE MILL,
Fraser Companies Ltd., Edmundston (New Brunswick).
For primary bibliographic entry see Field 5D.
W78-05470

WATER RESEARCH: SOLVING COLORADO'S WATER PROBLEMS,
Colorado State Univ Fort Collins. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W78-05481

DEVELOPMENT OF PROCEDURES FOR COST-SHARING AND REPAYMENT ANALYSIS,
New York State Coll. of Agriculture and Life Sciences, Ithaca.
For primary bibliographic entry see Field 6B.
W78-05485

HEAVY METAL ENRICHMENT IN MINE DRAINAGE: IV. THE ORANGE FREE STATE GOLDFIELD,
Pretoria Univ., (South Africa). Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-05491

POSSIBILITIES FOR ECONOMIC RECOVERY OF METALS FROM MINE DRAINAGE AND TAILINGS IN THE FRONT RANGE, COLORADO,
Colorado School of Mines, Golden. Dept. of Chemistry; and Colorado School of Mines, Golden. Dept. of Geochemistry.
R. W. Klusman, and E. B. Nelson.
The Mines Magazine, Vol 67, No 10, p 15-30, December, 1977. 2 fig, 2 tab, 16 ref.

Descriptors: *Mine wastes, *Leaching, *Metals, *Reclamation, *Mine drainage, Spoil banks, Iron, Chemical precipitation, Neutralization, Industrial wastes, Waste water treatment, Recycling, Costs.

Tailings from the Nevada Gulch area in the Central City mining district of Colorado were used in a series of experiments on leachates and their possible environmental effects. The possibility of the presence of a considerable quantity of precious metal in the area's mine tailings led to a study on the recovery of metal values to offset costs of leachate treartment. Leaching experiments with indoor vertical tubes and outdoor wooden boxes were used to examine the leaching behavior of Fe, Cu, Zn, Mn, Cd, Pb, As, Ag, Au, and S04 with respect to leaching solution, grain size, and residence times. Concentrations of heavy metals were higher in leachates from tailings having smaller grain sizes and in those which had been produced with acidic solutions. Heavy metal concentrations were decreased by the presence of Fe(OH)3 which absorbed some of the dissolved species. A two-stage treatment scheme with neutralization pH 4.0, followed by further pH adjustment to pH 9.0, has been suggested as an environmentally sound method of leaching metals from mine tailings. Recommendations for further study in the Colorado mining district include a survey of the tonnage and composition of the area's mine tailings, a pilot study of the two-stage treatment process, and a survey of the area's uranium deposits. (Schulz-FIRL)
W78-05507

EARLY PLANT SUCCESSION ON A DREDGING SPOILS ISLAND IN THE SENECA RIVER OF UPSTATE NEW YORK,
Eisenhower Coll., Seneca Falls, NY. Div. of Science and Mathematics.
G. L. Miller.
Bulletin of the Torrey Botanical Club, Vol. 104, No. 4, p 386-391, October-December, 1977. 1 fig, 3 tab, 13 ref.

Descriptors: *Succession, *Cottonwoods, Invasion, Wetlands, Plant populations, *New York, Willow trees, *Dredging spoils islands, *Moisture gradient, Goldenrod, Purple loosestrife, Scirpus validus, *Seneca River(NY).

Early plant succession on dredged lake bottom spoils was studied during the first two years following exposure. Species invasion during the first year was dominated by eastern cottonwood. The second year Scirpus validus dominated; eastern cottonwood was second in importance. The coefficient of community similarity for the first two years was 61%. Two distinct moisture gradient species assemblages developed: (1) Populus-Salix-Salidago occurred on the drier sites, (2) Scirpus-Lythrum-Verbena on wetter sites. Drier sites exhibited twice the diversity of the wetter sites. Fifty-eight species were identified during this investigation. Successful species invastion is directly related to seed dispersal mechanisms, with wind dispersed forms being the most common. (Stihler-Mass)
W78-05523

TRANSPLANTATION OF TYPA AND THE DISTRIBUTION OF VEGETATION AND ALGAE IN A RECLAIMED ESTUARINE MARSH,
Boyce Thompson Inst. for Plant Research, Yonkers, NY.
For primary bibliographic entry see Field 2H.
W78-05526

MODERN WAYS OF STRIP MINING IN MOUNTAINOUS AREAS,
Environmental Protection Agency, Cincinnati, OH.
E. C. Grim.
News of Environmental Research in Cincinnati, Industrial Waste Treatment Research, June 13, 1975. 4 p, 6 fig.

Descriptors: *Strip mines, *Strip mine wastes, *Reclamation, *Environmental effects, *Environmental control, Coal mines, *Coal mine wastes, Overburden, Spoil banks, Mining engineering, *Head-of-hollow strip mining, *Mountain-top removal strip mining, *Block-cut strip mining, *Contour strip mining, *Area strip mining, Surface mining.

Conventional methods of area and contour strip mining are briefly described; associated environmental and reclamation problems are discussed. Three new methods of contour mining which minimize adverse environmental damage are presented. The 'head-of-hollow fill' method provides storage space for spoil generated from mountainous mining operations and a waste area for overburden from contour benches. Spoil is used to fill hollows near the ridge top. The filled area is terraced and covered with topsoil; a stable useable erosion-resistant area results. 'Mountain-top removal' method is used to recover coal from seams lying near tops of mountains, ridges, knobs, or knolls. The mountain top is reduced by a series of cuts parallel to the ridge line. Overburden from each cut is used to fill the previously excavated cut or is transported to a storage area; none is pushed over the downslope. The mountain top is covered with a 20- to 40-foot layer of spoil, graded flat, and top-soiled. A large plateau of level, rolling land results. The 'block-cut' method is an operational adaption of conventional contour steep-slope mining. A large initial cut is made into the mountain; first-cut spoil is deposited above the highwall or in a head-of-hollow fill. Overburden from succeeding cuts is used to fill the previous cut as mining and concurrent reclamation progress around the mountain in both directions. No spoil is deposited downslope; topsoil is saved and used in reclamation. Diagrams of each method are presented. A comprehensive environmental assessment of all three methods is mandated. (Seip-IPA)
W78-05530

ONSITE CONTROL OF SEDIMENTATION UTILIZING THE MODIFIED BLOCK-CUT METHOD OF SURFACE MINING.
Kentucky Dept. of Natural Resources and Environmental Protection, Frankfort.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 244, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-068, July 1977. 91 p, 29 fig, 16 tab, 34 ref, 2 append. EHE 623, 802681.

Descriptors: *Mining, Sedimentation, Surface runoff, Surface waters, Mining engineering, *Sediment control, Kentucky, Economics, Environmental effects, *Water pollution control, Pollution abatement, *Block-cut method, *Surface mining.

A detailed site survey, subsurface investigation, and the development of preliminary plans were part as a study at Lower Lick Fork in Perry and Letcher Counties, which was conducted to determine the feasibility of a demonstration project for onsite control of sedimentation utilizing the modified block-cut method of surface mining. Calculations indicate that the sediment yield from the mining operation will be within the water quality standards of the Commonwealth of Kentucky. All operations proposed in the demonstration project meet present State regulations for surface mining. A comparison of costs involved in the modified block-cut method of mining and in a method using the minimum acceptable requirements as set forth in the present regulations was prepared. The cost differential of the two method appears to be negligible. The demonstration should prove that the need for sediment basins with the modified block-cut method of mining should be minimized, or perhaps eliminated, according to State and Federal regulations. A water quality monitoring station was constructed to provide data before, during, and after the mining operation, for use in evaluating and documenting the efficiency of this method of mining in providing on-site control of sedimentation. The demonstration project plans should account for the economic and environmental interests of all concerned parties to the coal mining operations under study. (Wares-IPA)
W78-05536

DEVELOPMENT STATUS AND ENVIRONMENTAL HAZARDS OF SEVERAL CANDIDATE ADVANCED ENERGY SYSTEMS,
Lockheed Missiles and Space Co., Inc., Huntsville, AL. Huntsville Research and Engineering Center.
M. M. Penny, and S. V. Bourgeois.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 759, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-062, June 1977. 99 p, 18 fig, 8 tab, 43 ref. Task Order No. 8, 68-02-1331.

Descriptors: *Environmental effects, *Pollutants, *Energy, *Hazards, Assessments, Energy conversion, Electric power production, Electric power industry, Forecasting, Estimating, Ecology, *Energy resource development, Pollution control, Energy systems.

The development status of several advanced energy concepts is reviewed. Systems reviewed include potential new sources of energy and improved energy conversion (magnetohydrodynamics, hydrogen fuel cells, ocean thermal energy conversion, wind power, turbines, thermoelectric converters, thermionic converters, potassium vapor topping cycles, and electrogasdynamics). Estimates are made as to when each will begin to contribute significantly to U.S. energy needs. Appraisals were made of the environmental impact of each system, including assessment of the adequacy of pollution control technology and potential gross ecological impact. The overall conclusion is that each energy system has a ndegligible or mild direct environmental impact when compared with conventional fossil fuel and nuclear systems, but that indirect impacts for some of the energy systems could be severe and need further study to quantify their impact. Considering both the expected environmental impact and period of technology breakthrough/commercialization, the following order of research and development priorities on the candidate energy systems has been developed: high temperature turbines, ocean thermal gradients, windmills, magnetohydrodynamics, metal vapor (potassium) Rankine topping cycles, hydrogen fuel cells, thermionics, electrogasdynamics, and thermoelectric conversion. (Wares-IPA)
W78-05538

EXPERIMENTAL SIMULATION OF SINGLE AND MULTIPLE CELL COOLING TOWER PLUMES,
Corvalis Environmental Research Lab., OR.
For primary bibliographic entry see Field 5A.
W78-05539

A PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL IMPACTS FROM OIL SHALE DEVELOPMENTS,
TRW Environmental Engineering Div., Redondo Beach, CA.
K. W. Crawford, C. H. Prien, L. B. Baboolal, C. C. Shih, and A. A. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 283, Price codes: A09 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-069, July 1977. 174 p, 25 fig, 39 tab, 158 ref. 68-02-1881.

Descriptors: *Oil shales, *Mining, *Waste disposal, Waste water(Pollution), Separation techniques, Air pollution, Colorado, Utah, Solid wastes, Environmental effects, Water pollution sources, Extraction, Retorts, Refining, Land disposal.

A summary is presented of major oil shale extraction and retorting development activities, including properties, sources, and quantities of wastes which may be generated by these technologies and activities, potential environmental impacts and hazards resulting from oil shale development, and pollution control technology and/or management practices that have been developed or are planned for commercial operations on private and Federal lease tracts in Colorado and Utah. Atmospheric emissions of oil shale development activities are expected to include sulfur dioxide, nitrous oxides, carbon monoxide, hydrocarbons, particulate matter, and some hazardous substances such as ammonia, hydrogen sulfide, silica, volatile organics, and metals. Waste waters from oil shale processing may contain high levels of dissolved and suspended solids with high chemical and biochemical oxygen demand, such as oil and grease, reduced nitrogen, sulfur compounds, phenolics, carboxylic acids, organic compounds, raw shale fines, shale coke, catalysts, lime and alum sludges, and activated carbon and diatomaceous earth. Major environmental impacts will occur relative to air quality, water quality and hydrology, and solid waste disposal. Ongoing environmental monitoring programs and studies related to oil shale development activities are also described in order to indicate the scope, quality, and availability of data on geotechnology and the environment. (Wares-IPA)
W78-05540

HANDBOOK OF PROCEDURES, CONSTRUCTION GRANTS PROGRAM FOR MUNICIPAL WASTEWATER TREATMENT WORKS.
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5D.
W78-05546

THE STATUS OF THE EPA LABORATORY AUTOMATION PROJECT,
Environmental Monitoring and Support Lab., Cincinnati, OH. Physical and Chemical Methods Branch.
W. L. Budde, B. P. Almich, and J. M. Teuschler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 174, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/4-77-025, April 1977. 31 p, 4 fig, 2 tab, 11 ref.

Descriptors: *Automation, Computers, *Laboratories, *Testing, *Laboratory tests, *Water analysis, Instrumentation, Laboratory equipment, Research facilities, Quality control, Data collections, *Laboratory automation, Computer hardware, Computer software.

The status of the Environmental Protection Agency's laboratory automation project is described in terms of currently installed systems and work in progress to develop and improve the system. The following are included: a management overview of the general goals, a management implementation plan, a review of the quality control aspects, summaries of work in progress during fiscal year 1977, an overview of the hardware and software operations of the instrument automation system, and an overall plan for the integration of instrument automation and laboratory data management systems. (Seip-IPA)
W78-05547

FORECASTING THE COMPOSITION AND WEIGHT OF HOUSEHOLD SOLID WASTES USING INPUT-OUTPUT TECHNIQUES--AN EXECUTIVE SUMMARY,
Ebon Research Systems, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-05551

DESIGN UNDER STOCHASTIC GROUNDWATER FLUCTUATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 8E.
W78-05570

CATCH BASIN PROCESSING APPARATUS,
LRS Research Ltd., Broomall, PA. (Assignee).
L. P. Taylor, and A. Petroski.
U.S. Patent No. 4,040,960, 11 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 961, No 2, p 758, August 9, 1977.

Descriptors: *Patents, *Waste disposal, *Sludge disposal, Landfills, Water reuse, Equipment, Pumps, Monitoring, Sewage lagoons.

A mobile system for cleaning and processing catch basin and/or lagoon waste products is described where the degree of waste product dilution is carefully controlled prior to transmission to a mobile dewatering truck capable of producing a substantially dry land fill suitable end product and water suitable for recirculation or environmentally acceptable discharge to a process hear or sanitary sewer. Throughout the process, material which is collected from the catch basin (wash effluent or wash stream) is monitored qualitatively and quantitatively at numerous stages in the process. By monitoring the nature and quantity of this flow, the level of the equalization means, the density of the dewatering means input, the centrate turbidity centrate flow rate and centrate pH, various valves are automatically operated which regulate the bypass of the wash effluent back into the catch basin, the flow of material to the process head or ejector, rates of pumping means, dewatering means, etc. (Sinha-OEIS)
W78-05601

DREDGING SYSTEM AND METHODS OF DREDGING,
For primary bibliographic entry see Field 8C.
W78-05603

APPARATUS AND METHOD FOR RECOVERING OIL FROM ICY WATERS,
Artec, Inc., Columbia, MD. (Assignee).
P. C. Deslauriers, R. P. Voelker, E. J. Lecourt, and L. A. Schultz.
U.S. Patent No. 4,053,406, 11 p, 8 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 963, No 2, p 624, October 11, 1977.

Descriptors: *Patents, *Water pollution treatment, *Water quality control, *Oil pollution, Oil spills, Cold regions, Ice, Separation techniques, Equipment.

An acquatic vessel, preferably a barge which is either self- or non-self-propelled is equipped with ice curring, oil recovery and processing apparatus. The ice covered area that is polluted with oil is approached by the vessel and the oil-contaminated ice is cut into slabs which are conveyed to a cleaning station where high pressure air and/or water jets and/or chippers remove the oil and some of the exterior of the slab. The oil and ice mixture that is removed from the slab is collected and heated. The oil is separated and purified and used as fuel and/or stored. The cleaned ice slabs are dropped back in the channel behind the vessel. Oil that is located beneath the ice, not adhering to the ice slabs, travels down an inclined plane under the vessel, rises in a well, and is separated out and used as fuel or stored. The vessel can also be used to clear an area, such as a harbor, of ice and to transport the collected ice to a designated area, since it has the capabilities for loading, storing, and off-loading ice. The propulsion means for the barge may include Archimedes' screws for propelling the barge at slow speeds. (Sinha-OEIS)
W78-05609

SALT WATER INTRUSION IN THE UNITED STATES,
Robert S. Kerr Environmental Research Lab., Ada, OK.
For primary bibliographic entry see Field 5B.
W78-05613

FEASIBILITY OF SILVER-LEAD MINE WASTE MANIPULATION FOR MINE DRAINAGE CONTROL.
Montana Dept. of Natural Resources and Conservation, Helena. Engineering Bureau.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 599, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-600/2-77-225, November 1977. 97 p, 33 fig, 30 tab, 15 ref, 7 append. S802122.

Descriptors: *Feasibility studies, *Mine drainage, *Water pollution control, *Acid mine water, Acid streams, Drainage, Drainage effects, Montana, Pollution abatement, Surface sealing, Surface drainage, Topography, Revegetation, Environmental effects, Mine wastes, Water quality, Water chemistry, Grading, Lead mine wastes, Silver mine wastes, Tailings, Surface treatment.

A feasibility study examined the acid mine drainage problems of the Dry Fork of Belt Creek in Montana and recommended abatement methods. The history of mining and acid mine drainage problems in the study area is reviewed and current mine drainage abatement measures being employed there are evaluated. Consideration is also given to the jurisdictional framework: local topography, hydrology, water quality, social and environmental factors, and elements influencing the value of acid mine drainage demonstration projects through which a mine drainage abatement project may be carried out. Mine dump surface regarding and sealing are recommended as the method of reducing the acidic wastes entering Galena Creek. The top of Block P Mine dump should be sloped so as to allow proper drainage, and the top should be sealed with a bentonite seal and top soil added to allow revegetation. The bypass pipeline around the Block P Mine dump should be extended to prevent water in Galena Creek from creating seeps in the toe of the dump. Silver and Green Creeks should be rechanneled around the smaller tailings piles to prevent surface runoff from entering the tailings material. The appendices contain formation on water quality samples, flow vs. concentration data for selected stations, concentration and load vs. time data for selected stations, daily streamflow records, climatological data, and the chemistry of acid mine drainage and its effect on streams. (Wares-IPA)
W78-05614

RECLAMATION OF SURFACE MINED COAL SPOILS,
Kentucky Agricultural Experiment Station, Lexington. Dept. of Agronomy.
R. I. Barnhisel.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-272 678, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-093, August 1977. 57 p, 15 tab, 19 ref. CSRS IAG No. D6-E762.

Descriptors: *Coal mine wastes, *Mine wastes, Ecology, Atmosphere, Environmental effects, Environmental engineering, Phosphorus, Revegetation, Reclamation, Chemistry, Rainfall, Forages, Spoil banks, Combustion, Refining, Surface mining.

Field experiments were established in western Kentucky on four types of surface-mined coal spoils to represent the extremes in spoil materials commonly encountered in reclamation. With the provision for retaining rainfall on the spoils by means of tillage, yields of mixed legume-fescue forage exceeded 4 metric tons per hectare (2 T/acre). These yields were equal to or greater than those of adjacent nonmined land. The advantage of a rough surface created by ripping or subsoiling was obtained at all levels of applied phosphorus. The use of a chisel plow or heavy-duty disk produced a rough microrelief that also produced significantly greater forage yields than obtained from smooth graded plots. It was found that phosphorus and water are more commonly the limiting factors in obtaining an adequate degree of vegetative cover and associated forage yield than the acidic nature of spoils; however, lime must be incorporated in acidic spoils to effectively improve growing conditions. Downward movement of lime should not be expected to occur at a rate sufficiently high to improve the growing conditions of spoils for plants. Acidic spoils also tend to be much more droughty than adjacent nonacid spoils as the result of a restricted rooting depth. Conclusions indicate that mine spoils may be successfully reclaimed when proper levels of soil fertility have been restored. (Wares-IPA)
W78-05615

CATAWISSA CREEK MINE DRAINAGE ABATEMENT PROJECT,
Gannett, Fleming, Corddry and Carpenter, Inc., Harrisburg, PA.
A. F. Miorin, R. S. Klingensmith, F. J. Knight, R. E. Heizer, and J. R. Saliunas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 256, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-124, November 1977. 165 p, 21 fig, 8 tab, 1 ref, 4 append. 14010 DSD.

Descriptors: *Coal mine wastes, *Water pollution control, Pennsylvania, *Mine drainage, Acid mine water, Economics, Water table, Flooding, Water quality, Pollution abatement, Catawissa Creek(Penn), Anthracite, Sealing, Streambed relocation.

The feasibility of flooding underground coal mine workings in an isolated basin of coal to restore or partially restore the groundwater table in the basin and reduce the production of acid mine drainage was investigated in a small discrete basin in east-central Pennsylvania at Sheppton. Studies were made of regional and areal geology, the extent of strip and deep mining, and the water level tunnel flows and water quality. Internal tunnel investigations and core borings above potential seal sites and at anticipated future overflow points were made. About 80% of the basin could be inundated by sealing the tunnels to reduce acid discharge into a nearby creek. The watershed's streambed was relocated to prevent streamflow from passing into and emitting from the mined basin. The mine sealing project was not completed due to the high estimated cost (over $600,000 for one seal), consequently the methodology utilized in determining the feasibility of restoring the groundwater table and in reducing production of acid mine drainage and in effecting these changes was not verified. Flow rates (creek and tunnels) data which were to be compared between preconstruction and post-construction periods were not obtained. The appendices contain a typical agreement and grant of easement for such a project, logs of test borings, results of laboratory tests on rock samples, and results of chemical tests of tunnel rock samples. (Wares-IPA)
W78-05616

MINE DRAINAGE CONTROL FROM METAL MINES IN A SUBALPINE ENVIRONMENT: A FEASIBILITY STUDY.
Montana Dept. of Natural Resources and Conservation, Helena. Engineering Bureau.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 089, Price codes: A09 in paper copy, A01 in microfiche. Report No. EPA-600/2-77-224, November 1977. 168 p, 49 fig, 24 tab, 31 ref, 8 append. IBB604, S-802671.

Descriptors: *Acid mine drainage, *Mines, *Mills, Mine wastes, Reclamation, Montana, Rehabilitation, Sampling, Water quality, Observation wells, Water levels, Stream gages, Geology, Hydrology, Biology, Fish, Sealing, Environmental effects, Heavy metals, Bioassay, Cooke City(MT), Tailings, Subalpine.

Investigations of the McLaren mine and mill areas and the Glengary mine area near Cooke City, Montana were undertaken from July 1973 through September 1975 to examine the acid mine drainage from these sources and determine the feasibility of rehabilitating these subalpine mining and mill areas. Several surface water quality monitoring stations at each of the three project sites were selected. Ten observation wells were installed in the McLaren mill tailings pond area to study the groundwater regime of the tailings. Water levels and quality were monitored. Stream gauging equipment was installed and flow measurements, water level measurements, and water sampling continued throughout the winter and spring of 1973-1974. A geological review of the area was conducted and several areas suspected of natural acid water formation were examined. A biological study was conducted to determine the existing degraded biological conditions of the streams within the project area and the extent of reclamation required to restore a viable fishery to the streams. Proposed reclamation included recontouring and revegetating land surfaces, sealing shafts in the mine area, and isolating the tailings from Soda Butte Creek. The appendices contain data on climate, methodology of investigation, acid mine drainage effects on streams, water quality analysis, snow samples chemistry, wells and drilling, and McLaren mill water levels. (Wares-IPA)
W78-05618

FIELD MEASUREMENT OF DENITRIFICATION,
California Univ., Davis. Dept. of Land, Air and Water Resources.
For primary bibliographic entry see Field 5A.
W78-05619

PROTECTION OF SHELLFISH WATERS.
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 790, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA/430/9-74/010, July 1974. 18 p, 2 ref, 2 append.

Descriptors: *Shellfish, *Sewage treatment, *Industrial wastes, Waste treatment, Waste water treatment, Cites, Public health, Toxicity, Streamflow, Ecology, Construction, Grants, Sewage, Assessments, Safety zone.

A compilation of informartion, with applicability to all projects which could affect shellfish waters, is presented to assist in maintaining a high degree of reliability in the protection of such waters. Guidelines are given for grants applicants to determine if the proposed project could affect shellfish waters, to assess the impact of the project on these waters, to estimate the size of a closed safety zone around the proposed outfall site, to base the waste water treatment works design on established guidelines and criteria, and to provide specific shellfish protection instructions in the operation and maintenance manual for such treatment facilities. Where an effect on shellfish waters is expected, assessment will include specification of volume, location, and quality of effluent, effects of uncontrolled discharges, reliability of processes and equipment, present water conditions and variables, and permitting informtion. Based on this assessment, a safety zone can be designed for both normally operating and malfunctioning works. Provision must also be made for disinfection. Technical assistance sources besides EPA regional offices are listed in the appendices; including state shellfish regulatory agencies and regional offices of the Food and Drug Administration. (Wares-IPA)
W78-05622

MANAGEMENT: SOUTHEAST CONTINENTAL SHELF STUDIES,
Skidaway Inst. of Oceanography, Savannah, GA.
For primary bibliographic entry see Field 6E.
W78-05625

COASTAL MORPHOLOGY, SEDIMENTATION AND OIL SPILL VULNERABILITY,
South Carolina Univ., Columbia. Div. of Coastal Research.
M. O. Hayes, and C. H. Ruby.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 16. Hazards, p 1-86, March 1977. 37 fig, 3 tab, 25 ref, append. 03-5-022-82.

Descriptors: *Morphology, *Oil spills, *Water pollution effects, *Sediments, *Hazards, Baseline studies, Resources development, Alaska, Coasts, *Outer Continental Shelf, Gulf of Alaska, Petroleum development, Offshore operations.

Conclusions regarding the vulnerability of the various environments of the Gulf of Alaska are presented in detail in the first paper, 'Potential Oil Spill Impacts' by Miles O. Hayes and Christopher H. Ruby, of this report. Very briefly they indicate that slightly more than 50% of the 1773.4 km of shoreline classified are considered high risk environments. Oil would remain in these areas for periods of time ranging from a few years to as much as 10 years. In the second section of this report, 'Sedimentology' by Christopher H. Ruby, detailed sedimentological analysis of the 400+ sediment samples collected is presented. This section is followed by an appendix which contains the grain size data as well as compositional data. Topographic maps of the study area with an oil vulnerability risk classification overlay are provided. (See also W78-05221) (Sinha-OEIS)
W78-05628

THE ENVIRONMENTAL GEOLOGY AND GEOMORPHOLOGY OF THE GULF OF ALASKA COASTAL PLAIN AND THE COASTAL ZONE OF KOTZEBUE SOUND,
Alaska Univ., College. Dept. of Solid Earth Science.
For primary bibliographic entry see Field 2L.
W78-05632

THE ENVIRONMENTAL GEOLOGY AND GEOMORPHOLOGY OF THE GULF OF ALASKA COASTAL PLAIN,
Alaska Univ., College. Div. of Geoscience.
For primary bibliographic entry see Field 2L.
W78-05633

SEISMIC AND VOLCANIC RISK STUDIES - WESTERN GULF OF ALASKA,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2L.
W78-05640

FINAL REPORT AND RECOMMENDATIONS FOR THE BIG CYPRESS AREA OF CRITICAL STATE CONCERN TO THE STATE OF FLORIDA ADMINISTRATION COMMISSION.
Florida State Dept. of Administration, Tallahassee. Div. of State Planning.
Report No. CA 73-2, October 1973, 75 p, 6 fig, 1 tab, 87 ref.

Descriptors: *Boundaries(Surfaces), *Ecosystems, *Regulation, *Florida, *Management, Estuarine environment, Estuarine fisheries, Mangrove swamps, Land use, Planning, Aquifer management, Swamps, Legislation, Land development, Environmental effects, *Area of Critical State Concern, Big Cypress Area of Critical State Concern(FL), *Big Cypress National Fresh Water Reserve(FL), Everglades National Park(FL).

Background information is provided regarding the recommended boundary and land development regulations for the Big Cypress Area of Critical State Concern. The Big Cypress Area is viewed as a composite of interrelated natural systems. The recommended boundary recognizes the binding ecological links between the proposed Federal Big Cypress National Fresh Water Reserve, Everglades National Park, and contiguous estuarine coastal areas. Proposed critical area regulations recognize the necessity to preserve coastal mangroves and marshes for fish nurseries, protect vulnerable aquifer recharge areas, protect freshwater swamps and marshes for water storage, and preserve naturally vegetated areas for their ability to slow down surface water flow and absorb pollutants. This approach assumes that nature will continue to perform these essential functions in a recurring, self-maintaining and non-inflationary manner, barring undesirable development activity. This study was completed pursuant to the Florida legislative mandate contained in the Big Cypress Conservation Act of 1973. The Act both appropriated funds for land acquisition and authorized use of eminent domain proceedings. The boundaries recommended in this report may be changed at a future date if it is found that a

more expansive area is required to protect the Critical Area. (Nessa-NC)
W78-05654

STATISTICAL SUMMARY OF MUNICIPAL WATER FACILITIES COMMUNITIES OF 25,000 POPULATION AND OVER, AS OF JANUARY 1, 1960.
Public Health Service, Rockville, MD.
For primary bibliographic entry see Field 5F.
W78-05656

A REVIEW OF STATE AGENCIES IMPACTING REGIONAL WATER QUALITY MANAGEMENT.
Miami Valley Regional Planning Commission, Dayton, OH; and Linton and Co., Inc., Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 373, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, DC, Water Planning Division, March 1976, 55 p.

Descriptors: *Resources, *Management, *Administration, *Regulation, *Federal Water Pollution Control Act, *Water management(Applied), Water supply, Wastewater treatment, Flood plains, Solid wastes, Land use, Financing, Operation and maintenance, Planning, *Ohio, *Areawide Waste Treatment Management Plan(PL 92-500, Section 208), Water resources management, Statelevel agencies.

This is one of a series of eight reports providing background information necessary for development of the management component of the Miami Valley Regional Planning Commission's (MVRPC) Section 208 Areawide Water Quality Management Plan and Program. In this volume, ten state-level agencies in Ohio which have programs relating to land use, wastewater management, water supply, floodplain management, nonpoint source pollution, solid waste and transportation are identified. Each description includes the agency's geographic jurisdiction, basis of authority, areawide water quality related functions, operational constraints and relationships with other local, state and federal water resource agencies. Each agency's role in either financing, regulating, operating and maintaining, administering, planning or providing technical assistance to water quality programs is explained. The information is presented in narrative outline form for use in the Section 208 (PL 92-500) Areawide Waste Treatment Management Plan. (Zayac-NC)
W78-05657

HAWAII COASTAL ZONE MANAGEMENT PROGRAM, TECHNICAL SUPPLEMENT 2. MANAGEMENT OF HAWAII'S COASTAL ZONE FOR WATER QUALITY OBJECTIVES,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 6G.
W78-05659

POLLUTION FROM DREDGING OPERATIONS,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Chemical Engineering and Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-05673

HAZARDOUS MATERIALS WASTE DISPOSAL (A BIBLIOGRAPHY WITH ABSTRACTS).
National Technical Information Service, Springfield, VA.
For primary bibliographic entry see Field 5E.
W78-05675

CRITERIA FOR THE ESTABLISHMENT AND MAINTENANCE OF TWO YEAR POST HIGH SCHOOL WASTEWATER TECHNOLOGY TRAINING PROGRAMS, VOLUME I: PROGRAM CRITERIA.
Clemson Univ., SC. Dept. of Environmental Systems Engineering.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 713, Price codes: A04 in paper copy, A01 in microfiche. Report prepared for EPA, Washington, D.C., Training Grants Branch. 1970. Volume I of II, 45 p, 1 fig, 1 append. EPA-1TT1-WP-52-01.

Descriptors: *Training, *Institutions, *Evaluation, *Performance, *Waste water treatment, *Manpower, *Sewage treatment, Human resources, Management, Grants, Methodology, *Post high school training programs, *Specialized training, *Handbooks, Individualized training, *Programmed instruction, *Personnel development, Water Quality Improvement Act of 1970, Public Law 91-224, Waste water treatment plants, Training programs, Guidelines.

Criteria for the development of useful land practical training programs which will meet manpower requirements in wastewater treatment plants are presented. These criteria are also intended to aid in the selection of institutions and training facilities, and are arranged in a form which is appropriate for soliciting a self-appraisal by interested institutions. Trainee characteristics before and after training, the form and function of the management structure for the overall program, and a glossary of important terminology are included. Curriculum guidelines are outlined in Volume II. (Seip-IPA)
W78-05688

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

ECONOMIC EFFECT ON AGRICULTURAL PRODUCTION OF ALTERNATIVE ENERGY INPUT PRICES: TEXAS HIGH PLAINS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 3F.
W78-05350

MULTIOBJECTIVE ANALYSIS IN THE MAUMEE RIVER BASIN: A CASE STUDY ON LEVEL-B PLANNING,
Case Western Reserve Univ., Cleveland, OH. Dept. of Systems Engineering.
Y. Y. Haimes, P. Das, and K. Sung.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 206, Price codes: A10 in paper copy, A01 in microfiche. Report No. SED-WRG-77-1, January, 1977. 188 p, 10 fig, 23 tab, 87 ref. OWRT C-7047(No 6221)(1), AEN75015820.

Descriptors: *Land resources, *Water resources, *Mathematical modeling, *Planning, *Management, *River basin development, Methodology, Ohio, *Integrated multiobjective planning model, *Multiobjective modeling, *Level-B planning, *Maumee River basin, Surrogate Worth Trade-Off Method(SWT).

A Level-B planning and management framework for solving critical problems of water and land resources in the Maumee River Basin is developed. Chapters 1-2 present a general overview of the problems and complexities inherent in regional planning, developing, and describing relevant objectives and constraints. A hierarchical multiobjective model in water and land resources is presented; its importance and significance are discussed. Six noncommensurable objectives are identified in the mathematical modeling. Chapter 3 presents a detailed development of mathematical submodels which are responsive to each objective and which are applicable to the Maumee Basin. Chapter 4 presents the methodology for integrating each objective in order to form a Integrated Multiobjective Planning Model. Chapter 5 is a summary of the data necessary for solving the integrated model. Trade-off analyses, using the Surrogate Worth Trade-off method (SWT), are conducted. The implications, the associated levels of each of the noncommensurable objectives, and computational procedures and results are presented. Chapter 7 presents an overall summary and critical analysis of the planning process, multiobjective modeling, and the Applicability of the SWT method. (Seip-IPA)
W78-05484

A STUDY OF THE IMPACT OF THE WETLANDS EASEMENT PROGRAM ON AGRICULTURAL LAND VALUES,
Northern State Coll., Aberdeen, SD. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-05652

INDUSTRY-SPECIFIC GROSS OUTPUT MULTIPLIERS FOR BEA ECONOMIC AREAS.
Department of Commerce, Washington, DC. Div. of Regional Economic Analysis.
Guideline 5-Regional Multipliers, U.S. Water Resources Council, January 1977, 135 p, 12 tab, 1 chart, 1 map, 5 append.

Descriptors: *Regional analysis, *Water resources development, *Input-output analysis, Industrial production, Agriculture, Employment, Economics, *Regional multipliers, Economic areas.

Input-output type multipliers are relating changes in regional total gross output to changes in a specific-industry final demand, for 56 industrial sectors for each of 173 Bureau of Economic Analysis (BEA) economic areas of the U.S. This sectoring plan provides considerable detail among the agriculture and food processing industries, and moderate detail among other manufacturing industries. The user must independently estimate the initial final demand changes by industry, typically in terms of regional exports due to the program under study. The user must then select the appropriate industrial sector multiplier for his study region from the report. The product of the initial change and the multiplier provides an estimate of the change in total gross output in the region which is attributed to a particular element of the project or program. The sum of such calculations for all elements is the estimate of regional change due to the water development project. Procedures are provided for converting this regional total gross output change into a change in earnings and employment. (Zayac-NC)
W78-05655

6B. Evaluation Process

EXECUTIVE SUMMARY, DIRECTIONS IN U. S. WATER RESEARCH: 1978-1982.
Federal Coordinating Council for Science, Engineering and Technology, Washington, DC. Committee on Water Resources Research.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 808, Price codes: A08 in paper copy, A01 in microfiche. Submitted to Chairman, Committee on Water Resources Research, by Ad Hoc COWRR Committee on Research Needs. October 1977. 22 p, 3 fig, 1 tab.

Descriptors: *Water resources research, *Research and development, *Future planning(Projected), Projections, Planning, Water policy, *Federal project policy, *Project planning,

*Research projects, Expenses, Economics, Research priorities.

This summarizes the more detailed report entitled 'Directions in U. S. Water Research: 1978-1982.' (See W78-03428). It is the product of the Committee on Water Resources Research (COWRR) of the Federal Coordinating Council for Science, Engineering and Technology. It suggests the course of federally sponsored water research so that funds spent in the pursuit of new knowledge will bear upon those problems in which water is a national issue. Specific research projects are not recommended. It presents the major issues in which water is a vital factor, and it identifies those areas or technical disciplines in which research is needed if the issues are to be addressed properly. (OWRT)
W78-05203

EVALUATION OF ALTERNATIVE PROCEDURES FOR REVIEW OF WATER RESOURCES RESEARCH PROPOSALS.
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 9D.
W78-05344

WATER RESOURCES RESEARCH IN PENNSYLVANIA.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 9D.
W78-05351

MINUTES - IOWA STATE WATER RESOURCES RESEARCH INSTITUTE ADVISORY BOARD AND COUNCIL TENTH ANNUAL MEETING.
Iowa State Water Resources Research Inst., Ames.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 033, Price codes: A06 in paper copy, A01 in microfiche. September, 1975. 111 p, 3 tab, 8 append. OWRT A-999-IA(10).

Descriptors: *Iowa, *Water Resources Research Act, *Water resources development, *Research, Priorities, Water quality control, Water quality standards, Management, Planning.

Minutes of the September 23, 1975 meeting of the Iowa State Water Resources Research Institute (ISWRRI) Advisory Board and Council are presented. A research evaluation and priority worksheet matrix compilation identifies problems and assigns points on the basis of priority; the ten highest priority research areas are listed in three summary evaluations. Appendices contain: (1) a list of attendees, (2) members lists of the ISWARRI Advisory Board and Council, (3) director's statement, (4) a statement of support for research priorities (August 1975), (5) a statement of support (July 1975), (6) a detailed listing of Iowa water problems by water use categories (April 1975), (7) comments and suggestions of Advisory Board members, and (8) a list of current and completed projects. (Seip-IPA)
W78-05353

A GUIDE TO ENVIRONMENTAL PLANNING AND DEVELOPMENT, (LEHIGH-NORTHAMPTON COUNTIES JOINT PLANNING COMMISSION),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, PA.
W. R. Patzke.
Report JPC-NATRES-74-350-405.1, September 1974. 61 p, 15 fig, 28 ref, 2 append.

Descriptors: *Planning, *Flood plains, *Land use, *Land management, *Land development, *Environmental effects, Water table, Aquifers, Wetlands, Drainage, Bedrock, Geology, Slope protection, Soil moisture, Soil management, Administration, Regulation, Zoning, Non-structural alternatives, *Pennsylvania, Lehigh County(PA), Northampton County(PA), *Environmental management.

This guide analyzes the region's key environmental factors, including floodplains, water table, wetlands, aquifers, drainage, soil permeabilities, slopes and bedrock geology. Each factor is defined, followed by a discussion of major problems that could be caused by making land use decisions that do not take these factors into account. Sources of data available on each factor are identified. Finally, methods that can be employed to control future development in environmentally sensitive areas are discussed. The handbook is intended to provide a better understanding of the environmental factors in the region so that sound decisions can be made by public officials and others involved in the future development of the Lehigh Valley. (Zayac-NC)
W78-05394

SOLID WASTE MANAGEMENT PLAN, (LEHIGH-NORTHAMPTON COUNTIES JOINT PLANNING COMMISSION).
Weston (Roy F.) Inc., West Chester, PA.
For primary bibliographic entry see Field 5G.
W78-05395

SOLID WASTE MANAGEMENT PLAN-1977 SUPPLEMENT (LEHIGH-NORTHAMPTON JOINT PLANNING COMMISSION),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, PA.
For primary bibliographic entry see Field 5G.
W78-05396

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT: MAIN REPORT.
Coastal Zone Resources Corp., Wilmington, NC.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-034 144, Price codes: A15 in paper copy, A01 in microfiche. Prepared for Office, Chief of Engineers, Army Corps of Engineers, May 1975. 322 p, 70 tab. DACW73-75-C-0001.

Descriptors: *Management, Water resources development, *Multiple purpose projects, *Recreation facilities, Wildlife management, Fish management, Legal aspects, Legislation, Land use, Recreation demand, Planning, *Reservoirs, *Water Resource Development Projects.

This study's purpose is to evaluate the role of the Army Corps of Engineers in the management of recreation, fish, and wildlife resources at Corps water resource development projects (WRDP's). The study's findings, conclusions, and recommendations were developed through the performance of the following tasks: existing Corps policies, laws, and regulations relating to land use, recreation, fish and wildlife practices were assessed and classified; pertinent literature and national data were reviewed to provide base information for the performance of subsequent tasks; information was compiled by field surveys of 29 out of 407 representative WRDP's, the results of which are both summarized here and presented as case studies in separate volumes; the analyses generated by previous tasks were used to appraise Corps land use, recreation, and fish and wildlife practices; national water-oriented recreation needs were projected; major problems resulting from an inadequate resource base or its inefficient management were identified; the consequences of four alternative solutions to existing management problems were evaluated; and finally, a recommended course of action was detailed. The study's findings, recommendations, and conclusions are presented in this volume. The documentation has been compiled in four fully referenced technical appendices. (See W78-05401 thru W78-05407) (Nessa-NC)
W78-05400

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT: APPENDIX B - FOUNDATION FOR LEGAL ANALYSIS.
Coastal Zone Resources Corp., Wilmington, NC.
Available from the National Technical Information Service, Springfield, VA 22161 AIDA-034 145, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Office, Chief of Engineers, Army Corps of Engineers, May 1975. 26 p. DACW73-75-C-0001.

Descriptors: *Legal aspects, *Legislation, *Management, Water resources development, *Multiple purpose projects, Land use, Planning, Recreation demand, Wildlife management, Fish management, *Water Resources Development Projects.

This study's purpose is to evaluate the role of the Army Corps of Engineers in the management of recreation, fish, and wildlife resources at Corps water resource development projects (WRDP's). The main report of the study includes findings, recommendations and conclusions. In addition, there are a total of four technical appendices presenting documentation of the study. This volume is a compilation and classification of all legal authorities material to the study. The United States code was surveyed both section by section and by key words, the titles of relevant statutes were gathered from various compendia, and relevant regulations were obtained from the office of the Chief of Engineers. Each statutory and regulatory authority has been classified according to a general topic outline. The outline reflects the subject areas being studied. The relevant legal authorities are also presented in an orderly arrangement, with each indexed to the pertinent topic or topics in the general outline. The data contained in this volume are only part of the information used to complete the study. The study ultimately identifies major problems resulting from an inadequate resource base or its inefficient management at WRDP's. Four alternative solutions to these problems are identified, and a course of action is recommended. (See also W78-05400) (Nessa-NC)
W78-05401

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT. APPENDIX C - FEDERAL AND STATE AGENCY PROFILES.
Coastal Zone Resources Corp., Wilmington, NC.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-034 146, Price codes: A17 in paper copy, A01 in microfiche. Prepared for Office, Chief of Engineers, Army Corps of Engineers, May 1975. 365 p. DACW73-75-C-0001.

Descriptors: *Reservoirs, Water resources development, *Multiple purpose projects, *Recreation facilities, *Federal government, *State governments, Legal aspects, Land management, Fish management, Wildlife management, Land use, Washington, Texas, Pennsylvania, Tennessee, Missouri, Minnesota, *Water Resource Development Projects.

This study's purpose is to evaluate the role of the Army Corps of Engineers in the management of recreation, fish and wildlife resources at Corps Water Resource Development Projects (WRDP's). This volume describes the major Federal entities concerned with this endeavor, including the U.S. Forest Service, the National Park Service, the Bureau of Land Management, the U.S. Fish and Wildlife Service, the Tennessee Valley Authority, and the Bureau of Reclamation. Each agency is

described in terms of general statutory authorities; budget and funding sources; administrative organizations; fees, charges and in-lieu payment arrangements; and authorities for acquisitions and leases. The same descriptive organization is used to present state agency profiles of Minnesota, Missouri, Pennsylvania, Tennessee, and Texas. These states were selected because they would provide a wide range of activities and information from various levels of state effort, various levels of Corps effort, and various management practices. Particular attention is paid to unique activities in the Pennsylvania, Texas, and Washington profiles. Other agencies and groups concerned with land use for recreation and fish and wildlife enhancement were consulted, including the Bureau of Outdoor Recreation, Council on Environmental Quality, National Recreation and Parks Association, National Conference on State Parks, and the Bureau of the Census. The main study report includes findings, recommendations and conclusions. There are four technical appendices presenting documentation of the study. (See also W78-05400) (Nessa-NC)
W78-05402

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT. APPENDIX D; VOLUME I - CASE STUDIES D.1.1 TO D.5.1.
Coastal Zone Resources Corp., Wilmington, NC.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-034 147, Price codes: A09 in paper copy, A01 in microfiche. Prepared for Office, Chief of Engineers, Army Corps of Engineers, May 1975. 192 p. DACW73-75-C-0001.

Descriptors: *Management, Water resources development, *Multiple purpose projects, *Recreation facilities, *Recreation demand, *State governments, *Federal government, *Administrative agencies, *Reservoirs, Wildlife management, Fish management, Legal aspects, Legislation, Land use, Planning, *Water Resource Development Projects, Wappapello Dam and Reservoir(MO), Lake Ouachita(Blakely Mountain)(AR), Fort Peck Reservoir(MT), Oahe Reservoir(SD ND), Colebrook River Lake(CT MA).

This study's purpose is to evaluate the role of the Army Corps of Engineers in the management of recreation, fish, and wildlife resources at Corps Water Resource Development Projects (WRDP's). Appendix D documents the inspection and analysis of a representative sample of WRDP's. The WRDP's evaluated in this volume include Wappapello Dam and Reservoir, Lake Ouachita (Blakely Mountain), Fort Peck Reservoir, Oahe Reservoir, and Colebrook River Lake. Subsequent volumes consider 24 other WRDP's. Selection from among the 407 WRDP's was based on 12 factors that were found to be good indicators of major physical characteristics of WRDP's, the range and complexity of recreation and fish and wildlife programs, and the local management practices. The 12 factors and the relationship to the factors of the 29 WRDP's were: geographic location; concentration of Corps activity; land acquisition policies; complexity of shoreline management; water surface management; relation with other Federal agencies; relations with state governments; urban versus rural setting; size of Corps management responsibility; recreation visitor usage; interrelationships with all other project purposes; and complexity of real estate programs and practices. Significant findings representing problem areas, data conflicts, resource management approaches, agency relationships, and viable program practices are discussed. The main study report includes findings, recommendations and conclusions. Four technical appendices present documentation of the study. (See also W78-05400) (Nessa-NC)
W78-05403

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT, APPENDIX D, VOLUME II, CASE STUDIES D.6.1 TO D.13.1.
Coastal Zone Resources Corp., Wilmington, NC.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-034 148, Price codes: A10 in paper copy, A01 in microfiche. Prepared for Office, Chief of Engineers, Army Corps of Engineers, May 1975. 200 p. DACW73-75-C-0001.

Descriptors: *Management, Water resources development, *Multiple purpose projects, *Recreation facilities, *Recreation demand, *State governments, *Federal government, *Administrative agencies, *Reservoirs, Wildlife management, Fish management, Legal aspects, Legislation, Land use, Planning, *Water Resource Development Projects, Hopkinton-Everett Lakes(NH), Foster Joseph Sayers Dam and Reservoir(PA), Chesapeake and Delaware Canal(DE MD), Upper Mississippi River, Pool No 21(IL MO), Lake Ashtabula(ND), Leech Lake and Dam(MN), Pend Oreille Lake(Albeni Falls Dam)(IO), John Day Lock and Dam(OR WA).

This study's purpose is to evaluate the role of the Army Corps of Engineers in the management of recreation, fish, and wildlife resources at Corps Water Resources Development Projects (WRDP's). Appendix D documents the inspection and analysis of a representative sample of WRDP's. The WRDP's evaluated in this volume include Hopkinton-Everett Lakes, Foster Joseph Sayers Dam and Reservoir, Chesapeake and Delaware Canal, Upper Mississippi River, Pool No. 21, Lake Ashtabula, Leech Lake and Dam, Pend Oreille Lake (Albeni Falls Dam), and John Day Lock and Dam. The other volumes in this Appendix consider 21 other WRDP's. Selection from among the 407 WRDP's was based on 12 factors that were found to be good indicators of major physical characteristics of WRDP's, the range and complexity of recreation and fish and wildlife programs, and the local management practices. The 12 factors and the relationship to the factors of the 29 WRDP's were: geographic location; concentration of Corps activity; land acquisition policies; complexity of shoreline management; water surface management; relation with other Federal agencies; relations with state governments; urban versus rural setting; size of Corps management responsibility; recreation visitor usage; interrelationships with all other project purposes; and, complexity of real estate programs and practices. Significant findings representing problem areas, data conflicts, resource management approaches, agency relationships, and viable program practices are discussed. The main study report includes findings, recommendations and conclusions. Four technical appendices present documentation to the study. (See also W78-05400) (Nessa-NC)
W78-05404

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT, APPENDIX D, VOLUME III, CASE STUDIES D.14.1 TO D.22.1.
Coastal Zone Resources Corp., Wilmington, NC.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-034 149, Price codes: A12 in paper copy, A01 in microfiche. Prepared for Office, Chief of Engineers, Army Corps of Engineers, May 1975. 244 p. DACW73-75-C-0001.

Descriptors: *Management, Water resources development, *Multiple purpose projects, *Recreation facilities, *Recreation demand, *State governments, *Federal government, *Administrative agencies, *Reservoirs, Wildlife management, Fish management, Legal aspects, Legislation, Land use, Planning, *Water Resources Development Projects, Dworshak Reservoir(ID), Cordell Hull Dam and Reservoir(TN KY), Wolf Creek Dam and Lake Cumberland(KY), Old Hickory Reservoir(TN), J Percy Priest Reservoir(TN), Mosquito Creek Reservoir(OH), Warrior Lock and Dam(AL), Jones Bluff Lock and Dam(AL), Clark Hill Reservoir(GA SC).

This study's purpose is to evaluate the role of the Army Corps of Engineers in the management of recreation, fish, and wildlife resources at Corps' water resources development projects (WRDPs). Appendix D documents the inspection and analysis of a representative sample of WRDPs. The WRDPs evaluated in this volume include Dworshak Reservoir, Cordell Hull Dam and Reservoir, Wolf Creek Dam and Lake Cumberland, Old Hickory Reservoir, J. Percy Priest Reservoir, Mosquito Creek Reservoir, Warrior Lock and Dam, Jones Bluff Lock and Dam, and Clark Hill Reservoir. The other volumes in this Appendix consider 20 other WRDPs. Selection from among the 407 WRDPs was based on 12 factors that were found to be good indicators of major physical characteristics of WRDPs, the range and complexity of recreation and fish and wildlife programs, and the local management practices. The 12 factors and the relationship to the factors of the 29 WRDPs were: geographic location; concentration of Corps activity; land acquisition policies; complexity of shoreline management; water surface management; relation with other Federal agencies; relations with state governments; urban versus rural setting; size of Corps management responsibility; recreation visitor usage; interrelationships with all other project purposes; and, complexity of real estate programs and practices. Significant findings representing problem areas, data conflicts, resource management approaches, agency relationships, and viable program practices are discussed. The main study report includes findings, recommendations and conclusions. Four technical appendices present documentation of the study. (See also W78-05400) (Nessa-NC)
W78-05405

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT, APPENDIX D, VOLUME IV, CASE STUDIES D.23.1 TO D.29.1.
Coastal Zone Resources Corp., Wilmington, NC.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-034 150, Price codes: A11 in paper copy, A01 in microfiche. Prepared for Office, Chief of Engineers, Army Corps of Engineers, May 1975. 237 p. DACW73-75-C-0001.

Descriptors: *Management, Water resources development, *Multiple purpose projects, *Recreation facilities, *Recreation demand, *State governments, *Federal government, *Administrative agencies, *Reservoirs, Wildlife management, Legal aspects, Legislation, Land use, Planning, Fish management, *Water Resource Development Projects, Hartwell Reservoir(SC GA), Alamo Lake(AZ), Lake Isabella(CA), Table Rock Dam and Reservoir(MO AR), Eufaula Lake(OK), Robert S Kerr Lock and Dam and Reservoir(OK), Denison Dam-Lake Texoma(OK TX).

This study's purpose is to evaluate the role of the Army Corps of Engineers in the management of recreation, fish, and wildlife resources at Corps' water resources development projects (WRDPs). Appendix D documents the inspection and analysis of a representative sample of WRDPs. The WRDPs evaluated in this volume include Hartwell Reservoir, Alamo Lake, Lake Isabella, Table Rock Dam and Reservoir, Eufaula Lake, Robert S. Kerr Lock and Dam and Reservoir, and Denison Dam-Lake Texoma. The other volumes in this Appendix consider 22 other WRDPs. Selection from among the 407 WRDPs was based on 12 factors that were found to be good indicators of major physical characteristics of WRDPs, the range and complexity of recreation and fish and wildlife programs, and the local management prac-

tices. The 12 factors and the relationship to the factors of the 29 WRDPs were: geographic location; concentration of Corps activity; land acquisition policies; complexity of shoreline management; water surface management; relation with other Federal agencies; relations with state governments; urban versus rural setting; size of Corps management responsibility; recreation visitor usage; interrelationships with all other project purposes; and, complexity of real estate programs and practices. Significant findings representing problem areas, data conflicts, resource management approaches, agency relationships, and viable program practices are discussed. The main study report includes findings, recommendations and conclusions. Four technical appendices present documentation of the study. (See also W78-05400) (Nessa-NC)
W78-05406

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT: APPENDIX E--CONSOLIDATED BIBLIOGRAPHY.
Coastal Zone Resources Corp., Wilmington, NC.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-034 151, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Office, Chief of Engineers, Army Corps of Engineers, May 1975. 28 p. DACW73-75-C-0001.

Descriptors: *Management, Water resources development, *Multiple purpose projects, *Recreation facilities, *Reservoirs, Wildlife management, Fish management, Legal aspects, Legislation, Land use, Recreation demand, Planning, *Water Resource Development Projects.

This study's purpose is to evaluate the role of the Army Corps of Enginers in the management of recreation, fish, and wildlife resources at Corps water resources development projects (WRDPs). This volume lists alphabetically all literature that was consulted. The study's findings, conclusions, and recommendations were developed through the performance of the following tasks. Existing Corps policies, laws, and regulations relating to land use, recreation, fish and wildlife practices were assessed and classified. Pertinent literature and national data were reviewed to provide base information for the performance of subsequent tasks. Information was compiled by field surveys of 29 (out of 407) representative WRDPs, the results of which are both summarized in the main report and presented as case studies in technical appendices. The analyses generated by previous tasks were used to appraise land use, recreation, and fish and wildlife practices. National water oriented recreation needs were projected. Major problems resulting from an inadequate resource base or its inefficient management were identified. The consequences of four alternative solutions to existing management problems were evaluated. Finally, a recommended course of action was detailed. The study's findings, recommendations, and conclusions are presented in the main report. The documentation has been compiled in four fully referenced technical appendices. (See also W78-05400) (Nessa-NC)
W78-05407

THE EVALUATION OF WATER AND RELATED LAND RESOURCE PROJECTS: A PROCEDURAL TEST.
Oklahoma Univ., Norman. Dept. of Civil Engineering and Environmental Science.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 678, Price codes: A04 in paper copy, A01 in microfiche. (1972) 47 p, 14 ref.

Descriptors: *Regional development, *Regional analysis, *Economics, *Benefits, *Multiple-purpose reservoirs, *Water resources development, Planning, Environmental effects, National income, Management, Administration, Flood damage, Land use, Indirect benefits, Water supply, Cost analysis, Recreation, *Poteau River(AR), Environmental accounts, Well-being accounts.

A faculty-directed test team from the University of Oklahoma critically reviewed the Poteau River Watershed Project, a multi-purpose resource development project. The team first reclassified objectives into four categories: national income, regional development, environmental, and well-being. These objectives were then subjected to the following methodologies to measure project effects: flood damage reduction benefits; changed and/or more intensive land use benefits; recreation benefits; redevelopment benefits; municipal water supply benefits; secondary benefits; and annual cost. The test team found inadequacies in the initial Project's evaluation of benefits, disagreed with the use of subsidized prices rather than free market approximations for agricultural benefit estimation, declared that a higher value should be placed on the visitor-day use of recreational areas, and opined that secondary benefits from the national viewpoint should be considered. Finally, the test team suggested that the alternative plans generated in the initial report should be broadened in scope rather than simply being alternative means of supplying water or flood control to the region. Recommendations included suggestions for: a systemic comparison of expenditures (water, transportation, health, education) against each other; the consideration of water resources as a means of regional development; a distinction between long- and short-term goals; plan flexibility; and the bearing of a project cost by the group to whom the benefits will accrue. (Zayac-NC)
W78-05408

WATER RESEARCH: SOLVING COLORADO'S WATER PROBLEMS,
Colorado State Univ Fort Collins. Water Resources Research Inst.
D. Zimmerman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 172, Price codes: A03 in paper copy, A01 in microfiche. November, 1977. 36 p. OWRT A-999-COLO(4).

Descriptors: *Water resources development, *Water Resources Institute, *Colorado, Irrigation programs, Recreation facilities, Economics, Input-output model, Water demand, Flood control, Urban drainage, Sewage disposal, Heavy metals, Groundwater resources, Urban runoff, Halophytes, Water conservation, Water reuse, Solar radiation, Evaporation, *Irrigation reservoirs, *Recreation resources, South Platte River Basin(CO).

Several projects conducted by the Colorado Water Resources Research Institute are outlined. The report includes descriptive photographs and simplified procedural explanations designed for use by the general public. Sections of the report include: (1) High country irrigation reservoirs - Colorado's untapped recreation resource, (2) Colorado's economy - the role of water, (3) Answering the flood control benefit question, (4) Solving high country water and sewer problems - a planner's handbook, (5) Improving irrigation, (6) Heavy metals in groundwater - a mineral belt problem, (7) Urban runoff- a water pollution problem, (8) From cells to plants - a breakthrough in salt-tolerant varieties, (9) Stabilizing river channels, (10) Water conservation - a handbook for utility managers, (11) Water reuse - potential in the South Platte River Basin, and (12) Trapping the sun - to solve mountain sewage problems. (Seip-IPA)
W78-05481

MULTIOBJECTIVE ANALYSIS IN THE MAUMEE RIVER BASIN: A CASE STUDY ON LEVEL-B PLANNING,
Case Western Reserve Univ., Cleveland, OH. Dept. of Systems Engineering.
For primary bibliographic entry see Field 6A.
W78-05484

DEVELOPMENT OF PROCEDURES FOR COST-SHARING AND REPAYMENT ANALYSIS,
New York State Coll. of Agriculture and Life Sciences, Ithaca.
D. J. Allee, and F. Davenport.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 144, Price codes: A05 in paper copy, A01 in microfiche. Completion Report, (April, 1976). 93 p, 1 fig, 30 tab, 16 ref. OWRT C-3201(No 3701)(1).

Descriptors: *Cost sharing, *Cost repayment, Water resources development, Economic impact, Economic feasibility, New York, *Water policy, *Cost-benefit analysis, *Repayment analysis, Watershed management, *Policy-making variables, *Economic modeling, Flint Creek Small Watershed Project(NY).

Cost-sharing in water resource development is investigated with emphasis on the role of the states. A basis for state-local cost-sharing and repayment methods in water resource development projects for New York is developed. The existing federal-state cost-sharing mechanism and cost-sharing procedures followed by other programs in New York and by interstate programs are assessed. Existing and potential cost-sharing programs in municipal wastewater treatment plants, in flood contro, in municipal water supply, and in small watershed projects are discussed. The National Water Commission's Report to Congress on cost-sharing is critiqued and briefly described. The nature of the process of policy-making, economic and public administration principles, and intergovernmental relations are described. The impact of institutional settings, legal environments, political-economic behavior and intergovernmental relations on the policy-making process are outlined; an economic model is presented. Conceptual analyses of cost-sharing as a policy variable and an instrument of policy are assessed; goals, strategies, and philosophies are described. A cost-benefit analysis is included using the Flint Creek Small Watershed Project in New York as a case study in input-output modeling. (Seip-IPA)
W78-05485

A STUDY OF THE IMPACT OF THE WETLANDS EASEMENT PROGRAM ON AGRICULTURAL LAND VALUES,
Northern State Coll., Aberdeen, SD. Dept. of Economics.
R. J. Brown.
Land Economics, Vol. 52, No. 4, p 509-517, November 1976, 1 fig, 3 tab, 8 ref. Completed under contract with U.S. Fish and Wildlife Service.

Descriptors: *Wetlands, *Preservation, *Easements, Agriculture, *Market value, Pricing, Prairies, North Dakota, South Dakota, Resource allocation, *Regression analysis, *Economic impact, Multiple regression analysis, Capitalized value.

The purpose was to estimate the impact of a wetlands easement on the price of agricultural land. Two different approaches were used and the results were compared to determine the extent to which the wetlands easement was capitalized into the market price. A multiple regression of agricultural land sales in three regions in North and South Dakota was used to determine the extent to which the market valued the wetlands easement. The results of this analysis were compared with estimates of the capitalized value of net income

foregone as a result of the easement. It was concluded that in those cases where the net income foregone as a result of the easement is substantial, the market does fully capitalize the effect of the easement; where the net income foregone is small, the market price is discounted little if at all because of the easement. Even at relatively high land values, it was concluded that wetlands preservation was socially optimal. (Zayac-NC)
W78-05652

INDUSTRY-SPECIFIC GROSS OUTPUT MULTIPLIERS FOR BEA ECONOMIC AREAS.
Department of Commerce, Washington, DC. Div. of Regional Economic Analysis.
For primary bibliographic entry see Field 6A.
W78-05655

HAWAII COASTAL ZONE MANAGEMENT PROGRAM, TECHNICAL SUPPLEMENT 4. BEACHES: A COMPONENT OF THE COASTAL ZONE,
Hawaii Inst. of Geophysics, Honolulu.
For primary bibliographic entry see Field 6G.
W78-05660

HAWAII COASTAL ZONE MANAGEMENT PROGRAM: ENHANCEMENT OF COASTAL ZONE RECREATIONAL OPPORTUNITIES: A DESCRIPTION OF PRESENT COASTAL RECREATIONAL USAGE, CONSTRAINTS, DATA AND RESEARCH POSSIBILITIES IN THE STATE OF HAWAII. TECHNICAL SUPPLEMENT NO. 6,
Hawaii Univ., Honolulu. Dept. of Geography.
A. Sommarstrom.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 341, Price codes: A04 in paper copy, A01 in microfiche. Prepared for the Pacific Urban Stdies and Planning Program, University of Hawaii, August 1975, 64 p, 15 tab.

Descriptors: *Coasts, *Recreation demand, *Recreation facilities, *Management, *Hawaii, *Tourism, *Coastal areas, Parks, Planning, Projects, Research, *Coastal zone management, *Recreation enhancement.

The purpose was to investigate the variables involved in the development of a workable approach to the enhancement of Hawaii's coastal recreational opportunities. Focus is on coastal parks and coastal recreational user data because of limited data and staff. Jurisdictional coastal zone responsibilities are reviewed along with patterns of use. constraints for use, including area, access, pollution and cmpeting activities and responsibilities are recognized and recommendations for recreation managers are suggested. These include: proper objective, and objective fulfillment timetable, enunciation; creation of a data bank; identification of coastal recreation limiting factors; development of estimates of carrying capacities; recognition of recreatinal investment tradeoffs; and development of information on the relationship between the state's tourist industry and coastal recreation. (Zayac-NC)
W78-05662

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ECONOMIC EFFECT ON AGRICULTURAL PRODUCTION OF ALTERNATIVE ENERGY INPUT PRICES: TEXAS HIGH PLAINS,
Texas A and M Univ., College Station. Water Resources Inst.
For primary bibliographic entry see Field 3F.
W78-05350

DEVELOPMENT OF PROCEDURES FOR COST-SHARING AND REPAYMENT ANALYSIS,
New York State Coll. of Agriculture and Life Sciences, Ithaca.
For primary bibliographic entry see Field 6B.
W78-05485

TECHNOLOGICAL ECONOMICS APPLIED TO WASTE RECOVERY AND TREATMENT PROCESSES,
Aston Univ., Birmingham (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W78-05496

MODIFICATIONS OF ORNL'S COMPUTER PROGRAMS MSF-21 AND VTE-21 FOR THE EVALUATION AND RAPID OPTIMIZATION OF MULTISTAGE FLASH AND VERTICAL TUBE EVAPORATORS,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 3A.
W78-05692

6D. Water Demand

WATER REQUIREMENTS AND APPLICATION RATES FOR LAWNS,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3D.
W78-05201

6E. Water Law and Institutions

STATE GUIDELINES FOR LOCAL PLANNING IN THE COASTAL AREA UNDER THE COASTAL AREA MANAGEMENT ACT OF 1974.
North Carolina Coastal Resources Commission, Raleigh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 024, Price codes: A05 in paper copy, A01 in microfiche. Prepared for National Oceanic and Atmospheric Administration, Rockville, MD, 1975. 73 p, 4 fig.

Descriptors: *Land use, *Coasts, *North Carolina, *Local governments, *Planning, Legislation, Management, State governments, Regulation, Land classification, Land development, Resources, *North Carolina Coastal Area Management Act, *Coastal planning, Areas of environmental concern, Environmental management.

This report explains some of the procedures to implement the strong local government role mandated by the North Carolina Coastal Area Management Act (CAMA) of 1974. Local governments include counties and cities. Their role consists of: recommending specific areas that fit the general descriptions of Areas of Environmental Concern (AEC's) contained in these guidelines; developing land use plans and land use regulations for AECs that conform to these guidelines; and implementing the land use plans and regulations within ABC's for developments that are not of greater than local significance. The performance of this role is overseen by the Coastal Resources Commission (CRC). Land use plans for coastal land that is not within an AEC are also reviewed by the CRC, but they cannot enforce implementation of recommended modifications. Land classification plans to guide growth are also required, but implementation of these plans is not required. Each of the local governments' responsibilities cannot be undertaken without full public participation. The report contains both summary information for those interested in monitoring the planning process and detailed information for those responsible for the planning process. (Nessa-NC)
W78-05399

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT: MAIN REPORT.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05400

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT: APPENDIX B - FOUNDATION FOR LEGAL ANALYSIS.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05401

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT. APPENDIX C - FEDERAL AND STATE AGENCY PROFILES.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05402

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT. APPENDIX D; VOLUME I - CASE STUDIES D.1.1 TO D.5.1.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05403

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT, APPENDIX D, VOLUME II, CASE STUDIES D.6.1 TO D.13.1.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05404

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT, APPENDIX D, VOLUME III, CASE STUDIES D.14.1 TO D.22.1.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05405

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT, APPENDIX D, VOLUME IV, CASE STUDIES D.23.1 TO D.29.1.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05406

STUDY OF LAND USE FOR RECREATION AND FISH AND WILDLIFE ENHANCEMENT: APPENDIX E--CONSOLIDATED BIBLIOGRAPHY.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 6B.
W78-05407

SUMMARY REPORT - INSTITUTE IMPROVEMENT WORKSHOP FOR DIRECTORS OF WATER RESOURCES RESEARCH INSTITUTES.
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 9D.
W78-05479

HANDBOOK OF PROCEDURES, CONSTRUCTION GRANTS PROGRAM FOR MUNICIPAL WASTEWATER TREATMENT WORKS.
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5D.

W78-05546

MANAGEMENT: SOUTHEAST CONTINENTAL SHELF STUDIES,
Skidaway Inst. of Oceanography, Savannah, GA.
D. W. Menzel.
Available from the National Technical Information Service, Springfield, VA 22161 as SRO-9011, Price codes: A02 in paper copy, A01 in microfiche. Progress Report SRO-901-1, to Energy Research and Development Administration, August 1976. 12 p. 1 fig. E(38-1)-901.

Descriptors: *Continental Shelf, *Baseline studies, Water resources, *Water pollution effects, Ocean currents, Ocean circulation, *Management, Southeast US, Path of pollutants, *Outer Continental Shelf, *Southeast US Coast, Gulf Stream.

Progress in the program for coordination of ERDA supported oceanographic research in the Southeast Atlantic area is reported in the following areas: (1) a synthesis of the major scientific conclusions resulting from work in the area; (2) establishment of a Scientific Advisory Committee to assist in program direction and development; (3) establishing liaison between participating scientists through the mechanisms of meeting and data exchange; and (4) coordination of the use of ships and other facilities. The oceanographic program in the Southeast Atlantic currently is comprised of eight elements which may be viewed as follows: a study of physical oceanographic factors forcing water motion on the continental shelf--the origin of Gulf Stream intrusions; the physical oceanography of intrusions once isolated from the Gulf Stream; nutrient fluxes induced by and chemical characterization of intrusions; the effects of intrusions and coastal circulation; microorganisms; phytoplankton and zooplankton; heavy metal distribution and inputs into coastal waters; radioisotope geochemistry; and uptake and discharge of pollutants by marine organisms. (Sinha-OEIS)
W78-05625

A REVIEW OF STATE AGENCIES IMPACTING REGIONAL WATER QUALITY MANAGEMENT.
Miami Valley Regional Planning Commission, Dayton, OH; and Linton and Co., Inc., Washington, DC.
For primary bibliographic entry see Field 5G.
W78-05657

6F. Nonstructural Alternatives

REGIONAL STORM DRAINAGE PLAN, (LEHIGH-NORTHAMPTON JOINT PLANNING COMMISSION).
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, PA.
August 1975, 155 p, 14 tab, 30 maps, 13 fig, append.

Descriptors: *Storm runoff, *Drainage systems, *Flood control, *Regional development, Storm water, Storm drains, Cities, Urban drainage, Flood plains, Flood protection, Flood plain zoning, Regulation, Watershed management, Economics, Environmental effects, *Pennsylvania, Lehigh County(PA), Northampton County(PA), *Storm drainage.

The plan provides a regional framework and overall coordination scheme for the development of major storm drainage facilities in Lehigh and Northampton Counties. The regional overview was necessary because storm drainage and flood control problems often affect several contiguous municipalities. Storm drainage here relates to the transport of runoff from a municipality to the nearest river or stream; flood control relates to the entire length of the river or stream. In the field of storm drainage, the plan recommends storm sewers in developed areas and retention possibilities in less developed areas. With flood control, non-structual methods--especially floodplain regulation--were emphasized. End products were: both a long-range and short-range program for major storm drainage facilities; recommendations for a floodplain management program; recommendations for plan implementation; and procedures for ongoing plan evaluation. Intermediate products of special interest to local government officials included an in-depth analysis of alternative methods of handling storm runoff which are both environmentally and economically preferred, and an assessment of storm drainage impact on new development. (Zayac-NC)
W78-05397

REGIONAL STORM DRAINAGE PLAN-1977 SUPPLEMENT, (LEHIGH-NORTHAMPTON JOINT PLANNING COMMISSION),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, PA.
A. R. O'Dell.
June 1977, Annual supplement to the JPC Regional Storm Drainage Plan, August 1975. 10 p, 2 tab. 03-00-1092-14.

Descriptors: *Watershed management, *Storm water, *Storm runoff, *Legal aspects, *Legislation, Flood plain insurance, *Pennsylvania, Lehigh County(PA), Northampton County(PA), *Flood plain management, *National Flood Insurance Program, Storm drainage.

This is the most recent annual supplement to the 1975 Regional Storm Drainage Plan. It reports the status of storm drainage and floodplain management efforts in the region during the period July 1976-June 1977. In addition, recent revisions and pending changes to state and federal regulations which deal with stormwater management are presented. Finally, topics which will be considered during the coming year are introduced. (Zayac-NC)
W78-05398

FLOOD PLAIN INFORMATION: MILL CREEK, RIPLEY, WEST VIRGINIA, AND VICINITY.
Army Engineer District, Huntington, WV.
For primary bibliographic entry see Field 4A.
W78-05409

FLOOD PLAIN INFORMATION: OHIO RIVER, POPE AND HARDIN COUNTIES, ILLINOIS.
Army Engineer District, Louisville, KY.
For primary bibliographic entry see Field 4A.
W78-05410

FLOOD PLAIN INFORMATION: OHIO RIVER AND MASSAC CREEK, CITY OF METROPOLIS AND MASSAC COUNTY, ILLINOIS.
Army Engineer District, Louisville, KY.
For primary bibliographic entry see Field 4A.
W78-05411

FLOOD PLAIN INFORMATION: EMBARRAS RIVER AND TRIBUTARIES, CHARLESTON, ILLINOIS.
Army Engineer District, Louisville, KY.
For primary bibliographic entry see Field 4A.
W78-05412

FLOOD PLAIN INFORMATION: SUSSEX COUNTY, VIRGINIA, NOTTOWAY RIVER, VIRGINIA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-05413

FLOOD PLAIN INFORMATION: YELLOWSTONE RIVER, LIVINGSTON, MONTANA.
Army Engineer District, NE.
For primary bibliographic entry see Field 4A
W78-05414

FLOOD PLAIN INFORMATION: GREAT FALLS, MONTANA, VOLUME II, MISSOURI RIVER.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-05415

FLOOD PLAIN INFORMATION: BEAVERHEAD RIVER, DILLON, MONTANA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-05416

FLOOD HAZARD ANALYSES REPORT: HOCKING RIVER WITH RUSH CREEK, PLEASANT RUN, BLUE VALLEY, BALDWIN RUN, FETTERS RUN, EWING RUN AND TARHE RUN, FAIRFIELD COUNTY, OHIO.
Soil Conservation Service, Columbus, OH.
For primary bibliographic entry see Field 4A.
W78-05417

FLOOD PLAIN INFORMATION: SALT CREEK, KICKAPOO CREEK, BRAINARD BRANCH, AND SALT SPRING BRANCH, LOGAN COUNTY, ILLINOIS.
Army Engineer District, Chicago, IL.
For primary bibliographic entry see Field 4A.
W78-05663

FLOOD PLAIN INFORMATION: MUSKINGHAM DRAW, ODESSA, TEXAS.
Army Engineer District, Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W78-05664

FLOOD PLAIN INFORMATION: LITTLE KANAWHA RIVER, GLENVILLE, WEST VIRGINIA.
Army Engineer District, Huntington, WV.
For primary bibliographic entry see Field 4A.
W78-05665

FLOOD PLAIN INFORMATION: APPOMATTOX RIVER, CHESTERFIELD COUNTY - PETERSBURG, VIRGINIA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-05666

SPECIAL FLOOD HAZARD INFORMATION REPORT: SOUTH PLATTE RIVER, VOLUME 1, WELD COUNTY, COLORADO.
Army Engineer District, Omaha, NB.
For primary bibliographic entry see Field 4A.
W78-05667

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, MCKEAN COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-05668

6G. Ecologic Impact Of Water Development

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME I. RECEPTORS--MAMMALS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977, Environmental Assessment of the Alaskan Continental Shelf, March 1977. 712 p.

Descriptors: *Mammals, *Continental Shelf, *Baseline studies, *Resources development, Ecology, Alaska, *Outer Continental Shelf, Whales, Seals, Sea lions, Balaena mysticetus, Delphinapterus leucas, Phoca vitulina richardi, Erignathus barbatus.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: Marine Mammals of the Bering and Southern Chukchi Seas; Seasonal Distribution and Relative Abundance of Marine Mammals in the Gulf of Alaska; Bowhead and Beluga Whales in the Bering, Chukchi and Beaufort Seas, Morbidity and Mortality of Marine Mammals--Bering Sea; Biology of the Harbor Seal in the Gulf of Alaska; the Natural History and Ecology of the Bearded Seal and the Ringed Seal; Trophic Relationships Among Ice Inhabiting Phocid Seals; Population Assessment, Ecology, and Trophic Relationships of Steller Sea Lions in the Gulf of Alaska; The Relationship of Marine Mammal Distributions, Densities and Activities to Sea Ice Conditions; An Updated Assessment of Biological Resources and Their Commercial Importance in the St. George Basin of the Eastern Bering Sea; and A Survey of Cetaceans of Prince William Sound and Adjacent Vicinity. (NOAA)
W78-05206

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME II. RECEPTORS--BIRDS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 577 p.

Descriptors: *Baseline studies, *Resources development, *Birds, Ecology, Alaska, Migratory birds, *Outer Continental Shelf, Seabirds, Pribilof Islands.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: Identification, Documentation and Delineation of Coastal Migratory Bird Habitat in Alaska; A Census of Seabirds on the Pribilof Islands; Reproductive Ecology, Foods, and Foraging Areas of Seabirds Nesting on the Pribilof; Community Structure, Distribution, and Interrelationships of Marine Birds in the Gulf of Alaska; Shorebird Dependence on Arctic Littoral Habitats; The Distribution, Abundance and Feeding Ecology of birds associated with Pack Ice; Avifaunal Utilization of the Offshore Island Are near Prudhoe Bay, Alaska (NOAA)
W78-05207

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME III. RECEPTORS--BIRDS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 641 p.

Descriptors: *Baseline studies, *Resources development, *Birds, Ecology, Alaska, *Outer Continental Shelf, Seabirds, Bering Sea, Gulf of Alaska.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation containsk the following studies: Birds of Coastal Habitats on the South Shore of the Seward Peninsula, Alaska; Ecology and Behavior of Southern Hemisphere Shearwaters (Genus Puffinus) and other Seabirds, when over the Outer Continental Shelf of Bering Sea and Gulf of Alaska during the Northern Summer; Shipboard Surveys of Marine Birds - Part I and Part II; and Catalog of Seabird Colonies. (NOAA)
W78-05208

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME IV. RECEPTORS--BIRDS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 762 p.

Descriptors: *Baseline studies, *Resources development, *Birds, Ecology, Alaska, *Outer Continental Shelf, Seabirds, Shorebirds, Gulf of Alaska.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: Population Dynamics and Trophic Relationships of Marine Birds in the Gulf of Alaska and Southern Bering Sea, Part I: General Introduction; Part II: Populations and Ecology of Marine Birds on the Semidi Islands; Part III: Breeding Biology of Fulmars at Semidi Islands, Alaska; Part IV: Studies of Marine Birds on Ugaiushak Island; Part V: Studies of Seabird Parasites from Ugaiushak Island, Alaska; Part VI; (not included); Part VII; Dynamics of Marine Bird Populations on the Barren Islands, Alaska; Part VIII: Seabirds on the Wooded Islands, Alaska; Part IX: The Population Ecology and Migration of Seabirds, Shorebirds, and Waterfowl; Part X: Food Habits of Migrant Dunlins and Western Sandpipers; Part XI (not included); Part XII: Avifaunal Assessment of Nelson Lagoon; Part XIII: Field Studies at Cape Peirce, Alaska; and Part XIV: The Trophic Relationships of Marine Birds in the Gulf of Alaska, etc. (NOAA).
W78-05209

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME V. RECEPTORS--BIRDS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 454 p.

Descriptors: *Baseline studies, *Resources development, *Water pollution effects, *Birds, Alaska, Ecosystems, Oil pollution, *Outer Continental Shelf, Seabirds, Offshore operations.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: Avian Community Ecology at Two Sites on Espenberg Peninsula in Kotzebue Sound, Alaska; Studies of Populations, Community Structure and Ecology of Marine Birds at King Island, Bering Strait Region, Alaska; Avian Community Ecology of the Akulik-Inglutalik River Delta, Norton Bay, Alaska; A Comparative Sea-Cliff Bird Inventory of the Cape Thompson Vicinity, Alaska; Some Aspects of the Ecology of Cliff-Nesting Seabirds at Kongkok Bay, St. Lawrence Island, Alaska, during 1976; and Characterization of Coastal Habitat for Migratory Birds. (NOAA)
W78-05210

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME VI. RECEPTORS--FISH, LITTORAL, BENTHOS,
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 861 p.

Descriptors: *Baseline studies, *Resources development, *Environmental effects, Fish, Littoral zone, Benthos, Bibliographies, Alaska, Continental Shelf, Aquatic animals, *Outer Continental Shelf, Petroleum development, Offshore operations, Life histories.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: The distribution, abundance, diversity and productivity of the western Beaufort Sea benthos; and Summarization of existing literature and unpublished data on the distribution, abundance, and life histories of benthic organisms. (NOAA)
W78-05211

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME VII. RECEPTORS--FISH, LITTORAL, BENTHOS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 801 p.

Descriptors: *Baseline studies, *Water pollution effects, *Resources development, Environmental effects, Fish, Shellfish, Aquatic animals, Benthos, Ecosystems, Continental Shelf, Alaska, *Outer Continental Shelf, Petroleum development, Offshore operations.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: Alaska Marine Environmental Assessment Project, Herring Spawning Surveys--Southern Bering Sea; Alaska Marine Environmental Assessment Project, Finf-

ish Resource Surveys in Norton Sound and Kotzebue Sound; Razor Clam (Siliqua patula, Dixon) Distribution and Population Assessment Study; An Ecological Assessment of the Littoral Zone along the Outer Coast of the Kenai Peninsula for State of Alaska, Department of Fish and Game; and A Description and Numerical Analysis of the Factors Affecting the Processes of Production in the Gulf of Alaska. (NOAA)
W78-05212

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME VIII. RECEPTORS--FISH, LITTORAL, BENTHOS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 829 p.

Descriptors: *Baseline studies, *Resources development, *Water pollution effects, Continental Shelf, Alaska, Fish, Littoral zone, Benthos, *Outer Continental Shelf, Petroleum development, Offshore operations, Gulf of Alaska, Bering Sea, Beaufort Sea.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: Baseline/Reconnaissance Characterization, Littorial Biota, Gulf of Alaska and Bering Sea: Baseline Studies of Demersal Resources of the Gulf of Alaska Shelf and Slope: A Historical Review; Baseline Studies of Fish and Shellfish Resources of Norton Sound and the Southeastern Chikchi Sea; Beaufort Sea Estuarine Fishery Study; The Distribution, Abundance, Diversity, and Biology of Benthic Organisms in the Gulf of Alaska and the Bering Sea; Summarization of Existing Literature and Unpublished Data on the Distribution, Abundance, and productivity of Benthic Organisms of the Gulf of Alaska and Bering and Chukchi Seas; Food and Feeding Relationships in the Benthic and Demersal Fishes; and Illustrated Keys to Otoliths of Forage Fishes of the Gulf of Alaska, Bering Sea and Beaufort Sea. (NOAA)
W78-05213

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME IX. RECEPTORS--FISH, LITTORAL, BENTHOS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 831 p.

Descriptors: *Baseline studies, *Water pollution effect, *Environmental effects, Fish, Benthos, Plankton, Ecology, Bibliographies, Alaska, *Outer Continental Shelf, Ichthyoplankton, Bering Sea, Beaufort Sea, Chukchi Sea, Offshore operations, Petroleum development.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: Literature Search on the Density and Distribution of Fishes of the Beaufort Sea; Reconnaissance Characterization of Littoral Biota, Beaufort and Chukchi Seas; Beaufort Sea Plankton Studies, Ichthyoplankton of the Eastern Bering Sea; and Lower Cook Inlet Meroplankton. (NOAA)
W78-05214

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME X. RECEPTORS--FISH, LITTORAL, BENTHOS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 589 p.

Descriptors: *Baseline studies, *Environmental effects, *Water pollution effects, Alaska, Plankton, Primary biological productivity, Shellfish, Benthos, Ecology, Continental Shelf, Oil pollution, *Outer Continental Shelf, Petroleum development, Offshore operations, Gulf of Alaska, Cook Inlet, Norton Sound.

Report containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: Phytoplankton and Primary Productivity in the Northeast Gulf of Alaska and Lower Cook Inlet; Initial Zooplankton Investigations in Prince William Sound, Gulf of Alaska and Lower Cook Inlet; Zooplankton and Micronekton Studies in the Bering - Chukchi/Beaufort Seas; Demesal Fish and Shellfish Assessment in Selected Estuary Systems of Kodiak Island; Distribution of King Crab, Pandalid Shrimp, and Brachyuran Crab Larvae in Kachemak Bay, Alaska, 1972; Trawl Survey of the Benthic Epifauna of the Chukchi Sea and Norton Sound; Pelagic and Demersal Fish Assessment in the Lower Creek Inlet Estuary System; and The Distribution, Abundance and Diversity of the Epifaunal Benthic Organisms in two (Alitak and Ugak) Bays of Kodiak Island Alaska. (NOAA)
W78-05215

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XI. RECEPTORS--MICROBIOLOGY.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 426 p.

Descriptors: *Baseline studies, *Environmental effects, *Water pollution effects, *Microorganisms, *Aquatic microbiology, Alaska, Pollutants, Pathology, Diseases, Plankton, *Outer Continental Shelf, Hydrocarbons, Gulf of Alaska, Cook Inlet, Bering Sea, Petroleum development, Offshore operations.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Developmet on the Outer Continental Shelf in the Beaufort Sea; Assessment of Potential Interactions of Microorganisms and Pollutants Resulting from Petroleum Development on the Outer Continental Shelf in the Gulf of Alaska and Cook Inlet: Study of Microbial Activity in the Beaufort Sea and Gulf of Alaska and Analysis of Hydrocarbon Degradation by Psychrophilic Microorganisms; Determine the Frequency and Pathology of Marine Animal Diseases in the Bering Sea, Gulf of Alaska, and Beaufort Sea; and Phytoplankton Studies in the Bering Sea. (NOAA)
W78-05216

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XII. EFFECTS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 826 p.

Descriptors: *Baseline studies, *Water pollution effects, *Oil pollution, *Environmental effects, *Resources development, Alaska, Continental Shelf, Heavy metals, Ecology, Ecosystems, *Outer Continental Shelf, Offshore operations, Petroleum development.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: The physiological Effects of Acute and Chronic Exposure to Hydrocarbons on Near-shore Fishes of the Bering Sea; Lethal and Sublethal Effects on Selected Alaskan Maine Species after Acute and Long-term Exposure to Oil and Oil Components; Sublethal Effects of Petroleum Hydrocarbons and Trace Metals, Including Biotransformations; Ecosystem Dynamics, Eastern Bering Sea; Ecosystem Dynamics Birds and Marine Mammals, Part I and Part II; Effects of Petroleum Exposure on Hatching Success and Incubation Behavior of Glaucous-winged Gulls; Evolution, Pathobiology and Breeding Ecology of the Gulf of Alaska Herring Gull Group; Acute Effects - Pacific Herring Roe in the Gulf of Alaska; Sublethal Effects on Seagrass Photosynthesis; Transport, Retention, and Effects of the Water-Soluble Fraction of Cook Inlet Crude Oil; and Research to Determine the Accumulation of Organic Constituents and Heavy Metals from Petroleum-Impacted Sediments. (See also W78-04443--W78-04456) (NOAA)
W78-05217

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF VOLUME XIII. CONTAMINANT BASELINES.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 861 p.

Descriptors: *Baseline studies, *Water pollution sources, *Resources development, *Heavy metals, Alaska, Continental Shelf, Oil pollution, Sediments, *Outer Continental Shelf, Hydrocarbons, Petroleum development, Offshore operations, Bering Sea, Gulf of Alaska, Beaufort Sea.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from the following studies: Quality Assurance Program for Trace Hydrocarbon Analysis; Research and Evaluation of Trace Element Methodology for the Analysis of Sea Water; The Distribution, Composition and Transport of Suspended Particulate Matter in the Northeastern Gulf of Alaska, Southeastern Bering Shelf and Lower Cook Inlet; Distribution of Light Hydrocarbons in the Northeast Gulf of Alaska, Lower Cook Inlet, Southeastern Chukchi Sea; Submarine Seepage of Natural Gas in Norton Sound, Alaska; Natural Distribution of Trace Heavy Metals and Environmental Background in Alaskan Shelf and Estuarine Areas; Hydrocarbons: Natural Distribution and Dynamics on the Alaskan Outer Continental Shelf; Trace Metal Content of Bottom Sediment in Northern Bering Sea; and Characterization of Organic Matter in Sediments from Gulf of Alaska, Bering and Beau-

fort Seas. (See also W78-04457--W78-04468) (NOAA)
W78-05218

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XIV. TRANSPORT.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 747 p.

Descriptors: *Baseline studies, *Environmental effects, *Resources development, *Ocean currents, Alaska, *Ocean circulation, Deltas, Dispersion, Continental shelf, *Outer Continental Shelf, *Coastal processes, Mesoscale oceanographic processes, Offshore operations, Pollutant transport.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: Development and Operation of HF Ocean Current Mapping Radar Units; Surface Currents of the Northeast Chukchi Sea; Current Measurements in Possible Dispersal Regions of the Beaufort Sea; Effects of Seasonability and Variable of Streamflow on Nearshore Coastal Areas; Gulf of Alaska Stufdy of Mesoscale Oceanographic Processes; Numerical Studies of Alaskan Region; Bristol Bay Oceanographic Processes; STD Measurements in Possible Dispersal Regions of the Beaufort Sea; Yukon Delta Coastal processes Study; Lagrangian Surface Current Measurements on the Outer Continental Shelf; and Study of Climatic Effects on Fast Ice Extent and Its Seasonal Decay along the Beaufort Chukchi Coasts. (See also W78-04974--W78-04984) (NOAA)
W78-05219

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XV. TRANSPORT.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 677 p.

Descriptors: *Baseline studies, *Environmental effects, *Ocean currents, *Sea ice, *Water masses, Alaska, Ocean circulation, Climatology, Resources development, *Outer Continental Shelf, Offshore operations, Pollutant transport, Gulf of Alaska, Bering Sea.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: Mechanics of Origin of Pressure Ridges, Shear Redges and Hummock Fields in Landfast Ice; Morphology of Beaufort, Chukchi and Bering Seas Near Shore Ice Conditions by Means of Satellite and Aerial Remote Sensing; Experimental Measurements of Sea Ice Failure Stresses Near Grounded Structures; Beaufort Sea, Chukchi Sea, and Bering Strait Baseline Ice Study; Development of Hardware and Procedures for in situ Measurement of Creep in Sea Ice; Operation of an Alaskan Facility for Applications of Remote-sensing Data to OCS Studies; Circulation and Water Masses in the Gulf of Alaska; and Marine Climatology of the Gulf of Alaska, The Bering and Beaufort Seas. (See also W78-04985--W78-04998) (NOAA)
W78-05220

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XVI. HAZARDS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 521 p.

Descriptors: *Baseline studies, *Water pollution effects, *Environmental effects, *Oil spills, *Hazards, Alaska, Sedimentation, Sea ice, Geomorphology, Permafrost, Resources development, *Outer Continental Shelf, Offshore operations, Petroleum development, Gulf of Alaska, Beaufort Sea.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: Coastal Morphology, Sedimentation and Oil Spill Vulnerability; The Interaction of Oil with Sea Ice in the Arctic Ocean; Dynamics of Near-Shore Ice; Dynamics of Near Shore Ice; The Environmental Geology and Geomorphology of the Gulf of Alaska Coastal Plain and the Coastal Zone of Kotzebue Sound; Delineation and Engineering Characteristics of Permafrost beneath the Beaufort Sea; and Offshore Permafrost Studies, Beaufort Sea. (NOAA)
W78-05221

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XVII. HAZARDS.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 633 p.

Descriptors: *Baseline studies, *Resources development, *Environmental effects, *Hazards, *Alaska, Sea-ice, Permafrost, Water resources, Earthquakes, Foundations, Seismology, Tectonics, *Outer Continental Shelf, Engineering properties, Offshore operations, Petroleum development, Gulf of Alaska, Bering Sea, Beaufort Sea.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: Marine Environmental Problems in the Ice Covered Beaufort Sea Shelf and Coastal Regions; Areas of Faulting and Potentially Unstable Sediments in the St. George Basin Region; Earthquake Activity and Ground Shaking in and along the Eastern Gulf of Alaska; Faulting, Instability, Erosion, and Deposition of Shelf Sediments, Eastern Gulf of Alaska; Seismic and Volcanic Risk Studies - Western Gulf of Alaska; Subsea Permafrost: Probing Thermal Regime and Data Analysis; Beaufort Seacoast Permafrost Studies; Benthos-Sedimentary Substrate Interactions; Shallow Faulting, Bottom Instability, and Movement of Sediments in Lower Cook Inlet and Western Gulf of Alaska; and Seismicity of the Beaufort Sea, Bering Sea and Gulf of Alaska. (NOAA)
W78-05222

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XVIII. HAZARDS, DATA MANAGEMENT.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
Principal Investigators' Reports for the Year Ending March 1977. Environmental Assessment of the Alaskan Continental Shelf, March 1977. 502 p.

Descriptors: *Baseline studies, *Resources development, *Environmental effects, *Hazards, *Alaska, *Data management, Erosion, Sedimentation, Sediment transport, Geomorphology, Tectonics, Seismology, Data processing, Data collections, *Outer Continental Shelf, Offshore operations, Petroleum development.

Reports containing baseline studies are compiled in this annual report. They are intended to serve as markers or as points of departure from which to assess the potential environmental impact that might result from resources development on the Alaskan Continental Shelf. This compilation contains the following studies: Faulting, Sediment Instability, Erosion, and Depositon Hazards of the Norton Basin Seafloor; Sediment Transport in Norton Sound - Northern Bering Sea, Alaska; Coastal Processes and Morphology of the Bering Sea Coast of Alaska; Seismic and Tectonic Hazards in the Hope Basin and Beaufort Shelf; Seismicity Studies; Alaska OCS Program Coordination; R/V ACONA and Marine Logistics Support; Data File Index/Alaska MEA Program; Data Management/Alaska MEA Program; Bibliographic Support to Principal Investigators; Administrative Support for NODC/OCSEAP Representative and Alaskan Data Processing; Maintenance of Alaskan OCSEAP Surface Marine and Coastal Station Data File; Alaskan Data Processing Facility; and A Geographic Based Information Management System for Permafrost in the Beaufort and Chukchi Seas. (NOAA)
W78-05223

PROCEEDINGS OF THE CONFERENCE ON ASSESSING THE EFFECTS OF POWER-PLANT-INDUCED MORTALITY ON FISH POPULATIONS.
Energy Research and Development Administration, Oak Ridge, TN.; and Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 5C.
W78-05251

QUALITY OF INFERENCE CONCERNING THE EFFECTS OF NUCLEAR POWER PLANTS ON THE ENVIRONMENT,
Washington Univ., Seattle. Center for Quantitative Science in Forestry, Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-05262

TECHNICAL REQUIREMENTS AND ANALYSIS METHODS FOR EVALUATING THE ENVIRONMENTAL CONSEQUENCES OF GROUNDWATER CONTAMINATION,
BCS., Inc., Richland, WA.
For primary bibliographic entry see Field 5B.
W78-05372

A GUIDE TO ENVIRONMENTAL PLANNING AND DEVELOPMENT, (LEHIGH-NORTHAMPTON COUNTIES JOINT PLANNING COMMISSION),
Lehigh-Northampton Counties Joint Planning Commission, Lehigh Valley, PA.
For primary bibliographic entry see Field 6B.
W78-05394

STATE GUIDELINES FOR LOCAL PLANNING IN THE COASTAL AREA UNDER THE COASTAL AREA MANAGEMENT ACT OF 1974.
North Carolina Coastal Resources Commission, Raleigh.
For primary bibliographic entry see Field 6E.
W78-05399

ENVIRONMENTAL (IMPACT) ASSESSMENT: DONOHUE-ST. FELICIEN (KRAFT MILL) PROJECT,
Beak Consultants Ltd., Mississauga (Ontario).
For primary bibliographic entry see Field 5C.
W78-05467

ECOSYSTEM IMPACTS OF URBANIZATION ASSESSMENT METHODOLOGY.
Corvallis Environmental Research Lab., OH.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 931, Price codes: A11 in paper copy, A01 in microfiche. Report No. EPA-600/3-76-072, July, 1976, D. L. Jameson, Ed. 227 p, 56 fig, 16 tab, 302 ref, 1 append. 68-01-2642.

Descriptors: *Urbanization, *Ecosystems, Land use, Waste water treatment, Model studies, Analytical techniques, Water pollution effects, *Ecosystem modeling, *Environmental impact statements, Land-use, Analytical descriptor, Woodlands(TX), Lake George(NY).

A methodology, using ecosystem and space-time analysis and modeling, was developed to assess the secondary impacts of urbanization, e.g., waste water treatment, on natural ecosystems. The existing state of the ecosystem is described and emphasizes the dynamic, periodic, trend, and gradient processes, Ecosystem models are used to project land uses and alternatives and their impacts of ecosystems. Incremental and synergistic effects are indicated along with suggested operational adjustments to minimize ecosystem impacts for the recommended project. Ecosystem models are described and the literature on impacts is reviewed. A case study of urbanization at Lake George, NY, emphasizes the usefulness of the components of ecosystem models by linking units from several studies with a new model (Land-use Analytical Descriptor: LAND); a description of the new model is presented. Although there is no comprehensive model that can be used to predict the ecosystem effects of urbanization, there are models which are useful in predicting specific effects from specific perturbations. Thus, a space-time analytical method of exploring potential ecological effects of various aspects of urbanization was developed. A case study of the new town of Woodlands, TX indicates that changes in current methodologies which are required to adopt spact-time analysis and ecosystem modeling to the assessment of the effects of urbanization on the ecosystem. (Seip-IPA)
W78-05533

A PRELIMINARY ASSESSMENT OF THE ENVIRONMENTAL IMPACTS FROM OIL SHALE DEVELOPMENTS,
TRW Environmental Engineering Div., Redondo Beach, CA.
For primary bibliographic entry see Field 5G.
W78-05540

ECOLOGICAL AND AESTHETIC IMPLICATIONS FOR THE MERRIMACK ESTUARY OF THE MERRIMACK BASIN WASTEWATER MANAGEMENT ALTERNATIVES,
Massachusetts Univ., Gloucester, Marine Station.
For primary bibliographic entry see Field 5C.
W78-05554

MARINE ENVIRONMENTAL PROBLEMS IN THE ICE COVERED BEAUFORT SEA SHELF AND COASTAL REGIONS,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 2L.
W78-05636

FAULTING, SEDIMENT INSTABILITY, EROSION, AND DEPOSITION HAZARDS OF THE NORTON BASIN SEAFLOOR,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 2L.
W78-05646

SEDIMENT TRANSPORT IN NORTON SOUND - NORTHERN BERING SEA, ALASKA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 2L.
W78-05647

COASTAL PROCESSES AND MORPHOLOGY OF THE BERING SEA COAST OF ALASKA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 2L.
W78-05648

SEISMIC AND TECTONIC HAZARDS IN THE HOPE BASIN AND BEAUFORT SHELF,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 2L.
W78-05649

SEISMICITY STUDIES: (A) NORTHEAST ALASKA AND (B) NORTON AND KOTZEBUE SOUNDS,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2L.
W78-05650

DATA MANAGEMENT.
Environmental Research Labs., Boulder, CO.
For primary bibliographic entry see Field 7C.
W78-05651

A STUDY OF THE IMPACT OF THE WETLANDS EASEMENT PROGRAM ON AGRICULTURAL LAND VALUES,
Northern State Coll., Aberdeen, SD. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-05652

FINAL REPORT AND RECOMMENDATIONS FOR THE BIG CYPRESS AREA OF CRITICAL STATE CONCERN TO THE STATE OF FLORIDA ADMINISTRATION COMMISSION.
Florida State Dept. of Administration, Tallahassee. Div. of State Planning.
For primary bibliographic entry see Field 5G.
W78-05654

HAWAII COASTAL ZONE MANAGEMENT PROGRAM: TECHNICAL SUPPLEMENT 1. HAWAIIAN COASTAL WATER ECOSYSTEMS: AN ELEMENT PAPER FOR THE HAWAII COASTAL ZONE MANAGEMENT STUDY.
Hawaii Univ., Honolulu.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 336, Price codes: A03 in paper copy, A01 in microfiche. Prepared for National Oceanographic and Atmospheric Administration, Office of Coastal Zone, June 1975, 80 p, 8 tab, 6 fig. Margos, J. E. (editor).

Descriptors: *Coasts, *Ecosystems, *Boundaries(Surfaces), *Hawaii, *Land use, *Management, *Environmental control, Earth-water interfaces, Planning, Environmental effects, Watersheds(Basins), *Coastal zone management.

The general characteristics of the fresh or marine water ecosystems of Hawaii's coastal zone are described. Each of the 25 types of coastal water ecosystems can be placed in inland, shoreline, or offshore categories. The distribution, status, and importance of human derived impacts on each ecosystem type are described. These stresses are used as the criteria for defining the inland boundary for coastal water ecosystem management. The capability of natural ecosystems to perpetuate themselves is distinguished from man's influence on these systems which requires control or management. Since most of man's activities have been detrimental to, or have modified, the ecosystems, the activities must be controlled in order to preserve the functional integrity of the natural ecosystems. The principal sources of human impact on coastal water ecosystems originate on adjacent land areas within the watersheds which drain toward the coast. Hawaii's drainage basins are principally coastal. Thus, most land areas may potentially support activities capable of modifying coastal water ecosystems. As a result, the coastal zone boundary in Hawaii should include all land areas in the islands. (Nessa-NC)
W78-05658

HAWAII COASTAL ZONE MANAGEMENT PROGRAM, TECHNICAL SUPPLEMENT 2. MANAGEMENT OF HAWAII'S COASTAL ZONE FOR WATER QUALITY OBJECTIVES,
Hawaii Univ., Honolulu.
P. H. McGauhey, and L. S. Lau.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 337, Price codes: A04 in paper copy, A01 in microfiche. Prepared for National Oceanographic and Atmospheric Administration, Office of Coastal Zone, August 1975, 47 p, 3 tab, 6 fig.

Descriptors: *Coasts, *Water quality, *Hawaii, *Land use, *Management, Institutions, Environmental effects, Regulation, Boundaries(Surfaces), Economic impact, Water quality control, Water pollution, Waste water disposal, *Waste water management, *Coastal zone management.

An overview of wastewater management as related to the quality of Hawaii's coastal waters is presented. It is intended to be indicative rather than exhaustive. It is intended for planners and interested lay readers. It examines concepts for establishing an inland boundary of the coastal zone, and reflects some of the results of studies made during the course of the 'Quality of Coastal Waters' project. The major coastal features influencing coastal zone management and coastal water quality consideration are described, as are the existing water quality criteria and institutional arrangements. Economic and biological reasons for protecting the coastal water quality are identified. A rational basis for establishing the landward limits of the coastal zone is developed based both on the need to plan and regulate land use planning and regulation will most effectively protect the coastal water quality. The nature of typical waste generating activities are examined. Parameters indicating changes in coastal water quality are identified. Situations affecting coastal water quality are classified and explained according to whether they are manageable or poorly defined. (Nessa-NC)
W78-05659

HAWAII COASTAL ZONE MANAGEMENT PROGRAM, TECHNICAL SUPPLEMENT 4. BEACHES: A COMPONENT OF THE COASTAL ZONE,
Hawaii Inst. of Geophysics, Honolulu.
R. Moberly.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 339, Price codes: A03 in paper copy, A01 in microfiche. Prepared for National Oceanographic and Atmospheric Administration, Office of Coastal Zone August 1975, 36 p, 8 fig.

Descriptors: *Coasts, *Beaches, *Land use, *Management, *Hawaii, Geomorphology, Beach erosion, Littoral drift, Recreation, Seashores, Tidal effects, Access routes, Conservation, Shore protection, *Coastal zone management, Buffers, Sand extraction, Multiple use.

The study describes the beaches along the Hawaiian coasts, examines the benefits of beaches to man, explains the natural processes in which the beach is involved, and reviews the existing literature on beaches. This information is used to evaluate the compatibility of various beach uses, including access, buffer, recreation, and material extraction. These uses are evaluated for conflicts both within the beach system and outside the beach system. Reasonable remedies for each conflict are presented. The use of the beach for access is generally compatible with al other uses. Beaches used for land-sea access should remain in that use. Use of the beach as a buffer conflicts with materials extraction only if sand is removed faster than the ocean replenishes it. The beach protects many valuable coastal properties. Additional research is needed to identify the places where use as a buffer is the beach's highest and best use. Recreation uses frequently conflict with each other and with non-recreation uses; specialized beaches are recommended. Materials extraction conflicts with many uses. A combined envionmental economic, and quality evaluation of alternate sources of sand for construction and for beach restoration is recommended. (Nessa-NC)
W78-05660

HAWAII COASTAL ZONE MANAGEMENT PROGRAM: INUNDATIONS AND FORCES CAUSED BY TSUNAMIS FOR THE STATE OF HAWAII, OBSERVATIONS AND STATISTICAL PREDICTIONS. TECHNICAL SUPPLEMENT NO. 5,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 2L.
W78-05661

HAWAII COASTAL ZONE MANAGEMENT PROGRAM: ENHANCEMENT OF COASTAL ZONE RECREATIONAL OPPORTUNITIES: A DESCRIPTION OF PRESENT COASTAL RECREATIONAL USAGE, CONSTRAINTS, DATA AND RESEARCH POSSIBILITIES IN THE STATE OF HAWAII. TECHNICAL SUPPLEMENT NO. 6,
Hawaii Univ., Honolulu. Dept. of Geography.
For primary bibliographic entry see Field 6B.
W78-05662

7. RESOURCES DATA

7A. Network Design

EVALUATION OF THE NATIONAL ENVIRONMENTAL SPECIMEN BANK SURVEY,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-05617

RAINFALL NETWORK SYSTEMS ANALYSIS: THE OPTIMAL ESTIMATION OF TOTAL AREAL STORM DEPTH,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W78-05669

7B. Data Acquisition

ELECTROMAGNETIC WATER CURRENT METER WITH SYNTHETIC DIRECTION FIELD,
V. J. Cushing.
U.S. Patent No. 4,050,301, 9 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 962, No 4, p 1481, September 27, 1977.

Descriptors: *Patents, *Currents(Water), Ocean currents, *Current meters, Measurement, Flow measurement, Magnetic studies, Electromagnetic water current meters, Signal generation.

An electromagnetic water current meter includes a transducer driving a signal processor for deriving signals representative of orthogonal flow components of velocity in a known coordinate system, even though the transducer is not fixed relative to the known coordinate system. To effect this, means are provided for generating an artificial field having a predetermined direction relative to the known coordinate system. Sensing means, integral with the transducer, sense orthogonal components of the field. Since the sensing means is integral with the transducer, these components are sensed relative to the unknown coordinate system in which the transducer is oriented. Signal processing means then responds to both the flow signals in the unknown coordinate system to produce flow related signals in the known coordinate system. (Sinha-OEIS)
W78-05234

ANALYSIS OF THE SEASONAL STREAMFLOW VARIATION FOR THE PRIMARY UNREGULATED WATER COURSES IN SOUTH DAKOTA,
South Dakota State Univ., Brookings. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-05356

ANNUAL REPORT ON THE DEVELOPMENT OF SENSORS AND TECHNIQUES FOR IN SITU WATER QUALITY MONITORING,
Pittsburgh Univ., PA. Dept. of Petroleum Engineering.
For primary bibliographic entry see Field 5A.
W78-05362

OPTIMAL SAMPLING AND ANALYSIS USING TWO VARIABLES AND MODELED CROSS-COVARIANCE FUNCTIONS,
North Dakota Univ., Grand Forks, Dept. of Aviation.
For primary bibliographic entry see Field 2B.
W78-05378

AIR-TRUTH LIDAR POLARIZATION STUDIES OF OROGRAPHIC CLOUDS,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 2B.
W78-05382

AUTORUN ANALYSIS OF HYDROLOGIC TIME SERIES,
Technical Univ. of Istanbul (Turkey). Dept. of Hydraulic and Water Power.
For primary bibliographic entry see Field 2E.
W78-05386

SEASONAL COLOR-INFRARED PHOTOGRAPHS FOR MAPPING INLAND WETLANDS ON U.S. GEOLOGICAL SURVEY 7.5-MINUTE QUADRANGLES,
Geological Survey, Reston, VA. Water Resources Div.; and Geological Survey, Reston, VA. Topographic Div.
V. Carter, and W. R. Stewart.
In: Proceedings of the Fifth Color Aerial Photography Workshop, held in Sioux Falls, South Dakota, August 19-21, 1975: American Society of Photogrammetry, p 143-161, 1975. 7 fig, 18 ref.

Descriptors: *Wetlands, *Mapping, *Aerial photography, *Infrared radiation, *Classification, Remote sensing, Vegetation, Marshes, Swamps, Forests, Water levels, Analytical techniques, Florida, Minnesota, North Carolina, Virginia, Seasonal analysis.

The U.S. Geological Survey has initiated a research project on inland wetland mapping and is experimenting with new compilation methods and map products on three 7.5-minute quadrangles in Florida, Virginia/North Carolina, and Minnesota. Sample products will be evaluated by selected users. Maps are being prepared using existing color infrared (IR) photographs of different scales as overlays on a variety of map bases. Three classification systems are being tested for use in wetland map preparation. Seasonal color IR photographs provide information useful for the separation of vegetative communities. High-water, leaves-off photographs provide the best boundary information in wooded (deciduous) wetlands, facilitating the separation of wetland and forest. Growing-season photographs are necessary to identify and delineate vegetated flats and deep water marshes. (Woodard-USGS)
W78-05424

A STUDY OF MICROWAVE EMISSION PROPERTIES OF SEA ICE - AIDJEX 1972,
Aerojet ElectroSystems Co., Azusa, CA.; and Department of the Environment, Ottawa (Ontario); and Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 2C.
W78-05425

APPLICATION OF THERMAL IMAGERY AND AERIAL PHOTOGRAPHY TO HYDROLOGIC STUDIES OF KARST TERRANE IN MISSOURI,
Geological Survey, Rolla, MO. Water Resources Div.; and Missouri Dept. of Natural Resources, Rolla. Div. of Geology and Land Survey.
For primary bibliographic entry see Field 5G.
W78-05441

A STUDY OF HAWAIIAN WARM RAIN SHOWERS BASED ON AIRCRAFT OBSERVATION,
Hawaii Univ., Hilo. Cloud Physics Observatory.
For primary bibliographic entry see Field 2B.
W78-05582

7C. Evaluation, Processing and Publication

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. VOLUME XVIII. HAZARDS, DATA MANAGEMENT.
National Oceanic and Atmospheric Administration, Boulder, CO. Outer Continental Shelf Environmental Assessment Program.
For primary bibliographic entry see Field 6G.
W78-05223

GENERAL PURPOSE COMPUTER-AIDED ANALYSIS AND DESIGN OF TAINTER GATES; VOLUME II, PROCEDURAL MANUAL,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering: and Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 8C.
W78-05361

FLOOD PLAIN INFORMATION: MILL CREEK, RIPLEY, WEST VIRGINIA, AND VICINITY.
Army Engineer District, Huntington, WV.
For primary bibliographic entry see Field 4A.
W78-05409

FLOOD PLAIN INFORMATION: OHIO RIVER, POPE AND HARDIN COUNTIES, ILLINOIS.
Army Engineer District, Louisville, KY.
For primary bibliographic entry see Field 4A.
W78-05410

FLOOD PLAIN INFORMATION: OHIO RIVER AND MASSAC CREEK, CITY OF METROPOLIS AND MASSAC COUNTY, ILLINOIS.
Army Engineer District, Louisville, KY.
For primary bibliographic entry see Field 4A.
W78-05411

FLOOD PLAIN INFORMATION: EMBARRAS RIVER AND TRIBUTARIES, CHARLESTON, ILLINOIS.
Army Engineer District, Louisville, KY.
For primary bibliographic entry see Field 4A.
W78-05412

FLOOD PLAIN INFORMATION: SUSSEX COUNTY, VIRGINIA, NOTTOWAY RIVER, VIRGINIA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-05413

FLOOD PLAIN INFORMATION: YELLOWSTONE RIVER, LIVINGSTON, MONTANA.
Army Engineer District, NE.
For primary bibliographic entry see Field 4A.
W78-05414

FLOOD PLAIN INFORMATION: GREAT FALLS, MONTANA, VOLUME II, MISSOURI RIVER.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-05415

FLOOD PLAIN INFORMATION: BEAVERHEAD RIVER, DILLON, MONTANA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-05416

FLOOD HAZARD ANALYSES REPORT: HOCKING RIVER WITH RUSH CREEK, PLEASANT RUN, BLUE VALLEY, BALDWIN RUN, FETTERS RUN, EWING RUN AND TARHE RUN, FAIRFIELD COUNTY, OHIO.
Soil Conservation Service, Columbus, OH.
For primary bibliographic entry see Field 4A.
W78-05417

UNITED STATES GEOLOGICAL SURVEY YEARBOOK, FISCAL YEAR 1977.
Geological Survey, Reston, VA.
For primary bibliographic entry see Field 9D.
W78-05419

SEASONAL COLOR-INFRARED PHOTOGRAPHS FOR MAPPING INLAND WETLANDS ON U.S. GEOLOGICAL SURVEY 7.5-MINUTE QUADRANGLES,
Geological Survey, Reston, VA. Water Resources Div.; and Geological Survey, Reston, VA. Topographic Div.
For primary bibliographic entry see Field 7B.
W78-05424

AVAILABILITY OF GROUND WATER IN SEMINOLE COUNTY AND VICINITY, FLORIDA,
Geological Survey, Orlando, FL. Water Resources Div.
C. H. Tibbals.
Water-Resources Investigations 76-97 (open-file map), 1977. 15 p, 4 sheets, 15 fig, 17 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Groundwater availability, *Water yield, *Water quality, *Florida, Saline water intrusion, Saline water-freshwater interfaces, Chemical analysis, Water wells, Water levels, Groundwater recharge, Groundwater movement, Transmissivity, Potentiometric level, Projections, Seminole County(Fla).

The Floridan aquifer is the most important source of water supply in Seminole County, Fla. Virtually all public and domestic water supplies, industrial supplies, and most of the water used for irrigations are derived from wells that tap the Floridan. In many parts of Seminole County, the Floridan aquifer contains salty water. Since 1965, groundwater use has increased from about 13 mgd to about 34 mgd in 1975 with most of the increase due to increased pumping for public supply. It is estimated that by 1990, ground-water demand will be about 53 mgd and that this demand can be met if wells are located in areas where the thickness of the freshwater section of the aquifer is greatest. Since the 1950's ground-water levels have declined only a few feet and most of the decline is due to deficient rainfall. Ground-water quality has deteriorated only in areas of transition from fresh to salty water. Aquifer transmissivity ranges from about 59,000 sq ft to as low as about 2,000 sq ft. Estimated average annual recharge in Seminole County is 73 mgd. (Woodard-USGS)
W78-05426

DRAINAGE AREAS FOR JEFFERSON COUNTY, ALABAMA,
Geological Survey, Montgomery, AL. Water Resources Div.
J. C. Scott.
Alabama Geological Survey, University, Alabama, Atlas Series 11, 1977. 55 p.

Descriptors: *Maps, *Drainage areas, *Alabama, Water quality, Sampling, Sites, Jefferson County(Ala).

These maps (scale 1:24,000) provide drainage areas for stream basins in Jefferson County, Alabama. The 27 topographic maps show measured drainage areas, in square miles, of the basins contributing to runoff at selected sites along most of the streams. The drainage areas were determined by the U.S. Geological Survey in cooperation with the Geological Survey of Alabama, City of Birmingham and Jefferson County Commission. Sites for which significant stream-discharge data and surface-water quality data are available also are shown on the maps. (Woodard-USGS)
W78-05427

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1977--VOLUME 1. CENTRAL AND NORTHERN LOUISIANA.
Geological Survey, Baton Rouge, LA. Water Resources Div.
Water-Data Report LA-77-1, December 1977. 405 p, 9 fig.

Descriptors: *Louisiana, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Central and northern Louisiana.

Water resources data for the 1977 water year for Louisiana consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report, in three volumes, contains discharge records for 72 gaging stations; stage records for 66 of these gaging stations; stage only for 30 gaging stations; contents for 1 reservoir; stage only for 10 lakes; water quality for 148 stations (27 of these at gaging stations); 215 areal stations, 10 lakes, and 174 wells; and water levels for 696 observation wells. Also included are 199 crest-stage partial-record stations and flood-profile partial-record stations. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Louisiana. (Woodard-USGS)
W78-05428

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1977--VOLUME 2. SOUTHERN LOUISIANA.
Geological Survey, Baton Rouge, LA. Water Resources Div.
Water-Data Report LA-77-2, December 1977. 393 p, 13 fig.

Descriptors: *Louisiana, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Southern Louisiana.

Water resources data for the 1977 water year for Louisiana consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report, in three volumes, contains discharge records for 72 gaging stations; stage records for 66 of these gaging stations; stage only for 30 gaging stations; contents for 1 reservoir; stage only for 10 lakes; water quality for 148 stations (27 of these at gaging stations); 215 areal stations, 10 lakes, and 174 wells; and water levels for 696 observation wells. Also included are 199 crest-stage partial-record stations and flood-profile partial-record stations. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. Records for a few pertinent stations in bordering States are also included. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Louisiana. (Woodard-USGS)
W78-05429

WATER RESOURCES DATA FOR LOUISIANA, WATER YEAR 1977--VOLUME 3. COASTAL LOUISIANA,
Geological Survey, Baton Rouge, LA. Water Resources Div.
Water-Data Report LA-77-3, December 1977. 578 p, 7 fig.

Descriptors: *Louisiana, *Hydrologic data, *Surface water, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, Coastal Louisiana.

Water resources data for the 1977 water year for Louisiana consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report, in three volumes, contains discharge records for 72 gaging stations; stage records for 66 of these gaging stations; stage only for 30 gaging stations; contents for 1 reservoir; stage only for 10 lakes; water quality for 148 stations (27 of these at gaging stations); 215 areal stations, 10 lakes, and 174 wells; and water levels for 696 observation wells. Also included are 199 crest-stage partial-record stations and flood-profile partial-record stations. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. Records for a few pertinent sta-

tions in bordering States are also included in this report. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Louisiana. (Woodard-USGS)
W78-05430

SURFACE WATER SUPPLY OF THE UNITED STATES, 1966-70--PART 16. HAWAII AND OTHER PACIFIC AREAS.
Geological Survey, Reston, VA. Water Resources Div.
Available from the Branch of Distribution USGS, 1200 S. Eads St. Arlington, VA 22202, Price $5.85. Water-Supply Paper 2137, 1977. 750 p, 1 fig.

Descriptors: *Hawaii, *Surface waters, *Basic data collections, *Streamflow, *Lakes, Gaging stations, Flow rates, Average flow, Low flow, Peak discharge, Drainage area, Sites, Crest-stage gages, Reservoir storage, *Pacific Ocean islands, *American Samoa, *Guam, *Trust Territory of Pacific Islands.

This volume of surface water data for Hawaii and other Pacific areas is one of a series of 37 reports presenting records of stage, discharge, and content of streams, lakes, and reservoirs in the United States during the 1966-70 water years. The tables of data include a description of the gaging station, and daily, monthly, and yearly discharges of the stream. The description of the station gives the location, drainage area, records available, type and history of gage, average discharge, extremes of discharge, and general remarks. For most gaging stations on lakes and reservoirs, a description of the station and a monthly summary table of stage and contents are given. Data for partial-record stations include measurements at low-flow partial-record stations and annual maximum stage and discharge at crest-stage stations. (Woodard-USGS)
W78-05431

SUMMARY GROUND-WATER RESOURCES OF LANCASTER COUNTY, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-05432

GROUND-WATER LEVELS IN THE UNITED STATES, 1974. SOUTHEASTERN STATES.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-05433

GROUND-WATER LEVELS IN THE UNITED STATES, 1971-74. NORTHWESTERN STATES.
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-05434

GROUND-WATER RESOURCES OF CAMBODIA,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-05435

EVALUATION OF A POTENTIAL WELL FIELD NEAR CHURCH ROCK AS A WATER SUPPLY FOR GALLUP, NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-05436

RECONNAISSANCE OF GROUND-WATER RESOURCES IN THE MOUNTAIN HOME PLATEAU AREA, SOUTHWEST IDAHO,
Geological Survey, Boise, ID. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-05438

EVALUATION OF DATA FOR PONDS, LAKES AND RESERVOIRS IN MASSACHUSETTS,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 5A.
W78-05483

DEVELOPMENT OF A SYSTEM FOR CONDUCTING INTERLABORATORY TESTS FOR WATER QUALITY AND EFFLUENT MEASUREMENTS,
FMC Corp., San Jose, CA. Advanced Products Div.
For primary bibliographic entry see Field 5A.
W78-05534

THE STATUS OF THE EPA LABORATORY AUTOMATION PROJECT,
Environmental Monitoring and Support Lab., Cincinnati, OH. Physical and Chemical Methods Branch.
For primary bibliographic entry see Field 5G.
W78-05547

A MULTIDIMENSIONAL ANALYSIS OF THE RESULTS OF THE FRENCH 1971 SURFACE WATER QUALITY NETWORK CONTROL IN THE RIVER BASIN 'SEINE-NORMANDIE',
Ecole Nationale Superieure des Mines de Paris, Fontainebleau (France). Center for Geological Information.
For primary bibliographic entry see Field 5A.
W78-05581

CATALOG OF UNITED STATES CONTRIBUTIONS TO THE INTERNATIONAL HYDROLOGICAL DECADE 1965-1974.
National Committee for the International Hydrological Decade, Washington, DC.
For primary bibliographic entry see Field 2A.
W78-05590

EVALUATION OF THE NATIONAL ENVIRONMENTAL SPECIMEN BANK SURVEY,
National Bureau of Standards, Washington, DC. Analytical Chemistry Div.
For primary bibliographic entry see Field 5A.
W78-05617

DATA MANAGEMENT.
Environmental Research Labs., Boulder, CO.
In: Environmental Assessment of the Alaskan Continental Shelf. Principal Investigators' Reports for the Year Ending March 1977, Vol 18. Hazards, Data Management, p 319-498, March 1977.

Descriptors: *Alaska, *Baseline studies, *Data collections, *Data processing, Resources development, Water resources, Water pollution, Environmental effects, Hazards, Data storage and retrieval, *Outer Continental Shelf, *Petroleum development, Environmental conditions, Environmental hazards.

This section of volume 18, of the annual reports of principal investigators, contains brief indicative reports on the management of data pertinent to the baseline studies of the environmental assessment of the Alaskan Continental Shelf. The projects are identified as: Alaska OCS Program Coordination; R/V ACONA and Marine Logistics Support; Data File Index/Alaska MEA Program; Data Management/Alaska MEA Program; Bibliographic Support to Principal Investigators; Administrative Support for NODC/OCSEAP Representative and Alaskan Data Processing; Maintenance of Alaskan OCSEAP Surface Marine and Coastal Station Data File; Alaskan Data Processing Facility; and finally, A Geographic Based Information Management System for Permafrost in the Beaufort and Chukchi Seas. (See also W78-05223) (Sinha-OEIS)
W78-05651

FLOOD PLAIN INFORMATION: SALT CREEK, KICKAPOO CREEK, BRAINARD BRANCH, AND SALT SPRING BRANCH, LOGAN COUNTY, ILLINOIS.
Army Engineer District, Chicago, IL.
For primary bibliographic entry see Field 4A.
W78-05663

FLOOD PLAIN INFORMATION: MUSKINGHAM DRAW, ODESSA, TEXAS.
Army Engineer District, Fort Worth, TX.
For primary bibliographic entry see Field 4A.
W78-05664

FLOOD PLAIN INFORMATION: LITTLE KANAWHA RIVER, GLENVILLE, WEST VIRGINIA.
Army Engineer District, Huntington, WV.
For primary bibliographic entry see Field 4A.
W78-05665

FLOOD PLAIN INFORMATION: APPOMATTOX RIVER, CHESTERFIELD COUNTY - PETERSBURG, VIRGINIA.
Army Engineer District, Norfolk, VA.
For primary bibliographic entry see Field 4A.
W78-05666

SPECIAL FLOOD HAZARD INFORMATION REPORT: SOUTH PLATTE RIVER, VOLUME 1, WELD COUNTY, COLORADO.
Army Engineer District, Omaha, NB.
For primary bibliographic entry see Field 4A.
W78-05667

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, MCKEAN COUNTY, PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-05668

WATER QUALITY DATA STORAGE AND RETRIEVAL,
Environmental Health Lab. Kelly AFB, TX.
For primary bibliographic entry see Field 5A.
W78-05676

MODIFICATIONS OF ORNL'S COMPUTER PROGRAMS MSF-21 AND VTE-21 FOR THE EVALUATION AND RAPID OPTIMIZATION OF MULTISTAGE FLASH AND VERTICAL TUBE EVAPORATORS,
Oak Ridge National Lab., TN.
For primary bibliographic entry see Field 3A.
W78-05692

8. ENGINEERING WORKS

8B. Hydraulics

FLOATING WAVE BARRIER,
W. W. Bowley.
U.S. Patent No. 4,048,802, 11 p, 10 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 962, No 3, p 994, September 20, 1977.

Descriptors: *Patents, *Shore protection, *Breakwaters, *Coastal structures, Ocean waves, Waves(Water).

The floating wave barrier comprises at least one vessel having a top, walls and a bottom which, when placed in water, has the bottom submerged. The vessel or vessels, when placed in water, contain a gas and water. When several vessels are employed, they are connected with at least one flexible line or rigid connection and the top vessel is connected to an anchor on the sea bottom so that when the barrier is placed in water, the vessels are positioned at different vertical levels, with the top member being at or near the surface of the water. The remaining vessels are submerged but near the water surface so that they are located within the top portion of the wave where the major portion of the wave energy is encountered. When placed in water, the vessels are fixed to prevent substantial movement in the horizontal direction but are free to oscillate around its axis of pitch. The barriers are arranged parallel to the shore being protected at varying distances from the shore so that a given portion of the wave contacts more than one barrier prior to reaching the shore. (Sinha - OEIS)
W78-05228

WAVE FORCES ON SUBMERGED PIPELINES-A REVIEW WITH DESIGN AIDS,
Naval Construction Battalion Center, Port Hueneme, CA. Civil Engineering Lab.
D. A. Davis, and J. B. Ciani.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A028 620, Price codes: A04 in paper copy, A01 in microfiche. Technical Report R 844, July 1976. 57 p, 3 tab, 5 fig, 103 ref, 1 append. YF53.534.001.01.022.

Descriptors: *Pipelines, *Design data, *Wave(Water), Design, Hydrodynamics, Drag, Reviews, Publications, Equations, Testing, Graphical analysis, *Wave forces, *Ocean structures, *Submerged pipelines, Lift, Inertia.

The literature on the subject of wave forces on pipelines were reviewed. Interim design procedures, which include force equations incorporating inertia, drag, and lift components, were presented. Also presented were design aids for determining appropriate values of force coefficients. Three classes of pipeline problems were addressed: (1) pipelines remote from the seafloor, (2) pipelines in contact with the seafloor, and (3) pipelines near enough to the seafloor to be influenced by the boundary effects. It was recommended that these design procedures and aids be used until more data are available. Recommendations for future tests also were ade. (Adams-ISWS)
W78-05364

LOCALISED DESTRATIFICATION OF LARGE RESERVOIRS TO CONTROL DISCHARGE TEMPERATURES,
Victoria State Rivers and Water Supply Commission, Melbourne (Australia).
F. L. Burns.
Progress in Water Technology, Vol. 9, No. 1, p 53-63, 1977. 7 fig, 7 ref.

Descriptors: *Destratification, *Reservoirs, *Mixing, *Australia, Model studies, Hydraulic models, On-site investigations, Temperature, Water temperature, Dissolved oxygen, Jets, Aeration, Water quality, Rivers, Lakes, Dams, Limnology, Pre-impoundment, *Dartmouth Dam(Australia).

Temperature stratification occurs in many Victorian reservoirs in summer, resulting in water temperatures of up to 24C in the upper layers and down to 9C in the lower layers. For reservoirs having outlets only in this cold water region, the temperatures of summer releases to the river, therefore, may be well below normal summer river temperatures. This may have ecological effects on the river unless provision is made for breaking up the stratification or installing higher outlets. This paper described an investigation involving hydraulic model studies, using salt solutions to reproduce stratification and supported by full-scale field tests, to develop a destratification installation for he 180 m deep, 4,000,000 Ml capacity Dartmouth dam at present under construction on the Mitta Mitta river in Victoria. A model scale relationship was developed for artificial aeration, and, using this together with the Froude model relationship for water jets, an effective system was developed for producing local destratification in the vicinity of the outlets at Dartmouth. The model results indicated that a combined system of aeration and high-energy water jets will produce substantial increases in the temperature of water releases from the 60 m deep outlet. They also indicated that large outflows from the outlet will assist in this destratification action. (Sims-ISWS)
W78-05370

HYDRODYNAMICS OF BUBBLE PLUMES AND OXYGEN ABSORPTION IN STRATIFIED IMPOUNDMENTS,
College of Petroleum and Minerals, Dharan (Saudi Arabia). Dept. of Civil Engineering.
F. Rayyan, and R. E. Speece.
Progress in Water Technology, Vol. 9, No. 1, p 129-142, 1977. 11 fig, 3 tab, 10 ref.

Descriptors: *Reservoirs, *Georgia, *Dissolved oxygen, *Bubbles, *Model studies, Mathematical models, Laboratory tests, On-site investigations, Stratification, Thermal stratification, Fisheries, Stream fisheries, Trout, Hypolimnion, Oxygen, Absorption, Lakes, Rivers, *Clark Hill Reservoir(Augusta Ga), Bubble plumes.

Deep impoundments seasonally stratify. The penstock intake normally withdraws colder water from the hypolimnion. The downstream region, therefore, is classified as a trout fishery with six mg/l of dissolved oxygen (DO) specified by the water quality regulatory agencies. Algal growth in the surface waters and subsequent decay in the hypolimnion often deplete the DO within the hypolimnion by September each season. Consequently, tailrace DO diminishes as the stratification season progresses. It was determined that an unconfined oxygen bubble plume, rising freely through the hypolimnion, is a simple and effective oxygen absorption system for in-place hypolimnion oxygenation. This paper was directed toward the development of equations which describe the hydrodynamic behavior was calibrated initially using a very well controlled laboratory system. The water column stratification was achieved by very carefully adding successive layers of water at the desired temperature to the tank. Thermistors at 5 desired levels were suspended from an automatic traversing bridge which continuously traversed the bubble plume with the output recorded on punched tape. The predicted and observed results agreed within a maximum error of 10%. This agreement was deemed sufficiently close to subsequently use the model to design a full-scale hypolimnion oxygenation system for Clark Hill Reservoir near Augusta, Georgia. (Sims-ISWS)
W78-05371

PERTURBATION SOLUTION OF SPATIALLY VARIED FLOW IN OPEN CHANNELS,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
M. A. Gill.
Journal of Hydraulic Research, Vol 15, No 4, p 337-350, 1977. 7 fig, 2 tab, 7 ref, 2 append.

Descriptors: *Open channel flow, *Analytical techniques, *Subcritical flow, *Model studies, *Hydraulics, Steady flow, Flow resistance, Gradually varied flow, Froude number, Darcy-Weisbach equation, Regime, Equations, *Spatially varied flow, Perturbation solution, Mixed flow regime.

Approximate algebraic solutions were developed using the method of perturbation for spatially varied flow in open channels. The predictions from algebraic solutions are sufficiently accurate for subcritical flows in the range of y sub u = 0.5 to 1.1 where y sub u is the dimensionless depth at the upstream end. Algebraic results also were obtained for mixed flow regime. In the supercritical subregime of the mixed regime flow, the predictions are as accurate as the earlier numerical results given by Li. Analytical results also were produced taking hydraulic friction into account Experimental results were presented in support of the analytical equations for subcritical regime. The fact that hydraulic friction is increased appreciably in spatially varied flows as noted in some earlier studies was confirmed. (Singh-ISWS)
W78-05389

TRANSVERSE MIXING IN MEANDERING CHANNELS WITH VARYING BOTTOM TOPOGRAPHY,
Canada Centre for Inland Waters, Burlington (Ontario). Hydraulics Research Div.
For primary bibliographic entry see Field 5B.
W78-05390

STRATIFICATION AND OPEN CHANNEL FLOW,
Vanderbilt Univ., Nashville. TN. Dept. of Environmental Engineering and Policy Management.
R. H. French.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No HY1, Proceedings Paper 13458, p 21-31, January 1978. 9 fig, 2 tab, 5 ref, 2 append. NSF GI34932.

Descriptors: *Open channel flow, *Stratified flow, *Laboratory tests, *Theoretical analysis, Stratification, Density stratification, Roughness(Hydraulic), Flow resistance, Flow, Hydraulic models, Mathematical models, Mathematical studies, Analysis, Velocity, Profiles, Hydraulics, Open channels.

The effect of density stratification on the vertical velocity profile in turbulent open channel flow was examined. Using the Monin-Obukov length scale and Prandtl mixing length theory, equations reflective of the effect of stratification were derived, and the theory was extended to estimate values of the bottom boundary friction factor. Laboratory data were used to confirm the basic hypotheses. The results indicated that density stratification can modify significantly the shape of the vertical velocity profile and the value of the friction factor. (Humphreys-ISWS)
W78-05566

TRANSVERSE BED SLOPES IN CURVED ALLUVIAL STREAMS,
Karlsruhe Univ. (West Germany). Inst. fuer Hydromechanik.
C. Zimmermann, and J. F. Kennedy.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY1, Proceedings Paper 13482, p 33-48, January 1978. 5 fig, 1 tab, 23 ref, 2 append.

Descriptors: *Sedimentation, *Slopes, *Beds, *Streams, Open channel flow, Rivers, Sedimentation rates, Open channels, Hydraulics, Curves, Equations, *Secondary flow, Bed forms, Channel geometry, Bed particles.

Forty-nine experiments were conducted in three different constant radius, erodible bed, curved flumes using two different sediments to investigate the relationship between channel geometry, flow and sediment properties, and bed topography. An analytcial model based on moment equilibrium of the flow and force equilibrium of

the bed particles was used to develop and equation for the mean radial bed slope in terms of the friction factor, flow depth and velocity, channel radius, and particle densimetric Froude number. The relation was found to be in good agreement with reported experimental data and with bed topography measured by Hooke in a sinuous channel. (Lee-ISWS)
W78-05567

EFFECT OF CHANNEL MEANDERS ON FLOOD STAGE IN VALLEY,
Saskatchewan Univ., Saskatoon. Dept. of Civil Engineering.
C. D. Smith.
Journal of the Hydraulics Division, American Society of Civil Engineering, Vol. 104, No. HY1, Proceedings Paper 13497, p 49-58, January 1978. 8 fig, 3 tab, 3 ref, 2 append.

Descriptors: *Flood stages, *Meanders, *Channels, *Valleys, Open channel flow, Open channels, Hydraulics, Effects, Mathematical models, Equations, *Meandering streams, Overbank flow.

Results of this study indicated that for a meandering channel in a valley there is an interaction between the channel flow and valley flow. The nature of the interaction varies with stage in that channel flow remains dominant when the overbank flow is relatively shallow, but may become insignificant when the overbank flow is deep. Once the valley flow becomes dominant, the presence of the meandering chennel can produce greater stages than would occur if the channel were absent. The tests showed that the method recommended for straight channels with irreglar cross sections applies with good accuracy, but that it would be not totally erroneous to apply this method to a meandering channel in a valley. Although not tested, there is little doubt that the effects noted for a sinusoidal channel would be even more pronounced for a channel with a convoluted meander pattern. (Lee-ISWS)
W78-05568

TEMPERATURE AND MISSOURI RIVER STAGES NEAR OMAHA,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-05569

THEORETICAL ESTIMATIONS OF FLOOD ROUTING PARAMETERS,
Northeastern Univ., Boston, MA. Dept. of Civil Engineers.
A. D. Koussis.
Journal of the Hydraulics Division, American Society of Civil Engineers, Technical Note, Vol. 104, No. HY1, p 109-115, January 1978. 3 fig, 1 tab, 4 ref, 1 append.

Descriptors: *Flood routing, *Open channel flow, *Model studies, *Hydrographs, Floods, Hydraulics, Analytical techniques, Theoretical analysis, Discharge(Water), Flood waves, Open channels, Flow characteristics, Rating curves, Flood stages, Mathematical models, Model calibration, Kalinin-Miljukov method, Flood routing parameters.

Theoretical expressions for flood routing parameters were derived and modified to apply to the case of floods, based on the fact that the basic equations of the approximate methods lead to a convection-diffusion equation. The reliability of these expressions was checked by comparing theoretically estimated parameter values with the optimal ones obtained from flood records. In addition, an actual flood was routed through a short reach of the Rhine river using theoretically estimated parameters. The computed hydrographs were found to be in satisfactory agreement with the field observations. These results indicated that estimates derived from the foregoing expressions are sufficiently accurate to predict performance of preliminary channel designs. The expressions were derived assuming single-valued rating curves. Therefore, rapidly rising floods resulting in a noticeable difference between steady flow profiles and flood profiles have to be treated by more sophisticated methods that take into account the existence of loop-shaped rating curves. Dealing with significant lateral inflows (backwater effects) requires the application of the full governing equations. (Humphreys-ISWS)
W78-05572

HIGHWAYS IN THE RIVER ENVIRONMENT--HYDRAULIC AND ENVIRONMENTAL DESIGN CONSIDERATIONS, BASIC COURSE, INSTRUCTOR'S LESSON PLANS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
E. V. Richardson, S. Karaki, K. Mahmood, D. B. Simons, and M. A. Stevens.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 089, Price codes: A07 in paper copy, A01 in microfiche. Report No. FHWA-NHI-76-N004, August 1975. 120 p, 6 tab, 2 append. DOT-FH-11-8101.

Descriptors: Publications, *Open channel flow, *Sediment transport, *Bank protection, *Environmental effects, *Road construction, *Bridge construction, Embankments, Geomorphology, Hydraulic engineering, Highways, Training, Education, Engineering education, *Short courses, Causeways, Instructional materials.

Through a coordinated effort between the Federal Highway Administration and Colorado State University, a course was developed to provide training in the practical application of the concepts of open channel flow, fluvial geomorphology, and river mechanics for the planning, location, design, construction, maintenance and operation of highways and to enable the participants to apply these concepts to environmental problems associated with highway crossings and encroachments. This two-week course was oriented to graduate engineers who have had training in basic hydraulics. There are outlines for each of the thirty-four lessons for the course. A lesson may consist of only a lecture, or it may have a lecture, problems, and discussion session. Each lesson is a unit by itself with specific objectives. (Adams-ISWS)
W78-05585

A BAYESIAN APPROACH TO MULTIVARIATE HYDROLOGIC SYNTHESIS,
Massachusetts Inst. of Tech., Cambridge Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
J. B. Valdes, I. Rodriguez-Iturbe, and G. J. Vicens.
Available from the National Technical Information Service Springfield, VA 22161 as PB-261 575, Price codes: A07 in paper copy, A01 in microfiche. Report No. 201, June 1975. 127 p, 7 fig, 4 tab, 45 ref, 3 append. GK-416443X.

Descriptors: *Synthetic hydrology, *Markov processes, Analytical techniques, *Methodology, Risks, Regression analysis, Entropy, Hydrology, Model studies, *Bayesian approach, *Synthetic generation, Augmented data, Multivariate model.

A Bayesian multivariate autoregressive model for the synthetic generation of hydrologic traces was presented. The model explicitly accounts for the uncertainty existing in the estimation of the parameters of the model due to the finite size of historic sample in addition to the natural uncertainty in the hydrologic variables. The model was applied for the synthetic generation of three rivers in related basins, and the synthetic sample moments were compared with those of the historic records. Traditional and Bayesian models for data augmentation were discussed. Both types of models were applied to two very different rivers and their results were discussed. Current methods of model comparison were presented, and the need for newer criteria for the selection of stochastic models was discussed. The use of the entropy function, as defined in information theory, was explored, and several simulation runs were made to evaluate further this criteria. (Singh-ISWS)
W78-05586

HYDROLOGICAL FIELD INVESTIGATIONS FOR DESIGNING HYDROELECTRIC POWER-PLANTS,
For primary bibliographic entry see Field 8C.
W78-05593

EVALUATION OF FLOOD RISK FACTORS IN THE DESIGN OF HIGHWAY STREAM CROSSINGS. VOL III. FINITE ELEMENT MODEL FOR BRIDGE BACKWATER COMPUTATION,
Water Resources Engineers, Springfield, VA.
M. T. Tseng.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 960, Price codes: A09 in paper copy, A01 in microfiche. Report FHWA-RD-75-53, April 1975. 20 fig, 10 tab, 27 ref, 1 append.

Descriptors: *Mississippi, *Flow profiles, *Finite element analysis, *Numerical analysis, Continuity equation, Equations, Momentum equation, Bridge design, Hydraulics, Backwater, Flood flow, Computer models, *Risks, *Galerkin process, *Tallahalla Creek(Miss).

A mathematical model describing the steady, two-dimensional subcritical flow in wide, heavily vegetated flood plains of bridge waterways was developed using the finite element method of numerical analysis. The basic fluid equations comprising the model consist of the phenomenologic motion equations and the continuity equation, which are solved simultaneously by numerical methods to yield the spatial distribution of water surface elevations and velocities within the flow region for prescribing boundary conditions. The model simulates flow characteristics of arbitrary geometry. Hydraulic computations for various highway stream crossing orientations can be performed by the model. The model also simulates flow overtopping roadway embankments and performs hydraulic computations for a series of bridges across a stream valley without requiring prior assumption of the flow distribution for each bridge opening. The model was tested for two example problems: (1) a field site near Laurel, Mississippi, and (2) hydraulic flume data. In both examples good agreement between the model and the observed data was demonstrated. The other volumes of this study are: I. Experimental Determination of Channel Resistance for Large Sclae Roughness; II. Analysis of Bridge Backwater Experiments; IV. Economic Risk Analysis for Design of Bridge Waterways; and V. Data Report for Spur Dike Experiment. (See also W78-00699 and W76-10452) (Lardner-ISWS)
W78-05596

MATHEMATICAL MODELING OF SHORELINE EVOLUTION,
Tetra Tech, Inc., Pasadena, CA.
For primary bibliographic entry see Field 2L.
W78-05626

HAWAII COASTAL ZONE MANAGEMENT PROGRAM: INUNDATIONS AND FORCES CAUSED BY TSUNAMIS FOR THE STATE OF HAWAII, OBSERVATIONS AND STATISTICAL PREDICTIONS. TECHNICAL SUPPLEMENT NO. 5,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 2L.

W78-05661

8C. Hydraulic Machinery

SYSTEM FOR GENERATING POWER FROM WAVE MOTIONS OF THE SEA,
Insituform (Pipes and Structures) Ltd., (England). (Assignee).
E. Wood.
U.S. Patent No. 4,048,512, 12 p, 16 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 962, No 2 p 875, September 13, 1977.

Descriptors: *Patents, *Waves(Water), Ocean waves, Energy, Energy transfer, Energy conversion, Electric power production, Coastal structures.

A system for generating power from wave motions of the sea suggests a prime mover essentially floated on the sea but which has freedom only to rock about a defined axis, the principle being that the energy is derived from this rocking motion. The prime mover has been referred to as a 'duck' for the bobbing motion it executes. The invention provides a power generating system for the generation of energy from the wave motions of the sea and which is buoyantly supported by the sea in use comprising spine elements defining a spine on which ducks are rockably mounted. The system further includes tension cables pressing the spine elements towards each other to define the spine and energy conversion means for converting the rocking motions of the ducks in to a form which can be transmitted from the system. (Sinha - OEIS)
W78-05226

PROCESS AND DEVICE FOR HARNESSING WAVE ENERGY,
M. G. Tornabene.
U.S. Patent No. 4,048,801, 6 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 962, No 3, p 994, September 20, 1977.

Descriptors: *Patents, *Waves(Water), Energy conversion, Energy transfer, Engineering structures, Floating.

Spherical float elements are mounted on levers which are each mounted for reciprocation along elongated axes substantially vertical to the sea bottom with interconnected drive shafts for mutually contributing to a common drive. They are arranged relative to one another and relative to a direction of wave movement so that energy in the form of water pressure waves above and below the water surface are deflected from the forward float elements to the rearward elements to impel against the rearward elements together with the impelling of the normal waves or residual waves also impelling against each of forward and rearward waves, and the process of arranging the spherical float elements harnesses the deflected energy. (Sinha - OEIS)
W78-05227

APPARATUS FOR EXTRACTING WATER FROM THE ATMOSPHERE,
Firma Technico Development and Financing S.A., Fribourg (Switzerland). (Assignee).
W. Mehnert.
U.S. Patent No. 4,050,262, 8 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 962, No 4, p 1467, September 27, 1977.

Descriptors: *Patents, *Meteoric water, Atmosphere, Water vapor, Heat pumps, Distillation, Condensation, Equipment, Dehumidifiers, Portable.

A portable apparatus is provided for the extraction of water from the atmosphere. A heat pump driven by means of a prime mover or by hand, cooperates with one or two chamber systems through a valve. In the instance where one chamber is used, the chamber is connected to the heat extraction side of the heat pump. Where two chambers are used these chambers are alternately connected through a multi-way valve to the heat extraction side of the heat pump. The heat pump may operate by freezing, as well as by condensation, whereby the chamber systems generally are connected to the low pressure side of the heat pump. Each chamber system is provided with a suction fan or with a compressor. In a simple manner an apparatus is provided which sucks in the air of its environment to expand and cool the air whereby the latter releases its humidity at the strongly cooled surface of the vaporizer plates being cooled by the heat pump. The operation is such that depending on an operating characteristic in the evaporation chamber, a switch-over takes place from evaporation to liquification and vice versa. Where two chambers are employed an alternating switch-over between vaporization and liquification is performed. The output will depend on the prevailing humidity in the atmosphere. (Sinha-OEIS)
W78-05233

MULTIPLE-COMPLETION GEOTHERMAL ENERGY PRODUCTION SYSTEMS,
A. T. van Huisen.
U.S. Patent No. 4,051,667, 9 p, 6 fig, 1 tab, 7 ref; Official Gazette of the United States Patent Office, Vol 963, No 1, p 48, October 4, 1977.

Descriptors: *Patents, *Geothermal studies, *Geophysics, *Borehole geophysics, Heat flow, Convection, Thermal properties, Heat exchangers, Steam, Thermal powerplants.

A system for the mining of geothermal energy is described in which a number of geothermal wells radiate from a single surface site into a subsurface geothermal reservoir. The wells can be drilled by conventional slant drilling techniques and each may contain a closed end heat exchanger which receives water and generates steam. Some of the heat exchangers are places vertically and others are implanted horizontally. By alternating production of the wells in a programmed cyclical manner, convective movement of the hydrothermal fluid will occur within the geothermal zone. The generated steam is collected in a reservoir at the surface site and utilized to generate electricity. The condensate from the turbine can be recycled to the wells. (Sinha - OEIS)
W78-05240

GENERAL PURPOSE COMPUTER-AIDED ANALYSIS AND DESIGN OF TAINTER GATES; VOLUME II, PROCEDURAL MANUAL,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering: and Army Engineer Waterways Experiment Station, Vicksburg, MS.
L. Z. Emkin.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 938, Price codes: A12 in paper copy, A01 in microfiche. Contract Report K-76-1, August 1976. 255 p, 12 fig, 14 tab, 11 ref, 9 append. DACW39-76-M-0869,DACW39-76-M-2230.

Descriptors: *Radial gates, *Structural analysis, *Computer programs, *Loads(Forces), *Structural members, Hydraulic structures, Design, Gates, Structural design, Stress, Gate design, STRUDL.

A step-by-step procedure was presented for analyzing and designing tainter gate hydraulic structures by a general purpose, structural analysis, and design computer system. The ICES STRUDL II computer program that has all the necessary characteristics to perform the analysis and design. The method considers the effects of the hoisting cables, side seal friction, trunnion pin friction, and sidesway constraint limit. The STRUDL approach described herein is arranged for maximum utility of the approach in a design office environment. The use of the FASTDRAW/2 interactive graphics system also was described in step-by-step detail. FASTDRAW/2 proves to be useful for displaying three-dimensional views of the tainter gate structure geometry for final check purposes but is not as useful for tainter gate geometry creation. (Adams-ISWS)
W78-05361

HYDROLOGICAL FIELD INVESTIGATIONS FOR DESIGNING HYDROELECTRIC POWER-PLANTS,
Ya. L. Gotlib, I. A. Kuz'min, F. F. Razzorenov, and Sokol'nikov.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 729, Price codes: A14 in paper copy, A01 in microfiche. Publication No. TT 74-52003 Amerind Publishing Co. Pvt. Ltd, New Delhi (India). 1976. 302 p. Translated from Naturnye Gidrologicheskie Issledovaniya Pri Proektirovanii GES, 1971.

Descriptors: *Hydroelectric plants, *Hydrologic aspects, *On-site investigations, *Hydraulics, *Publications, Channel flow, Sedimentation, Reservoir storage, Water temperature, Tailwater, River flow, Rivers, Discharge(Water), Measurement, Evaluation, Analysis, Analytical techniques, Model studies, Ice cover, Diversion, Velocity, Operations, Flow, Meanders, Design, Sediment transport, Design data, Deposition(Sediments), Reservoirs, Ice, Thermal properties, Ice jams, Construction, Backwater, Floods, Foreign research, *USSR.

This book deals with the problems of full-scale hydrological field investigations made in the course of designing, construction, and operation of hydroelectric power stations. Utilizing the experience gained from the full-scale field investigations made during the design of a large number of hydroelectric stations, an attempt has been made to generalize the results of these investigations and to show what the content of hydraulics, channel flow, and ice and thermal regimes of flow investigations must be and what their requirements are. Since a large number of examples were cited during the course of description and since many of the problems given were based on the material derived from field investigations, this work, to a certain extent, throws light upon the flow regimes under natural conditions, during the process of construction and during operation of the hydroelectric stations at the upper and lower reaches of the installations. (Humphreys-ISWS)
W78-05593

WAVE-PUMP APPARATUS,
O. H. Andrews.
U.S. Patent No. 4,040,257, 6 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 961, No 2, p 529, August 9, 1977.

Descriptors: *Patents, *Waves(Water), *Currents(Water), *Water circulation, Pumping, Coastal structures, Water conveyances, Equipment.

This invention relates to a means for pumping water from large bodies of water and depositing it in a remote area, or more particularly, relates to a wave-pump apparatus positioned along coastal waters having substantially continuous wave action so that the force of the waves creates a moving force within the apparatus for continuous water flow. The invention is designed to capture each incoming wave of water within its structure so that the force generated by each succeeding wave moves the continuous flow of water through the apparatus and then discharges it at a predetermined point. The apparatus comprises a housing having a funnel-lide mouth entrance which receives the initial wave. The wave is constricted as it is channeled through a flap-valve gate, allowing the water to enter into a throat portion. As the

wave passes through the throat portion, the flap-valve closess-preventing back-flow before the next wave reaches the valve gate. From this point, the continuous rush of ingressing water into the throat causes the previously captured water to be forced through the throat and into an adjacent water tower defining a conduit. (Sinha - OEIS)
W78-05597

DREDGING SYSTEM AND METHODS OF DREDGING,
L. N. Smith.
U.S. Patent No. 4,052,801, 10 p, 11 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 963, No 2, p 422, October 11, 1977.

Descriptors: *Patents, *Dredging, *Excavation, *Underwater, Channel improvement, Aquatic soils, Earth handling equipment, Disc cutterhead.

This invention provides an underwater dredging apparatus for difficult-to-excavate materials wherein a rotary disc cutter is connected to a dredge pump in a manner which will permit it to be power turned end-for-end in 90 degree steps separated by a lowering step so that it may be employed to cut or excavate material on a continuous basis. The apparatus and method for excavating material such as marl from an underwater basin employes a disc-type cutterhead provided as the front wall of a material collecting compartment which connects with a slurry removing suction pipe. The cutterhead is movable 180 degrees about a longitudinal axis transverse to the axis of disc rotation and the disc incorporates pump means which 'supercharge' the suction pump normally carried on the dredging vessel. (Sinha-OEIS)
W78-05603

APPARATUS FOR REMOVING PARTICLES FROM WATER FOR SPRINKLERS AND THE LIKE,
For primary bibliographic entry see Field 3F.
W78-05610

8D. Soil Mechanics

LIQUEFACTION POTENTIAL OF DAMS AND FOUNDATIONS; REPORT 2, LABORATORY STANDARD PENETRATION TESTS ON PLATTE RIVER SAND AND STANDARD CONCRETE SAND,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
W. A. Bieganousky, and W. F. Marcuson, III.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A039 828, Price codes: A05 in paper copy, A01 in microfiche. Research Report S-76-2, February 1977. 87 p, 23 fig, 10 tab, 6 plate, 13 ref, 2 append.

Descriptors: Dams, *Dam foundations, *Failures, *Laboratory tests, Penetration, *Sands, Bulk density, Soil tests, Curves, Overburden, Soil pressure, Statistical methods, Correlation analysis, Uniformity coefficient, Testing, Equipment, Consolidation, Sieve analysis, Submergence, Colorado, *Platte River(Colo), *Liquefaction(Soils), *Standard penetration tests, Relative density, In situ tests, Standard concrete sand.

The Standard Penetration Test (SPT) was examined critically with respect to its ability to estimate relative density in situ. Six test specimens, 4 ft in diameter by 6 ft high, were constructed using Platte River sand and Standard Concrete sand. SPT's were performed, using field drilling equipment, on specimens under 3 overburden pressures and constructed to 3 relative densities. The results were presented as a family of curves correlating relative density with SPT N-values at the 3 overburden pressures. This research is an extension of a previous test series on Reid Bedford Model sand and Ottawa sand. The results from tests of the four sands were compared, and a statistical analysis was presented which produced an empirical equation relating relative density to overburden pressure, SPT N-value, and coefficient of uniformity. Comparisons also were made between this work and that of Gibbs and Holtz at the Bureau of Reclamation and Bazaraa at the University of Illinois. Conclusions based on both series of tests were presented. (Visocky-ISWS)
W78-05367

LIQUEFACTION POTENTIAL OF DAMS AND FOUNDATIONS REPORT 3: DEVELOPMENT OF AN ELASTIC-PLASTIC CONSTITUTIVE RELATIONSHIP FOR SATURATED SAND,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
G. Y. Baladi, and B. Rohani.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 192, Price codes: A04 in paper copy, A01 in microfiche. Research Report S-76-2, February 1977. 56 p, 14 fig, 1 tab, 13 ref, 1 append.

Descriptors: *Dam foundations, *Saturated soils, *Sands, Elasticity(Mechanical), Plasticity, Soil physical properties, Stress analysis, Strain, Pore pressure, Hysteresis, Hydrostatic pressure, Shear, Loads(Forces), *Liquefaction(Soils), *Constitutive relationship.

This report described the initial attempt at developing a three-dimensional constitutive relationship for saturated sand. An isotropic constitutive relationship was constructed, within the framework of the incremental theory of plasticity, that qualitatively simulates some of the features of the stress-strain-pore pressure response of saturated sand. It accounts for the hysteretic behavior of pressure-volumetric strain-softening behavior and does not predict progressive increase of pore pressure under low-amplitude (subyield) cyclic loading conditions. The behavior of the constitutive relationship under conventional undrained triaxial test condition was examined and correlated with experimental data for saturated Reid Bedford Model sand. A recommendation was made that the present constitutive relationship be extended to quantitatively simulate the basic features of the stress-strain-pore pressure response of saturated sand, including the strain-softening behavior and the progressive increase of pore pressure observed under cyclic loading conditions. (Visocky-ISWS)
W78-05368

DAM IN THE VILYUY HYDRAULIC POWER SYSTEM,
A. N. Demidov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 072, Price codes: A02 in paper copy, A01 in microfiche. Cold Regions Research and Engineering Laboratory Draft Translation 526, May 1976. 14 p, 2 fig. Translated from Trudy Gidroproekta, No. 34, p 64-77, 1973.

Descriptors: *Dams, *Rockfill dams, *Earth dams, *Cold weather construction, Cold regions, Subarctic, Construction, Dam construction, Design, Dam design, Structures, Hydraulic structures, Permafrost, *USSR.

The Vilyuy hydroengineering system is located on the Vilyuy River (Yakutskaya ASSR) in uninhabited taiga, far from railroads and ports. The climate in the region is decidedly continental, with a cold snowless winter and short hot summer. The mean annual air temperature is -8C. The temperature dips to -65C in the river valley; and during hot days of summer, the air is heated to +35C. The annual precipitation is only 290 mm. The lack of snow cover and negative mean annual air temperature are factors that result in the formation of heavy permafrost (200-300 m deep), with the exception of thawed soil beneath the river bed. The water regime of the river is characterized by extremely nonuniform runoff: 82% of the annual runoff occurs in the spring, 16% during the summer and autumn, and only 2% all winter. The spring high water discharge has reached 13,000 cum/s (1959), and the winter discharge has fallen to as low as 2 cum/s. The Vilyuy rock and earth-filled dam is 75 m high and is the highest of such dams of this type built in the USSR. The total volume of the dam is 5.1 million cubic meters. The design and construction techniques used for this dam were discussed. (Sims-ISWS)
W78-05589

8E. Rock Mechanics and Geology

DESIGN UNDER STOCHASTIC GROUNDWATER FLUCTUATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
I. Bogardi, and L. Duckstein.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY1, Proceedings Paper 13499, p 59-74, January 1978. 4 fig, 3 tab, 22 ref, 4 append.

Descriptors: *Aquifers, *Groundwater, *Concrete structures, *Stochastic processes, *Failure(Mechanics), Probability, Subsurface waters, Waterproofing, Economics, Foundations, Hydraulics, Hydrology, Time series analysis, Model studies, Submergence, Risks, Water quality, Chemical degradation, Mathematical models, *Hungary, *Danube River, *Budapest(Hungary), Bivariate analysis, Decision theory.

A foundation is to be protected against the harmful effects of sulfur groundwater, whose piezometric head fluctuates in a random manner. The stochastic process forms a partial duration series, where the jth event is defined by the maximum exceedance above the foundation floor, the duration and interarrival time until the (j +1)st event. To protect the structure against possible damage by high levels of groundwater with substantial sulfate concentration, it is possible to make four decisions, corresponding to waterproofing or using special sulfate resistant concrete or both, or providing no protection. The annual cost and expected loss associated with each of these four decisions were calculated with the help of explicit expressions. Sensitivity of the decision to sample, model, and economic uncertainty was analyzed as well as the possibility of using a Bayesian approach to account for sample uncertainty. (Visocky-ISWS)
W78-05570

EARTHQUAKE ACTIVITY AND GROUND SHAKING IN AND ALONG THE EASTERN GULF OF ALASKA,
Geological Survey, Menlo Park, CA. Office of Earthquake Studies.
For primary bibliographic entry see Field 2I..
W78-05638

FAULTING, INSTABILITY, EROSION, AND DEPOSITION OF SHELF SEDIMENTS, EASTERN GULF OF ALASKA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 2L.
W78-05639

SEISMIC AND VOLCANIC RISK STUDIES - WESTERN GULF OF ALASKA,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2L.
W78-05640

BEAUFORT SEACOAST PERMAFROST STUDIES,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W78-05642

BENTHOS-SEDIMENTARY SUBSTRATE INTERACTIONS,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W78-05643

SHALLOW FAULTING, BOTTOM INSTABILITY, AND MOVEMENT OF SEDIMENTS IN LOWER COOK INLET AND WESTERN GULF OF ALASKA,
Geological Survey, Menlo Park, CA.
For primary bibliographic entry see Field 2L.
W78-05644

SEISMICITY OF THE BEAUFORT SEA, BERING SEA AND GULF OF ALASKA,
National Geophysical and Solar Terrestrial Data Center, Boulder CO.
For primary bibliographic entry see Field 2L.
W78-05645

8F. Concrete

DESIGN UNDER STOCHASTIC GROUNDWATER FLUCTUATION,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 8E.
W78-05570

8G. Materials

PLASTIC ROTARY PUMP PROVIDES 20 YEARS OF SERVICE.
Industrial wastes, Vol. 24, No. 1, p 19, January/February, 1978.

Descriptors: *Chlorination, *Corrosion control, *Industrial wastes, *Metals, *Pumps, Construction materials, Plastics, Linings, Equipment, Design data, Waste water treatment.

A corrosion-resistant plastic rotary pump, manufactured by the Vanton Pump and Equipment Corp of Hillside, New Jersey, has been operating efficiently for more than 20 years at the S. K. Wellman Corp plant in Bedford, Ohio. The rotary pump injects chlorine into the corrosive waste water from the metal plating of earth handling equipment parts, brakes, and clutches. The neoprene flexible liners are the only parts of the pump requiring routine replacement, about 12 times within 20 years, because of exposure to wear and chlorine. The sectioned polyethylene body blocks are the only other parts exposed to chlorine and wastes during pump operation. The liquid is pressed between an oscillating, liner-covered shaft and the body blocks and forced toward the outlet by a squeegee action. Flanges located on the liners engage with the grooved endplate and mounting pedestal, compressing the liquid against the body block. The pump, which contains a self-priming mechanism, eliminates the need for stuffing boxes, packing glands, and mechanical shaft seals. (Lisk-FIRL)
W78-05305

THE SUCCESS OF REINFORCED PLASTICS FOR PROCESS PLANT IN CORROSIVE ENVIRONMENTS,
J. F. Burbridge.
Reinforced Plastics, Vol. 21, No. 12, p 387-391, December, 1977. 4 fig.

Descriptors: *Plastics, *Corrosion, *Chemical industry, *Food processing industry, *Oil industry, Construction materials, Metals, Pulp and paper industry, Sewage treatment, Aluminum, Stainless steel, Corrosion control, Industrial wastes.

The application of glass fiber-reinforced polyester resin in many industrial operations has proved that reinforced plastics are less susceptible to corrosion and more cost-effective than many metallic materials. A comparison of the corrosion resistance of metals and reinforced plastic to various chemicals showed that the reinforced bisphenol-A resin and the more expensive Hastelloy C were more resistant to chemical attack than carbon steel, stainless steel, and aluminum. The reinforced bisphenol-A resin also proved more resistant to chemical corrosion than other polyesters. The glass fiber-reinforced polyester resin has been effectively used for chemical storage tanks, reaction tanks, and pipelines in the chemical production industry. Ducts, scrubbers, and stacks constructed of plastic have been employed for corrosive gas handling operations; pipelines of reinforced resin have withstood years of use in waste water transport. Bisphenol resin liners have been applied to the high-temperature, acidic electrolytic refinement of copper and manganese and also in solvent extraction processes for copper, uranium, and rare earth elements. Polyester resins do not influence the taste of food processing products and have been applied to treatment facilities for the pulp and paper industry and storage facilities for the oil and chemical industries. (Lisk-FIRL)
W78-05338

WAVE FORCES ON SUBMERGED PIPELINES-A REVIEW WITH DESIGN AIDS,
Naval Construction Battalion Center, Port Hueneme, CA. Civil Engineering Lab.
For primary bibliographic entry see Field 8B.
W78-05364

LIQUEFACTION POTENTIAL OF DAMS AND FOUNDATIONS; REPORT 2, LABORATORY STANDARD PENETRATION TESTS ON PLATTE RIVER SAND AND STANDARD CONCRETE SAND,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
For primary bibliographic entry see Field 8D.
W78-05367

LIQUEFACTION POTENTIAL OF DAMS AND FOUNDATIONS REPORT 3: DEVELOPMENT OF AN ELASTIC-PLASTIC CONSTITUTIVE RELATIONSHIP FOR SATURATED SAND,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
For primary bibliographic entry see Field 8D.
W78-05368

EFFECT OF STEAM PURITY ON PERFORMANCE, RELIABILITY AND MAINTENANCE OF INDUSTRIAL STEAM TURBINES,
General Electric Co., Lynn, MA.
G. P. Wozney, A. Whitehead, and R. E. Sperry.
In: TAPPI Engineering Conference, Atlanta, Georgia, September 19-22, 1977, Preprinted Proceedings (TAPPI, Atlanta, Georgia), p 245-256. 11 fig, 8 illus, 3 tab.

Descriptors: *Steam turbines, *Steam, *Operation and maintenance, Turbines, Wastes, Reliability, *Corrosion, Water types, Equipment, Maintenance, Performance, Water pollution, Pulp and paper industry, Scaling, Training, Labor, Performance.

The impact of various contaminants on steam path efficiency and turbine capability is described and evaluated, and the effect of plugging and corrosive deposits on mechanical reliability, material performance, and turbine maintenance are discussed. The principal steam contaminants which adversely affect turbine operation are identified. The causes and mechanisms of vaporous and mechanical carryover are outlined and the contributions of desuperheating fluid contamination are examined. The effects of variant steam conditions and load changes are illustrated with several examples. The desirability of establishing a steam purity specification is discussed and a purity level is proposed for industrial steam turbines. Analytical methods for evaluating steam purity are reviewed. The importance of operator training, maintenance practices, and operational checks in maintaining steam purity is emphasized and suggestions for improvements in these areas are offered. (Witt-IPC)
W78-05476

DESIGN FOR CORROSION CONTROL OF POTABLE WATER DISTRIBUTION SYSTEMS,
Naval Civil Engineering Lab., Port Hueneme, CA.
F. M. Reinhart, and J. F. Jenkins.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A006 806, Price codes: A05 in paper copy, A01 in microfiche. Report No. AFWL-TR-73-218, January, 1975. 72 p, 4 tab, 27 ref. 63723F, Project 683M, Task 02.

Descriptors: *Potable water, *Distribution systems, *Corrosion control, Construction, Civil engineering, Domestic water, Design standards, Water supply, Conduits, Water storage, Protective coatings, Pipes, Cathodic protection, Plastic pipes, Metal pipes, Mains.

A survey of literature pertaining to corrosion problems and their control in domestic water and water distribution systems, especially for use in design of new construction at U.S. Air Force bases was conducted. Corrosion-related variables encountered with respect to source of water supply, storage tanks, mains, and distribution lines for both hot and cold water supplying domestic water at the bases are covered. Methods of reducing the corrosion of metals used in these systems are considered, by identifying potential causes for corrosion in the soil and other external envionments and in the domestic water itself. Many procedures to anticipate and control corrosion are presented, including the use of protective coatings, cathodic protection, and plastic composities as a substitute for metals. Problem areas such as galvanic corrosion, proper surface preparation, and techniques for application of protective coatings are also considered. Guidelines that combine economic considerations with practical corrosion control procedures and that will give the most effecient service life compatible with a projected time of use requirement are given. Specific applications are suggested for producing wells, treatment plants, water storage facilities, distribution facilities, and water service in buildings. (Wares-IPA)
W78-05624

DYNAMICS OF NEAR-SHORE ICE,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-05630

OFFSHORE PERMAFROST - DRILLING, BOUNDARY CONDITIONS, PROPERTIES, PROCESSES AND MODELS. DELINEATION OF MOST PROBABLE AREAS FOR SUBSEA PERMAFROST IN THE CHUKCHI SEA FROM EXISTING DATA. SUBSEA PERMAFROST: PROBING, THERMAL REGIME AND DATA ANALYSIS,
Alaska Univ., College. Geophysical Inst.
For primary bibliographic entry see Field 2C.
W78-05641

8I. Fisheries Engineering

HYDRODYNAMICS OF BUBBLE PLUMES AND OXYGEN ABSORPTION IN STRATIFIED IMPOUNDMENTS,
College of Petroleum and Minerals, Dharan (Saudi Arabia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-05371

ECOLOGICAL AND AESTHETIC IMPLICATIONS FOR THE MERRIMACK ESTUARY OF THE MERRIMACK BASIN WASTEWATER MANAGEMENT ALTERNATIVES,
Massachusetts Univ., Gloucester, Marine Station.
For primary bibliographic entry see Field 5C.
W78-05554

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

EXECUTIVE SUMMARY, DIRECTIONS IN U. S. WATER RESEARCH: 1978-1982.
Federal Coordinating Council for Science, Engineering and Technology, Washington, DC. Committee on Water Resources Research.
For primary bibliographic entry see Field 6B.
W78-05203

EVALUATION OF ALTERNATIVE PROCEDURES FOR REVIEW OF WATER RESOURCES RESEARCH PROPOSALS.
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 9D.
W78-05344

WATER RESOURCES RESEARCH IN PENNSYLVANIA.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 9D.
W78-05351

WATER RESOURCES RESEARCH IN NEBRASKA, FOURTH EDITION.
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 9D.
W78-05354

ANNUAL REPORT FISCAL YEAR 1976, DELAWARE WATER RESOURCES CENTER.
Delaware Univ., Newark.
For primary bibliographic entry see Field 9D.
W78-05355

9D. Grants, Contracts, and Research Act Allotments

EXECUTIVE SUMMARY, DIRECTIONS IN U. S. WATER RESEARCH: 1978-1982.
Federal Coordinating Council for Science, Engineering and Technology, Washington, DC. Committee on Water Resources Research.
For primary bibliographic entry see Field 6B.
W78-05203

EVALUATION OF ALTERNATIVE PROCEDURES FOR REVIEW OF WATER RESOURCES RESEARCH PROPOSALS.
Massachusetts Univ., Amherst. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 810, Price codes: A04 in paper copy, A01 in microfiche. Publication No. 59, Special Report, Sept. 1975. 59 p, 4 tab, 4 ref, 3 append. Workshop proceedings: New England Council of Water Center Directors and the Northeast Water Institute Directors, held in Durham, NH, June 18-19, 1975. OWRT A-999-MASS(12).

Descriptors: *Appropriation, *Grants, *Priorities, *Evaluation, Financing, Projects, Allotments, Value, Model studies, *Project funding.

The question of how, given limited funds, funding agencies should choose among project grant applications was discussed. The evaluation systems used by agencies such as OWRT, EPA, ARS, U.S. Geological Survey, National Sea Grant Program(NOAA), NSF, and Army Corps of Engineers were outlined. Evaluation techniques used by Water Resources Research Institute directors include peer review, internal (i.e., university facility) committees, external (i.e., practitioner or agency) committees, and rating systems. The results of a University of Massachusetts exercise in whi.h 12 mock proposals (in the form of OWRT Executive Summaries) were presented to 2 types of evaluators for priority ranking are discussed. The evaluation consisted of (1) 14 judgmental 'gut' reactors (practitioners from non-university settings, all experienced in water resources work), asked to evaluate on the basis of experience and intuition, and (2) 14 'programmed' reactors (institute directors) asked to evaluate using a standard pre-designed scale of criteria. The 'exercise' is described in detail in Appendix A. Results indicate that 'gut' reactors responded with extreme variability, and although only 5 out of 14 'practitioner' reactors had responded, there was an absence of any apparent agreement among or between either gut or programmed respondents. Individuals within both groups appeared to differ randomly in their reactions. It was concluded that water resources proposal evaluation processes are primitive and lacking in standards. A paper further analyzing the 'exercise' responses is presented in Appendix B, and the format for a more rigorous follow-up study is presented in Appendix C. (Seip-IPA)
W78-05344

TWELFTH ANNUAL REPORT, PROGRAM ACTIVITIES, FISCAL YEAR 1976, (MASSACHUSETTS WATER RESOURCES RESEARCH CENTER).
Massachusetts Univ., Amherst. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 002, Price codes: A06 in paper copy, A01 in microfiche. 1976. 107 p, 4 fig, 3 tab, 22 ref. OWRT A-999-MASS(13).

Descriptors: *Water Resources Research Act, *Research and development, Grants, *Projects, *Massachusetts, Education, Universities, Colleges, Training, *Water Resources Institute, *Project status report.

Status reports of 30 active projects (18 annual allotment, 6 matching grant, 4 title II, and 2 special projects), conducted at the Massachusetts Water Resources Research Center during Fiscal year 1976 are presented. The director's statement cites projects in several investigation categories, including water quality assessment and sampling, pollution prevention and control, planning, ecological impacts of land development, and technology transfer. A list of official publications is included. (Seip-IPA)
W78-05346

WATER RESOURCES RESEARCH IN PENNSYLVANIA.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 043, Price codes: A04 in paper copy, A01 in microfiche. Information Report No. 77, January, 1976, L. Mullenneaux and A. J. McDonnell, Eds. 60 p. OWRT A-023-PA(2).

Descriptors: *Abstracts, *Water resources, *Water resources development, *Pennsylvania, *Research and development, *Projects, Census, Investigations, Personnel scientific personnel, Universities, Colleges, Industries, Surveys, State government, *Research project inventory, Agencies.

A summary of a recent questionnaire survey of water resources research activities currently being conducted in Pennsylvania is presented. Included are abstracts of the activities of (1) universities and colleges, (2) state and municipal agencies, (3) federal agencies in Pennsylvania, and (4) private industries. An inventory of Pennsylvania water research projects and personnel, indices of investigators, keywords for abstracts, and keywords for investigators areas of interest are included. (Seip-IPA)
W78-05351

MINUTES - IOWA STATE WATER RESOURCES RESEARCH INSTITUTE ADVISORY BOARD AND COUNCIL TENTH ANNUAL MEETING.
Iowa State Water Resources Research Inst., Ames.
For primary bibliographic entry see Field 6B.
W78-05353

WATER RESOURCES RESEARCH IN NEBRASKA, FOURTH EDITION.
Nebraska Univ., Lincoln. Water Resources Research Inst.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 044, Price codes: A06 in paper copy, A01 in microfiche. NWRRI Publication No. 10, June, 1976. 95 p. OWRT A-999-NEB(18).

Descriptors: *Abstracts, *Water resources development, Water pollution, Water quality, Artificial recharge, Conservation, Ecology, Economics, Eutrophication, Evaporation, Transpiration, Fish, Wildlife, Geology, Soils, Groundwater, Hydrology, Irrigation, Model studies, Planning, Plant tissues, Vegetation, Rivers, River training, Social impact, Political aspects, Institutional constraints, Data collections, Waste water treatment, Water utilization, Efficiencies, *River engineering, Plants, Water use efficiency.

Abstracts of nearly 100 water resources studies currently being conducted in Nebraska are presented. Agency, author, and key word indices are given; projects are cross-referenced by key words. Major subdivisions of research areas include artificial recharge, conservation, ecology, economics, eutrophication, evapotranspiration, fish and wildlife, geology and soils, groundwater, hydrology, irrigation, modeling, planning, plants, river engineering, social-political-institutional aspects, water data, water quality and pollution, water and waste treatment, and water use efficiency. (Seip-IPA)
W78-05354

ANNUAL REPORT FISCAL YEAR 1976, DELAWARE WATER RESOURCES CENTER.
Delaware Univ., Newark.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 056, Price codes: A05 in paper copy, A01 in microfiche. August, 1976. 69 p, 12 tab. OWRT A-999-DEL(7).

Descriptors: *Delaware, *Water resources planning, *Water Resources Institute, Universities, Education, Colleges, Training, *Annual re-

port(Delaware), Fiscal Year 1976. Delaware Water Resources Council, Fiscal Statement, Public Law 88-379.

The twelfth Annual Report of the University of Delaware Water Resources Center for the year July 1, 1975 to June 30, 1976 (FY 1976) is presented. Section I contains the Director's Statement of current and anticipated water problems, research program emphases and results, and a review of accomplishments and activities. Section II contains examples of research findings and their actual or potential application to water resources problems. A progress report for each of ten annual allotment Program Projects comprises Section III. Accomplishments in the training of scientists in water resources are summarized in Section IV; research effort is combined with primary educational responsibilities under this program (P.L. 88-379). Publications and theses relating to Water Resources Research Program activities are listed in Section V. The fiscal information for each project in FY 1976 annual allotment program and for the operation of the Director's Office is contained in Section VI, and Section VII comprises a fiscal summary of the total annual allotment program (Seip-IPA)
W78-05355

UNITED STATES GEOLOGICAL SURVEY YEARBOOK, FISCAL YEAR 1977.
Geological Survey, Reston, VA.
For sale by Supt. of Documents, GPO Washington, D.C. 20402. 1978. 229 p, 52 tab.

Descriptors: *Reviews, *Annual, *Projects, *Data collections, *Natural resources, Water resources, Water quality, Energy, Mapping, Geological surveys, Volcanoes, Landslides, Indian reservations, Mineralogy, Land management, Oil industry, Programs, Administration, Cost allocation, Budgeting, *US Geological Survey.

This Yearbook summarizes the progress made by the United States Geological Survey during fiscal year 1977 in its mandated role--to identify the Nation's land, water, energy, and mineral resources; to classify Federally-owned mineral lands and water power sites; to regulate the exploration and development of energy and mineral resources on Federal and Indian lands; and to explore and appraise the petroleum potential of the National Petroleum Reserve in Alaska. As a report to Congress and the public, it falls logically into five parts: (1) The Year in Review: a look at the major issues and events which affected Survey programs, and some performance highlights; (2) Perspectives: a series of concise Earth-science essays which address national issues; (3) Missions, Organization, and Budget: a description of the Geological Survey's major duties and assignments and of the organizational and fiscal structures that support its missions; (4) A description of the activities and accomplishments of each of the nine operating Divisions and Offices; and (5) Statistical Tables: summary data which documents program trends, workloads, and significant 1977 accomplishments. (Woodard-USGS)
W78-05419

SUMMARY REPORT - INSTITUTE IMPROVEMENT WORKSHOP FOR DIRECTORS OF WATER RESOURCES RESEARCH INSTITUTES.
Iowa State Water Resources Research Inst., Ames.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 034, Price codes: A04 in paper copy, A01 in microfiche. Workshop held in Washington, DC., January 24-25, 1977. Report No. ISWRRI-89, July 1977, M.D. Dougat, Ed. 63 p, 1 tab, 10 ref, 5 append.

Descriptors: *Administration, *Management, *Water resources development, Programs, Project planning, Decision making, Evaluation, Analysis, Research, *Water Resources Research Institutes, *Program evaluation, Institute administration, Research planning.

Proceedings of an institute improvement workshop for the directors of state and territorial institutes are reported. Self-evaluation was emphasized in order to further the goal of achieving a more effective institute in each state and designated territory, one that is responsive to local, state, regional and national needs. University programs at each institute centering on research, training, and public service through technology transfer were reviewed. The following broad recommendations resulted from the workshop: (1) increase the emphasis on technology transfer, information dissemination, and public service activities; (2) strengthen the interface with state and federal agencies within each state, and with the basin commissions, interagency committees, and the federal Water Resources Council; (3) broaden institutes' ability to be more effective as multiple university entities in a state; (4) further the coordination of water resources research at the federal level by the federal OWRT organization; (5) develop an adequate institute/congressional interaction program; and (6) implement criteria for establishing adequate institute administration and management. Specific goals and implementation suggestions are included under each recommendation. (Seip-IPA)
W78-05479

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

VIRUSES IN WASTE, RENOVATED, AND OTHER WATERS, 1975 LITERATURE ABSTRACTS.
Environmental Monitoring and Support Lab. Office of Research and Development.
For primary bibliographic entry see Field 5D.
W78-05490

CATALOG OF UNITED STATES CONTRIBUTIONS TO THE INTERNATIONAL HYDROLOGICAL DECADE 1965-1974.
National Committee for the International Hydrological Decade, Washington, DC.
For primary bibliographic entry see Field 2A.
W78-05590

BIBLIOGRAPHY OF STATISTICAL AND METEOROLOGICAL METHODOLOGY IN WEATHER MODIFICATION,
Florida State Univ., Tallahassee. Dept. of Statistics.
For primary bibliographic entry see Field 3B.
W78-05591

HAZARDOUS MATERIALS WASTE DISPOSAL (A BIBLIOGRAPHY WITH ABSTRACTS).
National Technical Information Service, Springfield, VA.
For primary bibliographic entry see Field 5E.
W78-05675

10D. Specialized Information Center Services

EFFECTIVENESS OF TECHNOLOGY TRANSFER PROGRAMS,
Texas Univ. at Austin. Dept. of Civil Engineering.
L. R. Beard.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 140, Price codes: A04 in paper copy, A01 in microfiche. Technical Report No. OWRR 140, Sept. 1978. 42 p, 6 tab, 1 append. OWRT X 149 (No. 5266(1)

Descriptors: *Information exchange, Research and development, *Technology transfer, Information dissemination, Implementation techniques.

New concepts in technology transfer (specifically implementation of research result into engineering practice) and information dissemination are discussed. Criteria for effectiveness of technology transfer are that: (1) the procedure be implemented into practice, optimally to the stage of practice manuals; (2) the user understands new procedures; (3) research results are of sufficient benefit to warrant efforts of adoption; (4) sufficient data exist for procedure implementation; (5) procedures be acceptable to high-level technical reviewers. The usefulness of research is currently diminished because: (1) the market is frequently flooded with minimally valuable research reports (2) practitioners need results expressed in their vernacular (technical research language aggravates practitioners' problems of recognizing and applying useful research); (3) practitioners mistrust research results and are leery of using them; (4) research results have insufficient impact on practice to warrant implementation; (5) initial costs are high and time lag is long in implementation; and (6) some results are overly sophisticated for many applications, making the cost/benefit ratio high. Suggestions for improving the practical value of research include: (1) cooperative research; (2) short-term exchange of researchers and practitioners; (3) establishment of specialty research centers for screening new materials; (4) in-house research; and (5) frequent and open communication between researchers and users. Availability can be increased by (1) providing step-by-step procedures for application; (2) utilizing literature search aids; (3) increasing circulation of agency procedure manuals; and (4) conducting short courses in specific areas. (Seip-IPA)
W78-05486

10E. Translations

TRANSLATION OF REPORTS ON SPECIAL PROBLEMS OF WATER TECHNOLOGY, VOLUME 9 - ADSORPTION.
Karlsruhe Univ., (West Germany). Dept. of Water Chemistry.
For primary bibliographic entry see Field 05F.
W78-05544

10F. Preparation Of Reviews

FORECASTING THE COMPOSITION AND WEIGHT OF HOUSEHOLD SOLID WASTES USING INPUT-OUTPUT TECHNIQUES--AN EXECUTIVE SUMMARY,
Ebon Research Systems, Washington, DC.
For primary bibliographic entry see Field 05B.
W78-05551

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SELECTED WATER RESOURCES ABSTRACTS

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VOLUME 11, NUMBER 13
JULY 1, 1978

W78-05701 -- W78-06200
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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 13
JULY 1, 1978

W78-05701 -- W78-06200

Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
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Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS.
Ecosystems International, Inc., Gambrille, MD.
For primary bibliographic entry see Field 4D.
W78-05718

A STUDY OF APPLICATION OF REMOTE SENSING TO RIVER FORECASTING, VOLUME II.
IBM Federal Systems Div., Huntsville, AL.
For primary bibliographic entry see Field 4A.
W78-05719

THE ANATOMY OF THE MODELLING PROCESS,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. H. McCuen.
In: Mathematical Models for Environmental Problems. Proceedings of the International Conference, University of Southampton, England, Sept. 8-12, 1975. C.A. Brebbia (Ed.), Southampton University. John Wiley & Sons, N.Y., N.Y., p 401-412, 1976. 2 fig.

Descriptors: *Mathematical models, *Systems analysis, *Sensitivity, *Decision making, Environmental control, Planning, Optimization, Equations.

The role of mathematical modeling in the systems approach to problem-solving is examined. Since most environmental problems are highly complex and require multi-purpose solutions, models are needed in order to consider the dynamic nature of such problems, as well as the risks involved. In addition to predicting the response of a system, a model can be used to evaluate the relative importance of subsystem and external factors that can influence the output. Model verification can identify deficiencies in both model structure and the information required to calibrate and use the model. Examined first are the classification of models and modeling as an element of the systems approach. Then the mathematical foundations of sensitivity, so important to the modeling process, are discussed in detail. Considered are: the sensitivity equation; computational methods; parametric and component sensitivity; absolute and relative sensitivity; sensitivity and correlation; and multiple-effect sensitivity. The paper concludes with a discussion of sensitivity in model formulation and verification. Modeling is both an art and a science, and as such is valuable in improving decision-making capabilities and thus system operation. The techniques presented herein provide a means of obtaining the maximum possible information from observed data, thus furnishing a basis for formulating a rational representation of the system. (See also W78-05720) (Bell-Cornell)
W78-05726

RANDOM SEARCH OPTIMIZATION: STOPPING RULES,
Aalborg Universitetscenter (Denmark).
P. Thoft-Christensen.
In: Mathematical Models for Environmental Problems. Proceedings of the International Conference, University of Southampton, England, Sept. 8-12, 1975. C.A. Brebbia (Ed.), Southampton University. John Wiley & Sons, N.Y., N.Y., p 413-421, 1976. 7 ref.

Descriptors: *Random search, *Optimization, *Stopping rules, Environmental engineering, Criterion function, Global optimum, Multimodal functions, Nonlinear programming, Mathematical models, Systems analysis, Equations, Algorithms.

Nonlinear optimization has become more usable for engineers and scientists. The stopping rule or termination criterion is of major importance for the effectiveness of an iterative method. For multimodal functions where more than one optimum point exists, a good choice of termination criterion is essential. Unimodal problems can be successfully handled in most cases with nonlinear optimization techniques. But serious problems exist in dealing with multimodal functions. This paper considers stopping rules with reference to a recently presented very simple optimization strategy based on random search; the discussion is limited to unconstrained parameter optimization. To help solve the problem of choosing relevant and effective stopping rules, it is important to secure more experimental experience. More theoretical investigations of the combination of probability distributions and stopping rules are needed. (See also W78-05720) (Bell-Cornell)
W78-05727

A GENERAL CLASS OF STOCHASTIC MODELS FOR HYDROLOGIC SEQUENCES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
J. Ledolter.
Journal of Hydrology, Vol 36, No 3/4, p 309-325, February 1978. 3 fig, 3 tab, 16 ref, 1 append.

Descriptors: *Model studies, *Mathematical models, *Computer models, Hydrology, Stochastic processes, Markov processes, Time series analysis, Analytical techniques, Seasonal, Hydrologic data, Runoff, *Hydrologic sequences.

Stochastic models for hydrologic sequences were discussed. The class of autoregressive integrated moving average (ARIMA) models and the family of power transformations were introduced and illustrated on a set of streamflow data. ARIMA models and their seasonal extensions are a generalization of the Markovian models which are used frequently to describe the correlation structure of hydrologic sequences. The family of power transformations is a parametric class of transformations which includes the logarithmic transformation as a special case. (Sims-ISWS)
W78-05768

ANALYSIS OF HYDROLOGICAL RECESSION CURVES,
Commonwealth Scientific and Industrial Research Organization, Brisbane (Australia). Div. of Mathematics and Statistics.
For primary bibliographic entry see Field 2E.
W78-05769

A CRITERION OF EFFICIENCY FOR RAINFALL-RUNOFF MODELS,
University Coll., Galway (Ireland). Dept. of Engineering Hydrology.
M. Garrick, C. Cunnane, and J. E. Nash.
Journal of Hydrology, Vol 36, No 3/4, p 375-381, February 1978. 2 ref.

Descriptors: *Rainfall-runoff relationships, *Model studies, *Mathematical models, Evaluation, Precipitation(Atmospheric), Runoff, Rainfall, Streamflow, River forecasting, Rivers, Watersheds(Basins), Drainage, Flow, Hydrology.

Two criteria were proposed for expressing the efficiency of conceptual rainfall-discharge models. The first criterion assessed the model as a means of converting the input factors into discharge by comparison with a forecast based only on the seasonal regime of the river. The second criterion expressed the efficiency of the model under the assumption that it was to be used with an updating procedure to provide a forecast of discharge over a prescribed lead time. (Sims-ISWS)
W78-05770

EFFECT OF SOIL HEAT FLUX ON THE WATER BALANCE OF A SMALL CATCHMENT,
Waikato Univ., Hamilton (New Zealand). Dept. of Earth Sciences.
For primary bibliographic entry see Field 2G.
W78-05777

CHARACTERISTICS OF THE INTERRELATION OF SURFACE AND GROUND WATERS IN THE KARAKENGIR RIVER BASIN WITH A DISTURBED NATURAL REGIME,
For primary bibliographic entry see Field 2F.
W78-05794

ESTIMATES OF LOW FLOWS USING WATERSHED AND CLIMATIC PARAMETERS,
Stephen F. Austin State Univ., Nacogdoches, TX. School of Forestry.
For primary bibliographic entry see Field 2E.
W78-05944

GENERATING RAINFALL EXCESS BASED ON READILY DETERMINABLE SOIL AND LANDUSE CHARACTERISTICS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
E. A. Li, V. O. Shanholtz, D. N. Contractor, and J. C. Carr.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 6, p 1070-1078, November-December 1977. 8 fig, 3 tab, 22 ref. OWRT A-077-VA(1).

Descriptors: *Model studies, *Watersheds(Basins), *Runoff, *Virginia, *Hydrology, Analytical techniques, Hydrographs, Land use, Discharge(Water), Simulation analysis, Soil moisture, Demonstration watersheds, Precipitation excess, Drainage, Soil types, Soils, *Brunswick County(Va), *Rocky Run Branch watershed(Va), Hydrologic response units, Hydrologic models.

A procedure was designed to isolate such factors as soil type, soil depth, slope, and landuse to define the effect of heterogeneity on surface runoff. The drainage area was subdivided into hydrologic response units based on these factors or combinations thereof. A soil moisture model was used to simulate rainfall excess on each partial area, and the excess was routed to the watershed outlet assuming the kinematic wave approximation and using the finite element numerical technique to solve the governing flow equations. Discharge data were not available for each definable response unit, and therefore direct experimental verification of the technique was not possible. Comparisons between the total simulated and recorded hydrograph were made in an ungaged context. These results indicated the potential application to ungaged or gaged areas. The routing routine did not allow for reinfiltration and so caused difficulties in modeling low rainfall-low runoff events. The best simulations, as expected, were with major flood events. (Humphreys-ISWS)
W78-05945

SOME REMARKS ON THE USE OF DAILY RAINFALL MODELS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Land and Water Use; and Agricultural Univ., Wageningen (Netherlands). Dept. of Mathematics.
For primary bibliographic entry see Field 2B.
W78-06101

THE ANALYSIS OF MULTIVARIATE TIME SERIES APPLIED TO PROBLEMS IN HYDROLOGY,
International Inst. of Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2E.
W78-06102

SOLUTE DISTRIBUTION PROFILES COMPUTED WITH STEADY-STATE AND TRANSIENT WATER MOVEMENT MODELS,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-06110

STATISTICAL METHODS IN HYDROLOGY,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 7C.
W78-06125

A TWO DIMENSIONAL LAKE CIRCULATION MODEL USING THE METHODS OF FINITE ELEMENTS,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 2H.
W78-06200

2B. Precipitation

SPATIAL INTERPOLATION OF DAILY TOTALS OF RAINFALL,
Royal Netherlands Meteorological Inst., De Bilt.
S. Kruizinga, and G. J. Yperlaan.
Journal of Hydrology, Vol 36, No 1/2, p 65-73, January 1978. 5 fig, 1 tab, 4 ref.

Descriptors: *Rainfall, *Data collections, *Rain, Precipitation gages, Precipitation(Atmospheric), Meteorology, Meteorological data, Climatology, Foreign countries, Foreign research, *Daily rainfall, *Spatial interpolation, *The Netherlands, Interpolation techniques.

Some experiments concerning the spatial interpolation of daily totals of rainfall were reported. Several well-known techniques were evaluated in an experimental way, namely by using the given techniques for the estimation of the rainfall at a place where the rainfall also was measured. In each experiment, the same data set was used, so comparison of the performance of the different techniques was quite simple. The used techniques were all of the type of weighted average of surrounding stations (which type included also plane-fitting techniques but not spline fitting). The results of these experiments indicated that for the western part of The Netherlands, the choice of weights was not very critical and that opimization of weights was hardly necessary. This paper was a summary of a Research Report of the Royal Netherlands Mereorological Institute. (Roberts-ISWS)
W78-05766

THE SPEED AND DIRECTION OF MOVEMENT OF STORM RAINFALL PATTERNS WITH REFERENCE TO URBAN STORM SEWER DESIGN,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 5B.
W78-05776

STATISTICAL EVALUATION OF RAINFALL-SIMULATOR AND EROSION TESTING PROCEDURE,
Louisiana Dept. of Highways, Baton Rouge. Research and Development Section.
For primary bibliographic entry see Field 2J.
W78-05785

INVESTIGATION OF THE DYNAMICS OF SNOW-COVER MELTING FROM METEOROLOGICAL-SATELLITE DATA,
For primary bibliographic entry see Field 2C.
W78-05788

ADEQUACY OF HYDROLOGIC DATA FOR APPLICATION IN WEST VIRGINIA,
West Virginia Univ., Morgantown. Water Research Inst.
For primary bibliographic entry see Field 7C.
W78-05931

NUTRIENT CONTENT AND PRECIPITATION OVER IOWA,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W78-06020

HYDROGEN ION SPECIATION IN THE ACID PRECIPITATION OF THE NORTHEASTERN UNITED STATES,
Cornell Univ., Ithaca, NY. Section of Ecology and Systematics.
For primary bibliographic entry see Field 5A.
W78-06025

SOME REMARKS ON THE USE OF DAILY RAINFALL MODELS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Land and Water Use; and Agricultural Univ., Wageningen (Netherlands). Dept. of Mathematics.
T. A. Buishand.
Journal of Hydrology, Vol. 36, No. 3/4, p 295-308, February 1978. 3 fig, 6 tab, 8 ref.

Descriptors: *Rainfall, *Synthetic hydrology, *Daily hydrographs, Rainfall intensity, Rain, Rain gages, Raindrops, Markov processes, Wet seasons, Equations, *Daily rainfall models, Alternating renewal processes, Cumulative relative frequencies.

Features of daily rainfall processes were described using data from different sites of the world. The process of rainfall occurrence was modelled by an alternating renewal process or by a Markov chain. It was shown that rainfall amounts within a wet spell are often neither independent nor identically distributed. There are, however, features of the rainfall process which are hardly sensitive to the choice of the process for the occurrence of wet days or to some assumptions about the behavior of the rainfall amounts, for example, the distribution of 30-day totals and the distribution of monthly extremes. The rainfall data were provided by the Meteorological Institutes of Great Britain, India, Indonesia, and the Netherlands. (Roberts-ISWS)
W78-06101

INTERCEPTION BY PINUS PATULA IN RELATION TO RAINFALL PARAMETERS,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2I.
W78-06104

TRENDS OF SEDIMENT REMOVAL FROM ARID SCREE SLOPES UNDER SIMULATED RAINSTORM EXPERIMENTS,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W78-06108

THE COLLECTION OF PRECIPITATION FOR CHEMICAL ANALYSIS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 2K.
W78-06112

SEASONAL TRENDS OF NH4(+) AND NO3(-) NITROGEN ISOTOPE COMPOSITION IN RAIN COLLECTED AT JULICH, GERMANY,
Kerntorschungsanlage Juelich G.m.b.H. (West Germany). Inst. fuer Chemie.
For primary bibliographic entry see Field 5A.
W78-06113

FINAL REPORT TO THE NATIONAL SCIENCE FOUNDATION RESEARCH APPLIED DIRECTORATE WEATHER MODIFICATION ASSOCIATION,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W78-06130

2C. Snow, Ice, and Frost

INVESTIGATION OF THE DYNAMICS OF SNOW-COVER MELTING FROM METEOROLOGICAL-SATELLITE DATA,
Yu. V. Kurilova, P. A. Kolosov, L. K. Poplavskaya, and Yu. S. Sokolov.
Soviet Hydrology: Selected Papers, Vol. 15, No. 1, p 1-6, 1976. 3 fig, 2 tab, 3 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No. 237, p 22-31, 1976.

Descriptors: *Snow cover, *Melting, *Remote sensing, Satellites(Artificial), Data processing, On-site investigations, Spatial distributions, Analytical techniques, Methodology, Flood discharge, Foreign research, Ice, Hydrographs, Runoff, *USSR.

Various methodologica approaches to the study of the dynamics of snow cover melting from satellite data were analyzed. Snow cover melting was studied using the pictures obtained from the Meteor-10 satellite for March 1972. The orbit of this satellite crossed the eastern part of the European USSR, in particular the basins of the Don and Volga rivers. Information was received daily, and nearly cloud-free pictures of the underlying surface were obtained every 3-4 days. The dynamics of snow cover melting over the entire basin were determined from the change in the boundary of the zone of discontinuous snow cover and from changes in texture associated with melting patterns. The reliability of the snowmelt boundary, drawn from satellite data, was estimated by comparing it with the snow boundary on snow depth and water equivalent maps, constructed from conventional groundbased observations. This preliminary investigation showed that meteorological-satellite data can be used to determine the snow melting boundary and to estimate the proportion of melted snow in basins with areas exceeding 400 sq km. (Humphreys-ISWS)
W78-05788

ESTIMATION OF SNOW-COVER DYNAMICS FOR FORECASTS OF THE SPRING FLOOD IN THE GORNYY ALTAY FROM SATELLITE DATA,
N. V. Vostryakova, and A. M. Komlev.
Soviet Hydrology: Selected Papers, Vol. 15, No. 1, p 7-11, 1976. 4 fig, 2 tab, 15 ref. Translated from Transactions of the State Hydrologic Inst. (Trudy GGI), No. 237, p 32-40, 1976.

Descriptors: *Snow cover, *Spatial distribution, *Remote sensing, *Flood forecasting, Floods, Spring, Watersheds(Basins), Analytical techniques, Satellites(Artificial), Precipita-

tion(Atmospheric), Mountains, Snow, Foreign research, *USSR.

Systematic and detailed information on the state of the snow cover over large areas is required for analysis of the conditions of spring flood formation and its forecasting. Recent investigations in the Soviet Union and abroad showed the use of satellite information for this purpose to be promising. Reported were the first results of a study of snow cover dynamics in the Gornyy Altay from satellite data and an evaluation of the possibility of using them for spring flood forecasting. Snow cover cartograms of the Gornyy Altay were constructed from the features identified on the TV pictures for the period of April-November, when the seasonal variations in the height of the snow line are most distinct. Analysis of composite graphs showed that the variations in the height of the snow line obtained agree well with variations in meteorological conditions and, in particular, with the variations of the zero isotherm. Experimental interpretation of satellite pictures of the mountain regions of the Altay leads to the conclusion that further research in this direction is promising. (Humphreys-ISWS)
W78-05789

EMISSION CHARACTERISTICS OF MOIST STRATIFIED STRUCTURES IN THE VHF RANGE,
For primary bibliographic entry see Field 2G.
W78-05791

STUDY OF NEAR-INFRARED SNOW REFLECTANCE USING SKYLAB S192 MULTISPECTRAL SCANNER DATA,
Environmental Research and Technology, Inc., Concord.
J. C. Barnes, and C. J. Bowley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 504, Price codes: A04 in paper copy, A01 in microfiche. ERT Document No. 1474F, March 1977. 57 p, 19 fig, 1 tab, 9 ref. NOAA/NESS 635201.

Descriptors: *Remote sensing, *Snow cover, *Mapping, *Reflectance, Satellites(Artificial), Snowpacks, Snow, Data processing, Analytical techniques, Aerial photography, Mountains, Water resources, Infrared radiation, *Skylab data, S192 imagery.

Digital tape data (computer-compatible tapes) from the Skylab S192 Multispectral Scanner were analyzed to examine further the characteristics of snow reflectance in the near-infrared portion of the spectrum. The tapes used in the study were from four Skylab passes crossing mountainous terrain in the western United States, three in the winter from the Skylab-4 mission and one in the late spring from the Skylab-2 mission. In each case, the snow conditions were assessed through interpretation of the accompanying Skylab photography, snow reports, and meteorological data. The results of the investigation showed that the reflectance over a uniform snowpack is significantly lower in the near-infrared than in the visible or red-infrared portions of the spectrum. Overall, the refectances measured by the S192 Multispectral Scanner were in good agreement with snow reflectance measurement made from aircraft and in laboratory experiments. Because of the limited data sample, however, it was difficult to derive firm conclusions with regard to detecting in the spacecraft data the subtle differences that characterize different snow conditions in the laboratory experiments. Nevertheless, when the factors influencing the Skylab measurements were taken into consideration, the results substantiated the potential of using spacecraft near-infrared data to distinguish differing snow-cover conditions. Furthermore, the results of the analysis of one case also demonstrated the potential of using near-infrared data to distinguish automatically between cloud and snow. (Sims-ISWS)
W78-06120

ACOUSTIC EMISSION AND MECHANICAL PROPERTIES OF SNOW RELATED TO AVALANCHE RELEASE,
Montana State Univ., Bozeman.
R. L. Brown, T. E. Lang, and W. F. St. Lawrence.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-039 866, Price codes: A03 in paper copy, A01 in microfiche. Report 2-6000-694, March 1977. 23 p, 1 fig, 1 ref. ARO DAAG 29-76-G0037.

Descriptors: *Snow, *Avalanches, *Laboratory tests, *On-site investigations, Mechanical properties, Snow cover, Snowpacks, Slopes, Acoustics, Stability, Stress, Strength, *Snow properties, Acoustic emission, Snow slopes.

An evaluation was conducted of the physical and mechanical processes associated with snow avalanche initiation. Four separate tasks were involved in this effort: (1) a stress wave study to evaluate the response of snow to transient loads, (2) a slope stability investigation to determine the effectiveness of boundary conditions on slope stability, (3) a material constitutive representation to evaluate material properties for loads characteristically found in snow slopes, and (4) an acoustic emission study to investigate the process of slab release. Considerable progress was achieved in all portions of the project. An electromagnetic stress wave generator was constructed successfully and tested, and tests are now being carried out with this instrument. An equivalent linear viscoelastic model was formulated for snow for densities, temperature, and load conditions characteristic of alpine snow slopes. The acoustic emission field study is still gathering data, and a predictable pattern of acoustic emissions appears to be related to the process of fracture and avalanche initiation. The results of this one year project were reported in seven publications and symposium presentations. (Sims-ISWS)
W78-06129

PHOTOTACTIC AND THERMOTACTIC RESPONSES FACILITATING SURVIVAL OF CLOEON DIPTERUM (EPHEMEROPTERA) LARVAE UNDER WINTER ANOXIA,
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
For primary bibliographic entry see Field 5C.
W78-06162

2D. Evaporation and Transpiration

STUDY OF THE PHYSICAL CHARACTERISTICS OF THE ACTIVE HORIZON OF UNDRAINED BOGS (ISSLEDOVANIE FIZICHESKIKH KHARAKTERISTIK DEYATELNOGO GORIZONTA NEOSUSHENNYKH BOLOT),
For primary bibliographic entry see Field 2I.
W78-05760

COMPUTATION OF EVAPORATION FROM TALUS AND ROCKS,
V. V. Golubtsov.
Soviet Hydrology: Selected Papers, Vol 15, No 1, p 37-38, 1976. 1 tab, 9 ref. Translated from Transactions of the Kazakh Hydrometeorological Scientific Research Institute (Trudy KazNIGMI), No 48, p 26-29, 1975.

Descriptors: *Evaporation, *Water loss, *Talus, *Rocks, Analytical techniques, Forecasting, Foreign research, Equations, Estimating, Foreign countries, *USSR.

Large areas in mountain basins at elevations exceeding 2500-3000 m are occupied by talus and rocks. One of the characteristic features of talus and rock surfaces is their very low water-holding capacity, for which reason losses by evaporation are relatively small. The proposed method of computing the water content and evaporation from talus was verified on the basis of the published data. Observed and computed values of evaporation from talus in the medium and high-mountain zones on the northern slope of the Trans-Ili Ala-Tau were tabulated. The observed and computed monthly evaporation values generally agreed fairly well and there were no systematic discrepancies between them. Similar results were obtained from a verification of the proposed method on the basis of observational data published in other papers. Therefore, this method was recommended for computing evaporation from surface occupied by talus and rocks. (Humphreys-ISWS)
W78-05795

COMPUTATION OF PRECIPITATION INTERCEPTION BY THE PLANT COVER,
For primary bibliographic entry see Field 2I.
W78-05796

DIURNAL TEMPERATURE DISTRIBUTION IN SMALL WATER RESERVOIRS (PHASE II),
Missouri Water Resources Research Center.
For primary bibliographic entry see Field 2H.
W78-05818

INTERFEROMETRIC OBSERVATIONS OF THE TEMPERATURE STRUCTURE IN WATER COOLED OR HEATED FROM ABOVE,
Purdue Univ., Lafayette, IN. Heat Transfer Lab.
R. Viskanta, M. Behnia, and A. Karalis.
Advances in Water Resources, Vol. 1, No. 2, p 57-69, December 1977. 10 fig, 27 ref. OWRT B-077-IND(2).

Descriptors: *Water temperature, *Cooling, *Heating, Stratification, Experiments, Flow, Convection, Temperature distribution, Equations.

Controlled laboratory experiments were performed in a water tank to study energy transfer during cooling and radiant reheating of water from above. Accurate instantaneous temperature measurements were obtained using a Mach-Zehnder interferometer which did not disturb the temperature, radiation, and flow fields. The buoyancy-induced flow field was visualized by employing an electro-chemical dye production technique. Cooling of an initially uniform layer of water and stratification-cooling-restratification were studied. The experimental observation during cooling of an initially uniform temperature column of water indicated intermittent free convection near the surface; this was characterized by randomly descending cooler plumes penetrating 10 to 25 cm into the warmer underlying region. The cooling rate had a decisive influence on the frequency and intensity of the descending parcels of water. For lower cooling rates the colder water usually descended in a form of sheets. Observations during cooling of initially stratified water showed that buoyancy driven convection occurred near the surface. The motion had an initial regular roll pattern, but as the cooling continued the roll pattern in the convective layer deteriorated into motion similar to that observed during cooling of an initially uniform temperature layer of water. When the water was restratified by radiant heating, the circulation in the convective layer was suppressed, and the temperature profiles obtained were similar to those observed in a fluid during free convection between two solid parallel walls. (Bell-Cornell)
W78-05942

THE EFFECT OF EVAPOTRANSPIRATION ON STREAMFLOW RECESSION,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
R. N. Weisman.
Hydrological Sciences Bulletin, Vol. 22, No. 3, p 371-377, September 1977. 5 fig, 2 tab, 8 ref.

Descriptors: *Evapotranspiration, *Streamflow, Effects, Evaporation, Water loss, Mathematical

studies, Equations, Recession curves, Low flow, Groundwater, Moisture, *Streamflow recession, *Recession constants, Pan evaporation.

The effect that evapotranspiration has on recession curves during low flow periods was explored. Recession constants were obtained from flow data and plotted against the average daily pan evaporation that occurred during the recession. The results for the three study basins were similar, showing a decrease in recession constant with an increase in average daily pan evaporation. For low values of average daily pan evaporation, the recession constant approached a constant value. The basins studied were chosen because they exhibited a range of values for their recession constants. This range in values was caused in part, if not wholly, by evapotranspiration from the riparian zone. The evapotranspiration caused a loss in moisture that would otherwise have been available to sustain a low flow. (Roberts-ISWS)
W78-06107

2E. Streamflow and Runoff

A GENERAL CLASS OF STOCHASTIC MODELS FOR HYDROLOGIC SEQUENCES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2A.
W78-05768

ANALYSIS OF HYDROLOGICAL RECESSION CURVES,
Commonwealth Scientific and Industrial Research Organization, Brisbane (Australia). Div. of Mathematics and Statistics.
P. N. Jones, and C. A. McGilchrist.
Journal of Hydrology, Vol 36, No 3/4, p 365-374, February 1978. 4 fig 2 tab, 2 ref.

Descriptors: *Recession curves, *Streamflow, *Hydrographs, *Model studies, Mathematical models, Runoff, River forecasting, Rivers, Water levels, Frequency curves, Hydrology.

A model for stream flow recession curves was developed. Data from three Australian rivers were used to illustrate how the effects of seasonality and storm input can be catered for by a relatively simple estimation procedure. It was suggested that a master recession curve does not give an dequate description of recession flows for a river. (Sims-ISWS)
W78-05769

A CRITERION OF EFFICIENCY FOR RAINFALL-RUNOFF MODELS,
University Coll., Galway (Ireland). Dept. of Engineering Hydrology.
For primary bibliographic entry see Field 2A.
W78-05770

DILUTION GAUGING ON THE RECESSION LIMB: 1. CONSTANT RATE INJECTION METHOD,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 8B.
W78-05774

THE SPEED AND DIRECTION OF MOVEMENT OF STORM RAINFALL PATTERNS WITH REFERENCE TO URBAN STORM SEWER DESIGN,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 5B.
W78-05776

DEPENDENCE OF THE CORIOLIS AND BOUSSINESQ COEFFICIENTS ON THE SLOPE OF A MOUNTAIN STREAM,
V. V. Golubtsov.
Soviet Hydrology, Selected Papers, Vol 15, No 1, p 41-43, 1976. 1 fig, 1 tab, 15 ref. Translated from Transactions of the Kazakh Hydrometeorological Scientific Research Institute (Trudy KazNIGMI), No 48, 1975, p 96-100.

Descriptors: Flow, *Energy, *Velocity, *Distribution, *Streamflow, Streams, *Slope, Hydraulics, Mountains, Currents(Water), Natural flow, River flow, Foreign research, Foreign countries, Open channel flow, *USSR, *Coriolis coefficient, *Boussinesq coefficient, Momentum.

The Coriolis coefficient, alpha, is known to express in computations from the energy equation the ratio of the true energy to its value determined from average velocity. The Boussinesq coefficient alpha sub o is a correction in computations from the momentum equation, which brings the momentum determined from average velocity into correspondence with the true momentum. The values of alpha and alpha sub o must be known in various hydraulic computations. The dependence of alpha and alpha sub o on hydraulic parameters has not been studied sufficiently for mountain streams. In hydraulic manuals it is recommended that these coefficients be taken sufficiently close to unity. Several formulas have been proposed for determining both coefficients. The results of determinations of the coefficients from the formulas were tabulated. Comparison showed that the results of determinations of alpha and alpha sub o from the various formulas differ considerably. The probable reason for this is that the formulas in question were obtained proceeding from different theoretical premises and describe different conditions of streamflow. (Humphreys-ISWS)
W78-05797

CHARACTERISTICS OF SOME REGULARIZING PROCEDURES FOR DETERMINING THE MORPHOMETRIC CHARACTERISTICS OF A RIVER CHANNEL,
A. V. Romanov.
Soviet Hydrology: Selected papers, Vol 15, No 1, p 31-36, 1976. 3 fig, 5 ref. Translated from Transactions of the Hydrometeorological Center of the USSR (Trudy Gidromettsentra SSSR), No 168, p 38-50, 1975.

Descriptors: *Channel morphology, *Theoretical analysis, Mathematical studies, Analytical techniques, Equations, Continuity equation, Rivers, Hydraulics, Shape, Width, Water levels, Methodology, Algorithms, Mathematics, Foreign research, *USSR, Regularization parameters.

Experience in the use of St. Venant equations for computing unsteady flow in natural streams showed that it is most difficult to assign the morphometric and hydraulic characteristics of a river channel that enter these equations as coefficients. The author investigated some methodological problems of the numerical realization of some regularizing algorithms in solving the inverse problem for the continuity equation. Presented were methods of selecting the regularization parameter and also presented were analysis of the methods and description of the errors on the form of the regularization criteria. (Humphreys-ISWS)
W78-05798

WINTER FLOOD IN LENINGRAD ON DECEMBER 20, 1973,
B. A. Pomytkin.
Soviet Hydrology: Selected Papers, Vol. 15, No. 1, p72-74, 1976. 3 fig, 1 tab. Translated from News of the All-Union Geographic Society (Izvestiya VGO), No. 1, p 53-56, 1976.

Descriptors: *Floods, *Winter, *Foreign countries, *Storm surge, Cyclones, Weather, Ice, Storms, Water levels, Water level fluctuations, On-site investigations, Disasters, Tidal waters, *USSR, *Leningrad(USSR), *Gulf of Finland.

A winter flood (January-March) is rare and usually occurs when the Gulf of Finland or its eastern part is covered completely with ice, which markedly reduces the amplitude of the tidal wave and thus the rise in water level in the Neva delta. The last winter flood with a rise in level of 240 cm at Leningrad began in the early morning of December 20, 1973. It was caused by a cyclone that formed over the Scandinavian Peninsula in the Oslo region on December 19 and moved eastward at a speed of 60-70 km/hr, crossed the Baltic Sea at the end of the day of December 19, skirted Finland from the south, and reached Lake Ladoga at about 6 a.m. on December 20. The flood reached the Neva delta at 7h 20m on December 20 and raised the level at Leningrad by 189 cm. The wave component of this rise was estimated at slightly more than 1 m, while the wind tide accounted for 80-85 cm of this rise. The flood situation in the city, particularly distinct in its low western areas where the level was 1.5 m above normal stage, persisted for 3.5 hours (from 6 to 9 a.m.); it remained 2 m above normal stage for 2 hours, from 6 to 8 a.m. Huge piles of broken ice formed everywhere on the shore. (Humphreys-ISWS)
W78-05800

DEVELOPMENT OF A VERSION OF STANFORD MODEL AND ITS EVALUATION FOR STREAMFLOW SYNTHESIS FROM SMALL WATERSHEDS IN WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Agricultural Engineering.
A. M. Chaudhry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 540, Price codes: A09 in paper copy, A01 in microfiche. PhD Thesis, 1975. 178 p, 30 fig, 26 tab, 67 ref, 3 append. OWRT A-021-WVA(2).

Descriptors: *Streamflow forecasting, Model studies, *Mathematical models, *Computer models, *Computer programs, *West Virginia, *Watershed(Basins), Surface runoff, Forecasting, Estimating, *Agricultural watersheds, *Stanford Streamflow Model, *FORTRAN.

A FORTRAN version of the Stanford Streamflow Model was used to generate 3-5 years of streamflow data on 2 small agricultural watersheds located on the West Virginia University Animal Husbandry Farm. Three years of recorded data were used to calibrate the model. Three statistical summaries were made; good prediction of streamflow on an annual basis and fairly good prediction on a monthly basis were obtained. Storm hydrographs were predicted less accurately. The sensitivity of several model parameters was evaluated by holding the value of all parameters constant, while one variable was ranged from a low to a high value. Surface runoff estimates were particularly sensitive to changes in average roughness coefficient for overland flow in soil surfaces (MANP), mean overland flow length in feet (LENGTH), and average slope in feet per foot of the overland flow surfaces perpendicular to the channel (S). The most important parameters appeared to be the interflow index (CC), infiltration index (CBI), nominal lower zone storage (FLZSN), ratio of the lower zone storage to the nominal value (FLZS/FLZN), and an infiltration-evaporation index (EF) for applying a seasonal variation to infiltration. Several of the deviations of the simulated from actual flow can be traced directly to simple mathematical expressions used in the model for the natural processes which are too complex to permit an intricate analysis. The model appears to simulate the hydrologic processes within the accuracy of the basic input data. (Seip-IPA)
W78-05808

ADEQUACY OF HYDROLOGIC DATA FOR APPLICATION IN WEST VIRGINIA,
West Virginia Univ., Morgantown. Water Research Inst.
For primary bibliographic entry see Field 7C.
W78-05931

DEVELOPMENT OF A SUBSURFACE HYDROLOGIC MODEL AND USE FOR INTEGRATED MANAGEMENT OF SURFACE AND SUBSURFACE WATER RESOURCES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W78-05934

ESTIMATES OF LOW FLOWS USING WATERSHED AND CLIMATIC PARAMETERS,
Stephen F. Austin State Univ., Nacogdoches, TX. School of Forestry.
M. Chang, and D. G. Boyer.
Water Resources Research, Vol. 13, No. 6, p 997-1001, December 1977. 4 fig, 5 tab, 16 ref. OWRT A-023-WVA(2).

Descriptors: *Low flow, *Climatology, *West Virginia, Low flow frequency, Statistics, Forecasting, Watersheds(Basins), Runoff, Rainfall, Precipitation(Atmospheric), Droughts, Topography, Temperature, Climates, Rainfall-runoff relationships, Mathematical models, *Monongahela watershed(W Va).

The lowest 7-day streamflows (10-yr return period) of 12 Monongahela tributaries in West Virginia were estimated from watershed and climatic parameters. Of the parameters studied, watershed perimeter alone accounted for about 88% of the spatial variability of 7-day low flows in a multiple-regression analysis. Main channel length and watershed form increased the predictability to about 95%. Precipitation and temperature parameters, which were highly correlated with watershed elevation and latitude, raised the R sq to 0.999. The standard error of estimate was 7.43 cu ft/s, or about 30% of the observed mean; this result, an order of magnitude smaller than that obtained in an earlier study, suggests that meaningful low-flow estimates can be obtained from watershed parameters alone in a mountainous humid region. (Sims-ISWS)
W78-05944

GENERATING RAINFALL EXCESS BASED ON READILY DETERMINABLE SOIL AND LAND-USE CHARACTERISTICS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W78-05945

THE ANALYSIS OF MULTIVARIATE TIME SERIES APPLIED TO PROBLEMS IN HYDROLOGY,
International Inst. of Applied Systems Analysis, Laxenburg (Austria).
J. Ledolter.
Journal of Hydrology, Vol. 36, No. 3/4, p 327-352, February 1978. 21 ref, 1 append.

Descriptors: *Hydrology, *Statistical models, *Time series analysis, Synthetic hydrology, Equations, Mathematical studies, Mathematics, Model studies, Analysis, Stochastic processes, *Multivariate time series, Stochastic models, Vector process.

Stochastic models for vector processes, in particular the class of multivaritate autoregressive moving average models were discussed. Special cases of this class have been discussed in the literature on synthetic hydrology, and it was shown how these results can be brought into a general framework. An iterative model building procedure, consisting of model specification-estimation-diagnostic checking, was stressed. Results on model specification were given, and it was shown how partial autocovariance matrices can be used to check whether multivariate autoregressive models provide adequate representation for (standardized) streamflow sequences. Furthermore, estimation of parameters in multivariate autoregressive moving average models was discussed, and it was pointed out that moment estimators can be inefficient when moving average parameters are present. An approximate maximum likelihood estimation procedure was suggested. Furthermore, an inconsistency in modelling hydrologic sequences was pointed out; it was shown that, in general, it is not possible to have the individual series in a multivariate (first-order) autoregressive process follow univariate processes of the same (first) order. (Lee-ISWS)
W78-06102

THE EFFECT OF EVAPOTRANSPIRATION ON STREAMFLOW RECESSION,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2D.
W78-06107

STATISTICAL METHODS IN HYDROLOGY,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 7C.
W78-06125

2F. Groundwater

COMPUTER MODELLING OF GROUNDWATER 13C AND 14C ISOTOPE COMPOSITIONS,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
E. J. Reardon, and P. Fritz.
Journal of Hydrology, Vol 36, No 3/4, p 201-224, February 1978. 3 fig, 3 tab, 16 ref, 5 append.

Descriptors: *Groundwater, *Isotope studies, *Carbon, *Computer models, Mathematical models, Model studies, Computer programs, Water chemistry, Carbon radioisotopes, Carbonate rocks, Carbonates, Carbon dioxide, Hydrogen ion concentration, Radioactive dating, Hydrology.

A 13C and 14C isotope subroutine called ISOTOP has been written for WATEQF, a FORTRAN IV version of the water-analysis treatment program (WATEQ) translated and modified from the original PL1 version. This subroutine performs a series of simulations of water samples where 13C and 14C data are available by assuming various initial pH and -log (P sub C02) values under open-system conditions and computing the variation of 13C of the C02 gas phase to be compared with the actual water sample's value and an age for each simulation applied. Some of the models use total Ca plus Mg as a measure of whole-rock carbonate dissolved under closed-system conditions, while other models make corrections for gypsum dissolution and ion-exchange reactions. In additin, the subroutine may be used to compute age differences between pairs of water samples along the same flow path using congruent and incongruent carbonate dissolution models. In the simulations applied, carbonate and bicarbonate in pairing and complexing were considered. (Sims-ISWS)
W78-05767

DETERMINATION OF UNIFORM AND GRANULAR AQUIFER CHARACTERISTICS BY LINEAR METHODS,
Gerede Sokat, Ankara (Turkey).
O. Dumlu.
Hydrological Sciences Bulletin, Vol 22, No 3, p 413-419, September 1977. 3 fig, 2 tab.

Descriptors: *Aquifers, *Drawdown, *Aquifer characteristics, *Analytical techniques, Model studies, Mathematical models, Wells, Water wells, Pumping, Data processing, Graphical methods, Graphical analysis, Groundwater, Groundwater movement, Hydrology.

It is known fact that some methods used in the calculation of aquifer coefficients for unconsolidated formations require the use of semilogarithmic and logarithmic papers, and other methods need previously prepared tables. In this study, some linear methods were considered for the determination of aquifer characteristics because of the greater possibilities they give for accurate drawing of the drawdown/time graph. (Sims-ISWS)
W78-05775

CHARACTERISTICS OF THE INTERRELATION OF SURFACE AND GROUND WATERS IN THE KARAKENGIR RIVER BASIN WITH A DISTURBED NATURAL REGIME,
S. P. Rylov.
Soviet Hydrology, Selected Papers, Vol 15, No 1, p 44-49, 1976. 3 fig, 3 tab, 5 ref. Translated from Transactions of the Karakh Hydrometeorological Scientific Research Institute (Trudy Kazakhskogo Nauchno-Issledovatel'skogo Gidrometeorologicheskogo Instituta), No 48, p 132-141, 1975.

Descriptors: *Runoff, *Groundwater, *Groundwater recharge, Measurement, On-site investigations, Model studies, Recharge, Precipitation(Atmospheric), Aquifers, Water levels, Rivers, Groundwater movement, Infiltration, Surface waters, Evaporation, Withdrawal, Water wells, Hydrology, *USSR.

The hydrologic and hydrogeological investigations performed by the Kazakh Hydrometeorological Scientific Research Institute in 1969-1972 in Dzhezdy district of Dzhezkazgan Province made it possible to refine and, in some cases, to obtain anew the quantitative characteristics of the interrelation of surface and groundwaters. The studies were performed 60 km to the north of Dzhezkazgan within the Aydos brachyanticlinal structure. The Karakengir River, which crosses this structure, has a basin area of 9380 sq km at the outlet gaging station. In the reach within the structure, the two-sided floodplain 600-1000 m wide is dissected by arms and oxbows and the river channel consists of a chain of deep (4-6 m) pools. The reach studied begins 2 km upstream of the confluence of Uronsay Ravine, where the gaging station Verkhniy is located, and ends at the gaging station Nizhniy in the Aydos village area. To determine the losses of Karakengir runoff and the recharge of the groundwaters of the structure, the following observations and computations were performed: the inflow and outflow of water along the Karakengir in the reach under study were taken into account, precipitation and evaporation in the flood plain were determined, and the groundwater levels in wells and the magnitude of water withdrawal were measured. Meteorological observations were made at Aydos station. To determine lateral inflow between the reference gaging stations, runoff was measured in the mouth areas of all ravines. Summer precipitation and the maximum water equivalent of snow in the flood plain were determined from direct measurements, and evaporation from the flood plain was determined by establishing and using its dependence on the air moisture deficit, according to the GGI-3000 evaporimeter data. Groundwater-level observations were made in 12 wells in the alluvium of the Karakengir River and in 30 wells in the remaining part of the structure. (Sims-ISWS)
W78-05794

A PUMP TEST IN THE DAKOTA SANDSTONE AT WALL, SOUTH DAKOTA,
South Dakota School of Mines and Technology, Rapid City. Dept. of Geology and Geological Engineering.

For primary bibliographic entry see Field 4B.
W78-05946

DISPERSION CALCULATIONS IN NONUNIFORM SEEPAGE,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-06099

IDENTIFICATION OF DISTRIBUTED PARAMETERS IN GROUNDWATER BASINS,
James Cook Univ. of North Queensland, Townsville (Australia). Dept. of Civil Engineering.
V. Guvanasen, and R. E. Volker.
Journal of Hydrology, Vol. 36, No. 3/4, p 279-293, February 1978. 7 fig, 3 tab, 21 ref.

Descriptors: *Groundwater movement, *Aquifers, *Groundwater, *Model studies, Mathematical models, Calibrations, Recharge, Discharge(Water), Transmissivity, Potentiometric level, Water levels, Storage, Analytical techniques, Hydrology.

A method for evaluating parameters in an equation describing groundwater flow in two-dimensional space was presented. The method employs finite-difference approximations and the assumption of a limit on the local variability of transmissivity or hydraulic conductivity. The approach entails a systematic minimization of the difference between recorded and calculated water levels using the Newton-Raphson technique along a path in such a way that the calibrated regions are isolated from the rest. Illustrations of the application of this scheme are those from an idealistic rectangular water-table aquifer and a real water-table aquifer system. The method is successful in retrieving the true values of parameters provided that the other data are accurate. In the case of noisy data, a set of parameters capable of faithfully reproducing the recorded water levels with minimum deviation was obtained. (Sims-ISWS)
W78-06100

GROUND-WATER RESOURCES OF EMMONS COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div
For primary bibliographic entry see Field 4B.
W78-06179

SELECTED HYDROLOGIC DATA, PAROWAN VALLEY AND CEDAR CITY VALLEY DRAINAGE BASINS, IRON COUNTY, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06180

RECORD OF GROUND-WATER EXPLORATION AND DEVELOPMENT, 1975-76, MOEN, TRUK, EASTERN CAROLINE ISLANDS,
Geological Survey, Honolulu, HI. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06193

LAND-SURFACE SUBSIDENCE IN THE HOUSTON-GALVESTON REGION, TEXAS,
Geological Survey, Houston, TX. Water Resources Div.
R. K. Gabrysch.
In: Proceedings of the Anaheim Symposium, December 1976: International Association of Hydrological Sciences Publication No 121, p 16-24, 1976. 5 fig, 7 ref.

Descriptors: *Land subsidence, *Aquifers, *Pumping, *Drawdown, *Texas, Groundwater, Withdrawal, Compaction, Groundwater recharge, Aquifer management, Projections, Evaluation, Hydrogeology, Harris County(Tex), Galveston County(Tex).

Development of ground water in the Houston-Galveston region, Texas, began in the 1890's. Pumping of ground water from the Chicot and Evangeline aquifers for municipal supply, industrial use, and irrigation was about 23 cubic meters per second by 1974. Pumping of large amounts of ground water has resulted in water-level declines during 1943-73 of as much as 61 meters in wells completed in the Chicot aquifer and as much as 99 meters in wells completed in the Evangeline aquifer. The declines in artesian pressures have resulted in pronounced regional subsidence of the land surface. The center of subsidence is east-southeast of Houston at Pasadena, where as much as 2.3 meters of subsidence occurred between 1943 and 1973. The maximum amount of subsidence during 1964-73 was about 1.1 meters. The area in which subsidence is 0.3 meter or more has increased from about 906 square kilometers in 1954 to about 6,475 square kilometers in 1973. Water from Lake Livingston on the Trinity River, about 97 kilometers east of Houston, will become available in 1976. As a result, it is estimated that groundwater pumping will decrease by about 3.1 cubic meters per second in the area of maximum artesian-pressure decline and subsidence. The recovery of water levels is expected to decrease the rate of subsidence substantially. (Woodard-USGS)
W78-06195

ESTIMATING PARAMETERS OF COMPACTING FINE-GRAINED INTERBEDS WITHIN A CONFINED AQUIFER SYSTEM BY A ONE-DIMENSIONAL SIMULATION OF FIELD OBSERVATIONS,
Geological Survey, Sacramento, CA. Water Resources Div.
D. C. Helm.
In: Proceedings of the Anaheim Symposium, December 1976: International Association of Hydrological Sciences Publication No 121, p 145-156, 1976. 12 fig, 1 tab, 4 ref.

Descriptors: *Aquitards, *Computer models, *Land subsidence, Mechanical properties, *California, Aquifer characteristics, Clays, Compaction, Compressibility, Consolidation, Stress, Hydraulic conductivity, Hydrologic properties, Mathematical models, Model studies, Permeability, Physical properties, Soil mechanics, Storage coefficient, Specific capacity, Geomorphology.

A one-dimensional mathematical model that calculates idealized aquifer-system compaction and expansion has been applied to observed water-level fluctuations and to the resulting observed transient compaction-and-expansion behavior of a total thickness interval at one site in the San Joaquin Valley and at several sites in the Santa Clara Valley, Calif. Values for total cumulative thickness (b'sum) of fine-grained interbeds within the confined aquifer system, the weighted-average thickness (b'equiv) of these interbeds, recoverable vertical compressibility (S'ske), and the initial distribution of preconsolidation pressure - p'max(z, 0) - must be approximated from field data independently of any subsequent simulation process. Only values for vertical components of hydraulic conductivity (K') and nonrecoverable compressibility (S'skv) are adjusted by trial-and-error to fit calculated to observed compaction history. The estimated values for K' at the sites studied range from 1.7 x 10 to the minus 7th power to .0000038 m/day, those for S'skv range from .00046 to .0043 m-1, and those for S'ske range from .0000072 to .000052 m-1. For established values of b'sum, b'equiv, and p'max(z, 0), carefully evaluated values of K' and S'skv can be used to predict aquifer-system behavior with reasonable accuracy over periods of several decades. (Woodard-USGS)
W78-06196

HYDROGEOLOGIC EFFECTS OF SUBSIDENCE, SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Sacramento, CA. Water Resources Div
For primary bibliographic entry see Field 4B
W78-06197

LAND SUBSIDENCE STOPPED BY ARTESIAN-HEAD RECOVERY, SANTA CLARA VALLEY, CALIFORNIA,
Geological Survey, Sacramento, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06198

2G. Water In Soils

EFFECT OF SOIL HEAT FLUX ON THE WATER BALANCE OF A SMALL CATCHMENT,
Waikato Univ., Hamilton (New Zealand). Dept. of Earth Sciences.
I. Simmers.
Hydrological Sciences Bulletin, Vol 22, No 3, p 433-445, September 1977. 4 fig, 3 tab, 16 ref, 1 append.

Descriptors: *Water balance, *Heat flow, *Soil moisture, *Model studies, Mathematical models, On-site investigations, Watersheds(Basins), Rainfall, Runoff, Storage, Water storage, Evapotranspiration, Hydrology, *River Ray Basin(England).

A study of the water balance of the upper River Ray basin revealed that calculated soil moisture storage exceeds measured storage in winter and falls well below it in summer. The systematic seasonal error is of the order + or - 50 mm. Several reasons have been proposed which may account for some local water balance anomalies. However, the reported discrepancies are characteristic of a much broader area and are attributed partly to the omission of a soil heat storage term (G) from the Penman equation. The reported analysis tested this hypothesis. Soil heat flux was measured directly at the Grendon Underwood climatological station and was found to be smal in relation to other water balance components. Inclusion of the term in the Penman equation was not enough in itself to account for the published seasonal moisture anomalies. With a change of neutron probe from that used n the earlier study, and inclusion of G in the calculations, the 50 mm inbalance can be reduced to + 34 mm and -18 mm for the summer and winter half years, respectively. (Sims-ISWS)
W78-05777

FALLOUT CESIUM-137 IN CULTIVATED AND NONCULTIVATED NORTH CENTRAL UNITED STATES WATERSHEDS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W78-05779

STATISTICAL EVALUATION OF RAINFALL-SIMULATOR AND EROSION TESTING PROCEDURE,
Louisiana Dept. of Highways, Baton Rouge. Research and Development Section.
For primary bibliographic entry see Field 2J.
W78-05785

EMISSION CHARACTERISTICS OF MOIST STRATIFIED STRUCTURES IN THE VHF RANGE,
A. Ye. Popov, Ye. A. Sharkov, T. A. Shiryayeva, and V. S. Etkin.
Sovict Hydrology: Selected Papers, Vol 15, No 1, p 15-17, 1976. 3 fig, 6 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No 237, p 143-147, 1976.

Descriptors: *Remote sensing, *Soil moisture, *Moisture content, *Theoretical analysis, Radio waves, Frequency, Mathematical models, Analysis, Analytical techniques, Foreign research, Wavelengths, Infiltration, Radiation, *USSR, *Very high frequency range.

Radiometric methods are effective for remote hydrologic investigations. Unlike infrared methods, the effective radio emission layer is fairly thick for the VHF range (from several centimeters to several meters), and therefore, radiometric methods can be used not only to detect subterranean water and ice, but also to study the dynamics of water penetration into the soil. Theoretical investigation of the ratio emission of moist structures is generally limited to the study of the simplest homogeneous models. Radio emission was analyzed of some more complex moist stratified structures and the possibilities of determining some hydrologic parameters by the multiple-frequency method. Water under a soil layer, ice or frozen ground under a soil layer, soil layers with different moisture contents, etc., can satisfy the adopted idealization (layers with smooth boundaries) under natural conditions. (Humphreys-ISWS)
W78-05791

SOME RESULTS OF MEASUREMENTS OF THE RADIO EMISSION OF SOILS USING A HIGHLY SENSITIVE AIRCRAFT RADIOMETER WITH A 3-CM WAVE RANGE,
Ye. A. Bespalova, V. V. Melent'yev, Yu. I. Rabinovich, and V. Yu. Rayzer.
Soviet Hydrology: Selected Papers, Vol 15, No 1, p 18-20, 1976. 3 fig, 5 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No 237, p 172-176, 1976.

Descriptors: *Soils, *Radiation, *Remote sensing, Radio waves, Statistical methods, Analysis, Analytical techniques, Measurements, On-site investigations, Instrumentation, Temperature, Data processing, Foreign research, *USSR, Radiometers.

Some results were reported of radiothermal investigations of semidesert and swampy regions in the lower courses of the Amu-Dar'ya and Ural rivers and of a tentative correlation-statistical analysis of these regions. In 1973 the radiothermal emission of earth covers were investigated from an IL-18 aircraft-laboratory with a 3-cm radiometer. This radiometer is a straight-amplification modulation radiometer with four tunneldiode amplifier stages. The normalized spectra of two different waterlogged areas were very similar qualitatively and also quantitatively in their high-frequency portion. In the two areas in question, the characteristic dimensions in the fields of radioluminance temperatures have distinct features: two high-frequency peaks, which correspond to features (periodicities) with characteristic dimensions of 1.2 and 1.7 km, and two lower-frequency peaks with characteristic dimensions of 2.2 and 5 km. Another important conclusion follows from analysis of these spectra: since the records were made on flights in different directions, the field of random values of radioluminance temperatures is probably spatially isotropic. The main result obtained is that statistical methods can be used to analyze the fields of radioluminance temperatures (for aircraft observations), and that they give fairly explicit and interpretable results. (Humphreys-ISWS)
W78-05792

COMPUTATION OF THE SOIL MOISTURE PROFILE FROM HYDROMETEOROLOGICAL DATA,
L. S. Kuchment, and G. P. Zhmayeva.
Soviet Hydrology: Selected Papers, Vol 15, No 1, p 27-30, 1976. 2 fig, 2 tab, 4 ref. Translated from Transactions of the Hydrometeorological Center of the USSR (Trudy Gidrometttsentra SSSR), No 168, p 16-23, 1975.

Descriptors: *Soil moisture, *Profiles, *Analytical techniques, Analysis, Finite element analysis, Numerical analysis, Data processing, Hysteresis, Diffusion, Mathematical models, Mathematical studies, Foreign research, *USSR.

Experimental data showed that the hydraulic permeability of soils depends largely on the type of soil and its moisture content and varies in time and over the area of a basin. The hysteresis of moisture conductivity, produced by a change in the suction force of the soil during alternation of wetting and drying, markedly complicates the dependence of this coefficient on the soil moisture content. An even stronger hysteresis effect is observed in the moisture characteristic of the soil. Numerical experiments showed that the moisture diffusion coefficient plays a determining role in the description of soil moisture dynamics over a long period. The values of the moisture diffusion coefficients for hysteresis conditions were tabulated. At some instants of time, particularly when soil moisture measurements were made directly after a rainfall, the middle part of the soil moisture profile sometimes has noticeable errors because of delays or advances of variations in the profile. However, these errors attenuate rapidly. Numerical values of the moisture diffusion coefficient were tabulated for various points. (Humphreys-ISWS)
W78-05793

SEDIMENTATION AND SOIL ALTERATION, MONROE RESERVOIR, INDIANA,
Indiana Univ., Bloomington. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-05815

INFILTRATION FORMULA BASED ON SCS CURVE NUMBER,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
G. Aron, A. C. Miller, Jr., and D. F. Lakatos.
Journal of the Irrigation and Drainage Division, Proceedings of ASCE, Vol. 103, No. IR4, p 419-427, December, 1977. 3 fig, 4 tab, 9 ref, 1 append.

Descriptors: *Infiltration, *Rainfall-runoff relationships, *Soil properties, *Storage capacity, *Permeability, Hydrologic cycle, Precipitation excess, Runoff coefficient, Hortons Law, Waste water disposal, Municipal wastes.

An equation for determining infiltration based on rainfall, runoff, and soil water storage capacity is presented as an alternative to Hortons Law. The infiltration equation utilizes United States Soil Conservation Service (SCS) runoff equations and soil curve numbers. The SCS formula for cumulative infiltration is dependent upon hydrologic soil complex curve numbers, which are based on soil permeability and land use, and soil water storage capacity. The infiltration equation based on the SCS formula is used to determine the cumulative infiltration as a function of soil characteristics and antecedent infiltration. The equation is reported to be adaptable to computer models and to eliminate the need for extensive on-site field tests because of the SCS soil properties and curve numbers used. (Lisk-FIRL)
W78-05819

THE MIGRATION OF 238U, 226RA, 232TH AND 40K INTO FLOODPLAIN SOILS OF SUPERAQUATIC LANDSCAPES OF THE BITYUG RIVER, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of General Soil Science.
For primary bibliographic entry see Field 5B.
W78-05822

BIOLOGICAL ACTIVITY OF SODDY-PODZOLIC SOILS UNFLOODED AND FLOODED BY THE WATER OF MOZHAISK RESERVOIR, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics; and Moscow State Univ. (USSR). Dept. of Soil Melioration.
V. E. Korenevskaya, V. I. Duda, I. S. Reshetova, I. A. Kostromina, and A. S. Nikiforova.
Vestn Mosk Univ SER Vi Biol Pochvoved 31(4), p 78-86, 1976.

Descriptors: *Soil moisture, Bacteria, Biological communities, Catalase, *Flooded soils, Invertase, *Anaerobic microorgnisms, Nitrification, Podzolic soils, Reservoirs, Respiration, Soddy, Soils, *Unflooded soils, Urease, *Nitrifying bacteria, *Mozhaisk Reservoir(USSR).

The flooding of derno-podzolic soils by waters of the Mozhaisk Reservoir, USSR is accompanied by a total rebuilding of complex biological processes in the soils; the quantity of aerobic microorganisms decreases, as revealed on various nourishing substrates; the quantity of anaerobic microorganisms grown on soil agar increases; the activity of nitrification bacteria is suppressed; the activity of catalase, urease and invertase decreases. The intensity of respiration in fresh samples at high moisture is higher in a flooded soil. In preliminary dryed samples the intensity of respiration in the moisture interval from 30-100 relative per cent is considerably higher in unflooded derno-podzolic soils in the flooded ones.--Copyright 1977 Biological Abstracts, Inc.
W78-05827

INFLUENCE OF ARTIFICIAL DRAINAGE ON PENETRATION OF COLIFORM BACTERIA FROM SEPTIC TANK EFFLUENTS INTO WET TILE DRAINED SOILS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-05881

BEHAVIOR OF ANIONIC SURFACTANTS IN A SOIL-SEWAGE EFFLUENT SYSTEM,
Agricultural Research Organization, Bet Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 5B.
W78-05900

IMPROVING SUBSURFACE DISPOSAL SYSTEM PERFORMANCE,
Agricultural Research Center, Beltsville, MD.
For primary bibliographic entry see Field 5E.
W78-05901

NITRATE LEACHING DURING LONG-TERM SPRAY IRRIGATION FOR TREATMENT OF SECONDARY SEWAGE EFFLUENT ON WOODLAND SITES,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-05903

APPLICATION OF HEAT-FLOW TEMPERATURE MODEL FOR REMOTELY ASSESSING NEAR SURFACE SOIL MOISTURE BY THERMOGRAPHY,
South Dakota State Univ., Brookings. Dept. of Physics.
J. A. Tunheim.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 616, Price codes: A03 in paper copy, A01 in microfiche. South Dakota Water Resources Research Institute, Brookings, Completion Report, November 1977. 44 p, 11 fig, 14 tab, 15 ref, append. OWRT A-053-SDAK(1). 14-31-0001-6043.

Descriptors: Groundwater, *Thermography, Thermal prospecting, *Saline seeps, *Soil tempera-

tures, *Soil moisture, *Remote sensing, Soil profile, Seepage, Model studies, Thermometers, Instrumentation.

Experimental and theoretical investigations were carried out relating to the detection and mapping of near-surface groundwater by the use of remote sensed thermal emittance data (thermography). The specific focus of the study was the detection of saline seeps in their pre-emergence stages. Soil temperature profiles, water table depths and other pertinent data were collected in two potential seep areas. The data were related to thermal emittance acquired during three aircraft flights and results were used to modify a theoretical model. Recommendations were also made for scheduling thermography flights. Conclusions are: (1) Thermography flights for the detection of potential seep areas should be scheduled in early spring or late fall to avoid heavy crop cover. They should also be scheduled early in the night since thermal emittance and shallow soil temperatures correlate best with water table depths at this time. (2) The purely conduction model previously proposed for relating soil temperature patterns to the presence of near surface groundwater is not valid in the case of saline seeps. Thus any model relating thermal emittance to a potential saline seep must consider other factors such as differences in soil moisture. (Wiersma-South Dakota)
W78-05932

PHOSPHORUS DYNAMICS IN SOILS IRRIGATED WITH MUNICIPAL WASTEWATER,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W78-05937

DETERMINATION OF SOIL HUMUS CONTENT WHEN CONDUCTING FIELD EXPERIMENTS ON ERODED SOILS, (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Geography.
M. N. Zaslavskii, and A. B. Levin.
Pochvovedenie 6, p 138-146, 1976.

Descriptors: *Soil erosion, *Humans, Geomorphology, Cover crops, Heterogeneity, Lithology, Morphology, Soils.

Fields experiments on slopes demand a preliminary study of geomorphological, lithological and soil-genetic conditions, and a thorough investigation of soil cover heterogeneity in respect to soil erodibility. This depends on the relationship between relative decrease in soil humus content and crop. The study of the soil cover structure on slopes helps make a right choice of the field plot and accounts for the effect of the heterogenous distribution of eroded soils on experimental results.--Copyright 1977, Biological Abstracts, Inc.
W78-05943

EFFECT OF LAND DISPOSAL APPLICATIONS OF MUNICIPAL WASTES ON CROP YIELDS AND HEAVY METAL UPTAKE,
National Fertilizer Development Center, Muscle Shoals, AL.
For primary bibliographic entry see Field 5B.
W78-05985

USE OF CLIMATIC DATA IN ESTIMATING STORAGE DAYS FOR SOILS TREATMENT SYSTEMS,
Environmental Data Service, Asheville, NC.
For primary bibliographic entry see Field 5E.
W78-05993

ENGINEERING AND PEDOLOGICAL PROPERTIES OF SOILS AS THEY AFFECT SOIL ERODIBILITY,
California Univ., Davis. Dept. of Land, Air, and Water Resources; and California Univ., Davis. Dept. of Civil Engineering.
M. Singer, J. Blackard, E. Gillogley, and K. Arulanandan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 856, Price codes: A03 in paper copy, A01 in microfiche. Technical Completion Report, Contribution No. 166, Water Resources Center, January 1978. 32 p, 18 fig, 17 tab, 59 ref. (Project UCAL-WRC-W-502).

Descriptors: *Erosion, *Erosion rates, *Mulching, Soil management, *Soil erosion, *Soil physical properties, Sediments, *Vegetation effects, Soil-water-plant relationships, Soil chemical properties, *California, Cover crops.

This study evaluated the erodibility of three major range soils through field study. A persistent drought during the study period prevented the collection of meaningful data from the field plots. Rainfall from a small laboratory simulator was used to evaluate the relative erodibilities of eight extensive California soils. The physical, chemical, and engineering properties of these soils were determined in the laboratory and related to the relative erodibility of the soils. Critical shear stress, SAR, and dithionite iron content are three measureable properties of soils found to be important in determining their relative erodibility. The relationship between mulch cover percentage and sediment in surface runoff from simulated rainfall was also studied for oat, straw, oak leaf, and redwood litter mulches. A single model was insufficient to accurately show the relationship between soil cover percentage and soil loss. The relationship between soil cover percentage and soil loss was generally parabolic but this does not include soil splash. (Snyder-Calif, Davis)
W78-06036

FUNDAMENTAL STOCHASTIC MODELS OF THE TRANSPORT OF WATER AND SOLUTES THROUGH SATURATED AND UNSATURATED POROUS MEDIA,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
V. K. Gupta, G. Sposito, and R. N. Bhattacharya.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 772, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, December 1977. 47 p, 42 ref. OWRT B-052-ARIZ(3), 14-34-0001-7136.

Descriptors: Porous media, Model studies, Solutes, *Solute transport, *Soil water movement, Markov processes, Theoretical studies, *Stochastic models, *Transport models(Soils).

The theories that have been employed to derive the macroscopic partial differential equations that describe solute transport through porous media are reviewed critically. These foundational theories may be grouped into three general classes: (I) approaches based in fluid mechanics, (II) approaches based in the theory of Markov processes, and (III) approaches based in a formal analogy between statistical thermodynamics and hydrodynamic dispersion. The theories of Class I are open to serious question, among other things because of their use of highly artificial models of porous media and because of their tacit and unproved assumption that solutions of the equations of fluid mechanics exist at the pore level. The theories of Class II tend to suffer from the absence of a firm dynamical basis for the stochastic properties they attribute to the velocity of a solute molecule. The theories of Class III can be either purely formal in nature, with an unclear physical content, or equivalent to well known phenomenological theories that make use of the analogy between heat and matter flow at the macroscopic level. None of the existing foundational theories has yet achieved its objective of deriving in a physically meaningful and mathematically rigorous fashion the macroscopic differential equations of subsurface solute transport theory.
W78-06064

SEASONAL NUTRIENT AND SODIUM ACCUMULATION IN THE MACROPHYTE PONTEDERIA CORDATA,
Carleton Univ., Ottawa (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-06085

SEEPAGE FROM A TRAPEZOIDAL AND A RECTANGULAR CHANNEL USING VARIATIONAL INEQUALITIES,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 4B.
W78-06098

THE INFILTRATION CYLINDER: SOME COMMENTS ON ITS USE,
Dundee Univ. (Scotland). Dept. of Geography.
A. S. Tricker.
Journal of Hydrology, Vol. 36, No. 3/4, p 383-391, February 1978. 5 fig, 3 tab, 10 ref.

Descriptors: *Infiltrometers, *Infiltration, *Laboratory tests, Seepage, Permeability, Soils, Data processing, Regression analysis, Soil science, Soil water, Soil water movement, Cylinder infiltrometets.

Values of infiltration capacity obtained from cylinder infiltrometers are always distorted because of the lateral seepage of water. Recommendations were made as to the best size of cylinder to achieve reasonable accuracy with a small demand for water supply. Laboratory experiments were described also, from which an equation to correct measured infiltration capacities for lateral seepage was derived and tested. (Sims-ISWS)
W78-06103

PACKING AND ANGLE OF REPOSE OF NATURALLY SEDIMENTED FINE SILICA SOLIDS IMMERSED IN NATURAL AQUEOUS ELECTROLYTES,
Imperial Coll. of Science and Technology London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-06106

FACTORS INFLUENCING THE CRUST TEST FOR IN SITU MEASUREMENT OF HYDRAULIC CONDUCTIVITY,
Wisconsin Univ.-Madison. Dept. of Soil Science.
F. G. Baker.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1029-1032, November-December 1977. 1 fig, 5 tab, 14 ref. EPA R802874.

Descriptors: *Hydraulic conductivity, *Permeability, *On-site investigations, Soil water, Soil water movement, Soils, Soil properties, Soil physics, Soil physical properties, Testing, Testing procedures, Soil science, Crust tests.

Field trials using the crust test were used to determine the influence of five parameters on the saturated and unsaturated hydraulic conductivity values measured on two soils of different structure. These factors were: (1) the diameter, (2) the height of the soil pedestal used in the test, (3) the degree of soil wetness at which k was measured, (4) soil structure, and (5) operator effects. Diameter and height were found to strongly affect measurement when they had low values. These two

design factors were dependent on the wetness and structure of the soil. Operator differences were small. (Sims-ISWS)
W78-06109

SOLUTE DISTRIBUTION PROFILES COMPUTED WITH STEADY-STATE AND TRANSIENT WATER MOVEMENT MODELS,
New Mexico State Univ., University Park. Dept. of Agronomy.
P. J. Wierenga.
Soil Science Society of America Journal, Vol 41, No 6, p 1050-1055, November-December 1977. 8 fig, 23 ref. EPA S-803156.

Descriptors: *Hydraulic conductivity, *Solutes, *Soil water movement, *Model studies, Mathematical models, Moisture content, Pressure head, Fertilizers, Pesticides, Salts, Irrigation, Dispersion, Analytical techniques, Soil water, Soil physics, Soil science, Miscible displacement, Finite difference analysis.

A comparison was made between two numerical models for simultaneous movement of water and salts in soil profiles. In the first model, the water content and flux were constant during irrigation with time or depth (steady-state model). In the second model, the water contents and fluxes changed with time and depth following each infiltration according to the hydraulic properties of the soil (transient model). From a comparison between data obtained with the two models, it was shown that both techniques yield comparable results when concentrations are plotted versus cumulative drainage. Measured effluent concentration distributions from columns periodically irrigated with labeled water also compared well with effluent concentation distributions computed with the steady-state model. (Sims-ISWS)
W78-06110

HIGHWAY OPERATION AND PLANT DAMAGE-DATA APPENDIX (SOIL CHEMISTRY, SALT APPLICATION, OZONE, PRECIPITATION),
California State Dept. of Transportation, Sacramento. Transportation Lab.
For primary bibliographic entry see Field 4C.
W78-06131

THE EFFECT OF THE SPRAY IRRIGATION OF SECONDARY TREATED EFFLUENT ON THE VEGETATION, SOILS AND GROUNDWATER QUALITY IN A NEW JERSEY PINE BARRENS HABITAT,
Rutgers - The State Univ., New Brunswick, NJ.
For primary bibliographic entry see Field 5B.
W78-06135

SEWAGE SLUDGE-SOIL SYSTEMS: A STUDY OF METAL FORMS AND EFFECT OF METALS ON CARBON AND NITROGEN TRANSFORMATIONS,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 5C.
W78-06139

EFFECTS OF ANAEROBICALLY DIGESTED MUNICIPAL SEWAGE SLUDGE APPLICATION ON CHEMICAL PROPERTIES OF SELECTED SOILS WITH EMPHASIS ON DISTRIBUTION OF ZINC AND CADMIUM FORMS,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 5B.
W78-06173

2H. Lakes

PRIMARY PLANKTON PRODUCTION IN LAKE BAIKAL, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Inst.
For primary bibliographic entry see Field 5C.
W78-05709

PLANNING METHODOLOGY FOR ANALYSIS AND MANAGEMENT ON LAKE EUTROPHICATION,
Yale Univ., New Haven, CT. School of Forestry and Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-05715

DYNAMICS OF THE BACTERIOPLANKTON POPULATION IN THE UCHINSKOYE RESERVOIR, (IN RUSSIAN),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 5C.
W78-05729

THE PRIMARY PRODUCTION OF PHYTOPLANKTON IN EXPERIMENTS ON BIOMONITORING AT THE UCHINSKOYE RESERVOIR, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W78-05733

PERACARIDA FROM LAKE DUSYA (BALTIC SEA BASIN) (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vinius. Inst. Zoologii i Parazitologii.
For primary bibliographic entry see Field 5C.
W78-05737

SOME TABLES AND REMARKS CONCERNING THE PELAGIC CRUSTACEAN-ASSOCIATION OF LAKE CONSTANCE 1952-1962, (IN GERMAN),
Staatliches Inst. fuer Seenforschung und Seenbewirtschaftung, Konstanz (West Germany). Abt. Max Auerbach-Inst.
For primary bibliographic entry see Field 5C.
W78-05747

REMOTE SENSING OF LAND USE AND WATER QUALITY RELATIONSHIPS-WISCONSIN SHORE, LAKE MICHIGAN,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 5A.
W78-05749

GREAT LAKES FISH EGG AND LARVAE IDENTIFICATION: PROCEEDINGS OF A WORKSHOP, APRIL 19-21, 1976, ANN ARBOR, MICHIGAN.
National Power Plant Team, Ann Arbor, MI.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 772, Price codes: A11 in paper copy, A01 in microfiche. Report FWS/OBS, 1976. 220 p, 4 append. Edited by J. Boreman.

Descriptors: *Great Lakes, *Fish eggs, *Larvae, *Bibliographies, Fish, Growth stages, Classification, *Fish taxonomy, Reviews, Faunal lists, Distribution, Abundance, Methodology, Analytical techniques, Spawning, Life history studies, Morphology, Terminology, Basic data collections.

A workshop on identifying Great Lakes fish eggs and larvae was sponsored April 19-21, 1976 in Ann Arbor, Michigan by the National Power Plant Team of the U.S. Fish and Wildlife Service. Six workshop papers include: (1) the current level of published taxonomic information, including a 377-entry annotated bibliography and a summary table showing gaps in the literature; (2) complete fish species checklists for the five Great Lakes, with an indication of abundance and commercial, sport, and forage importance; (3) an illustrated identification key to the eggs and larvae of the 26 families of fish in the Great Lakes; (4) research problems of fish egg and larvae studies; (5) proposed terminology system for larval fish phases; and (6) detailed descriptions of the larvae of seven fish species common to southeastern Lake Michigan, with notes on relative abundance, egg size, and spawning periods. Four working group reports deal with; (1) determination of taxonomic information gaps of highest priority; (2) current and potential identification tools; (3) relative value of characteristics used for identification, and their variability in the literature; and (4) identification of a reference collection, with recommendations for a coordination center for the Great Lakes. (See W78-05754 thru W78-05758) (Lynch-Wisconsin)
W78-05753

CURRENT LEVEL OF TAXONOMIC INFORMATION ON GREAT LAKES FISH EGGS AND LARVAE,
State Univ. of New York at Syracuse. Dept. of Forest Zoology.
R. G. Werner.
In: Great Lakes Fish Egg and Larvae Identification: Proceedings of a Workshop, April 19-21, 1976, Ann Arbor, Michigan, P. 6-18. 1 tab, 2 ref.

Descriptors: *Fish eggs, *Great Lakes, *Larvae, *Fish taxonomy, *Bibliographies, Reviews, Fish, Growth stages, Classification, Basic data collections.

A 377-entry annoateted bibliography of literature relevant to fish eggs and larvae of the Great Lakes is presented, and gaps in the literature indicated. There are descriptions of egg and larval stages for only about 34% of Great Lakes fish species while an additional 28% have only one of the two stages described; the remaining 38% have no description. Of existing descriptions many are incomplete, and may not be comparable among species. Although an unidentified specimen may appear to match a description, lack of descriptions for closely-related species makes positive identification impossible. A two-step solution of the problem is: (1) compile descriptive material from the literature as a short-term identification aid to the field investigator, and (2) establish a long-term program to encourage comprehensive investigations into limited tasonomic groups. When sufficient additional research has been completted, an identification dye can be developed. Descriptions should be standardized to enable comparison of species. In addition to the extensive bibliograhy, a summary table arranged by species in included listing references for eggs and larvae descriptions. The bibliography itself is arranged taxonomically, and is considered relatively complete by the author. (See also W78-05753), (Lynch-Wisconsin)
W78-05754

FISH INHABITING U.S. WATERS OF THE GREAT LAKES, WITH INDICATIONS OF THEIR RELATIVE ABUNDANCE AND OF THEIR IMPORTANCE AS COMMERCIAL, SPORT, OR FORAGE SPECIES,
National Marine Fisheries Service, Ann Arbor, MI. Great Lakes Fishery Lab.
L. Emery.
In: Great Lakes Fish Egg and Larvae Identification: Proceedings of a Workshop, April 19-21, 1976, Ann Arbor, Michigan, p. 19-25. 9 ref.

Descriptors: *Fish, *Great Lakes, *Faunal lists, *Abundance, United States, Animal populations, Lake Michigan, Lake Superior, Lake Huron, Lake Erie, Lake Ontario, Distribution, Forage fish, Commercial fish, Sport fish.

A literature survey was used to construct complete checklists of fish species for each of the Great Lakes, presented in an appendix to this report. Each species' abundance was classified as: (1) common: (2) uncommon, although formerly common; or (3) uncommon, past and present. Species which have not been recorded in the last ten years were excluded from the lists. A species was classified as common if it occurs in any substantial portion of the lake; included as all fish of commercial importance and most of those important as sport or forage fish. Category 3 fish are generally only marginal inhabitants, residing primarily in tributaries. Fish species important as commercial, sport, or forage fish were do designated. A commercially important fish was defined as one with a production of at least 5,000 lbs in 1974. Only common names are given for the fish. (See also W78-05753) (Lynch-Wisconsin)
W78-05755

FISH EGG AND LARVAE STUDIES: SOME PROBLEMS AND RECOMMENDED SOLUTIONS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
J. D. Hardy, Jr.
In: Great Lakes Fish Egg and Larvae Identification: Proceedings of a Workshop, April 19-21, 1976, Ann Arbor, Michigan, p. 32-40.

Descriptors: *Fish eggs, *Larvae, *Methodology, Analytical techniques, *Research equipment, Reviews, Growth stages, Laboratory equipment, Spawning, Fish, Life history studies, Publications, Preservation, Illustration techniques, Specimen collections.

Difficulties encountered by researchers studying fish eggs and larvae are discussed, including; (1) library research, (2) rearing of fish eggs and larvae, (3) maintaining a specimen collection, and (4) publication. Eight problems involved with bibliographic research are defined: missed references, errors introduced by reviewers, information gaps in reviews, misquoted data, misidentifications, misuse of the term 'life history,' misleading titles, and changes in life history terminology. For egg and larvae rearing, a brief description is given of a circular constant flow embryological module, consisting of a wading pool with a trash can in the middle, a pump, and some water. A mobile unit is being developed. Fish eggs have traditionally been preserved in buffered formalin, but other fixatives are preferred for certain purposes. For illustrations using electron scanning, eggs should be preserved in gluteraldehyde, and for electrophoresis, 2-phenoxyethanol is suggested. More use should be made of color in illustrating. A microscope should become a standard field tool for pigment observations prior to preservation of larvae specimens. Larvae should be preserved in 2-phenoxyethanol; electrophoresis, clearing, and staining are useful for identification. Despite the value of preservation, live eggs are nevertheless preferable for study. In publishing, a loose-leaf format should be considered. (See also W78-05753) (Lynch-Wisconsin)
W78-05756

TERMINOLOGIES FOR INTERVALS OF LARVAL FISH DEVELOPMENT,
Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology.
D. E. Snyder.
In: Great Lakes Fish Egg and Larvae Identification: Proceedings of a Workshop, April 19-21, 1976, Ann Arbor, Michigan, p. 41-60. 1 fig, 1 tab, 41 ref.

Descriptors: *Larvae, *Fish, *Growth stages, *Life History studies, *Terminology, Analytical techniques, Methodology, Morphogenesis, Fins, Animal growth, Morphology.

Several terminology systems for larval fish phases are reviewed, and a new standardized system is recommended, based on four phases: (1) larva, (2) protolarva, (3) mesolarva, and (4) metalarva. The phases are based on the morphogenesis of the median finfold and fin elements (spines, and rays); paired fins are included in the definition of the last phase. The larval phase is characterized by obvious fin morphogenesis following hatching or parturtion, ending immediately before: (1) the last finfold and atrophying fins are adsorbed beyond recognition; (2) the full complement of distinct fin elements (spines and rays) become apparent in all fins; and (3) principal ray segmentation becomes apparent in all fins. This phase may be absent in some fish. In the protolarval phase distinct median fin elements (dorsal, anal, or caudal spines or rays) are not yet apparent. In the mesolarval phase at least one but not the full complement is present and the adult possesses pelvic fins, the pelvic buds or fins are not yet apparent. The metalarval phase is characterized by the presence of the full complement of distict principal rays in the median fins and, if the adult possesses pelvic fins, the pelvic buds or fins are apparent. Thirteen terminology systems are reviewed in this paper, and a term frequency table is given. (See also W78-05753) (Lynch-Wisconsin)
W78-05757

IDENTIFICATION OF LARVAL FISHES TAKEN FROM THE INSHORE WATERS OF SOUTHEASTERN LAKE MICHIGAN NEAR THE DONALD C. COOK NUCLEAR PLANT, 1973-1975,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
J. A. Dorr, III, D. J. Jude, F. J. Tesar, and N. J. Thurber.
In: Great Lakes Fish Egg and Larvae Identification: Proceedings of a Workshop, April 19-21, 1976, Ann Arbor, Michigan, p 61-82. 3 fig, 8 tab, 14 ref.

Descriptors: *Fish, *Larvae, *Lake Michigan, *Nuclear powerplants, Entrainment, Fish eggs, Spawning, Great Lakes, Nearshore zones, Michigan, Species composition, Sampling, Alewife, Spottail shiner, Rainbow smelt, Yellow perch, Trout-perch, Jonny darter, Slimy sculpin, Basic data collections.

Characteristics of the larvae of seven fish species common to southeastern Lake Michigan are described as an aid to identification. Larvae described are: alewife (Alosa pseudoharengus), spottail shiner (Notropis hydsonius), rainbow smelt (Osmerus mordax), yellow perch (Perch flavescens), trout-perch (Percopsis omiscomaycus), Johnny darter (Etheostoma nigrum), and slimy sculpin (Cottus cognatus). Bloaters and white suckers are found, but spawn outside the study area. About 2000 specimens were collected between 1973-75 at open lake stations and intake/discharge forebays of the Donald C. Cook Nuclear Plant near Bridgman, Michigan. As many as 20 million eggs are calculated to have been entrained by the plant in a single day. Larval samples were collected with a 361-micrometer mesh plankton net, concentrated in 0.5-liter jars, and preserved in 10% formalin. Larval identification was made using abundance/distribution information for adult fish, identification keys and descriptive literature, comparison with known specimens, rearing of larvae, and assistance from outside investigators. Adult fish sampling was conducted concurrently. Alewife constituted 73% by number of the adult fish catch, and 72% of the larval catch, followed by spottail shiners (15%, 21%), rainbow smelt (7%, 5%), yellow perch (3%, 2%), trout-perch (2%, 0.2%), Johnny darter (0.2%, 0.1%), and slimy sculpin (0.1%, 0.1%). Spawning period and egg size charts are included. (See also W78-05753) (Lynch-Wisconsin)
W78-05758

OBSERVATIONS OF LONG NONLINEAR INTERNAL WAVES IN A LAKE,
Department of the Environment, Victoria (British Columbia). Inst. of Ocean Sciences.
D. M. Farmer.
Journal of Physical Oceanography, Vol 8, No 1, p 63-73, January 1978. 11 fig, 1 tab, 20 ref.

Descriptors: *Internal waves, *Lakes, *On-site investigations, *Canada, Temperature, Water temperature, Instrumentation, Winds, Waves(Water), Storm surge, Surges, Currents(Water), Current meters, Data collections, Data processing, Limnology, *Babine Lake(British Columbia).

Described in this paper were observations of large-amplitude, long internal waves in Babine Lake, British Columbia. A unique feature of the observations is that they were taken simultaneously at several different points along the major axis, which permits study of the formation and subsequent development of individual waves as they travel along the lake. The waves typically begin as depressions on the thermocline at the south end following strong westerly winds directed along the lake's major axis. A bend in the southern part of the lake, together with the influence of surrounding mountains, can introduce a divergence in the longitudinal component of the wind stress, which in turn produces a thermocline elevation. These two effects then combine to form a northward traveling surge. Subsequent modification of the waveform was interpreted in terms of nonlinear steepening and dispersion. (Sims-ISWS)
W78-05771

REMOTE DETERMINATION OF THE CONCENTRATION OF SUSPENDED PARTICLES IN THE WATER OF RESERVOIRS ON THE BASIS OF MEASUREMENTS OF SPECTRAL LUMINANCE COEFFICIENTS,
L. V. Semenchenko, L. V. Bakhareva, and A. G. Kal'ko.
Soviet Hydrology: Selected Papers, Vol 15, No 1, p 12-14, 1976. 3 fig, 1 tab, 6 ref. Translated from Transactions of the State Hydrologic Institute (Trudy GGI), No 237, p 65-70, 1976.

Descriptors: *Suspended solids, *Remote sensing, *Reservoirs, *Optical properties, Reflectance, Laboratory tests, Measurements, Silts, Sands, Spatial distribution, Distribution patterns, Analytical techniques, Instrumentation, Water quality, Foreign research, Pollutant identification, *USSR.

Simultaneous measurements of the concentration of suspended particles in water and of the spectral luminance coefficients were performed in 1966-69 in three reservoirs: Kayrakkum, Dubossary, and Mingechaur. These reservoirs have a different hydrologic regime and a different composition of suspended matter. Fine fractions typically predominate in the suspended matter, and its reflectivity in the Kayrakkum Reservoir is higher by a factor of 3 than that in the Dubossary Reservoir and by a factor of 2 than in the Mingechaur Reservoir. The suspended particle concentration in the water varied within broad limits, from 2 to 800 g/cum. The relative error in its determination was 15-20%. The depth of visibility of a white disk varied from 4 m to 10 cm. The coefficients of spectral luminance of the reservoirs were measured with an IFT-19 hydrophotometer. Correlation equations obtained can be used for remote determination of the suspended particle concentration in reservoirs from the measured coefficients of their spectral luminance. (Humphreys-ISWS)
W78-05790

CHEMICAL SYSTEMS MONROE RESERVOIR, INDIANA,
Indiana Univ., Bloomington. Dept. of Geology.
M. J. Graham.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 634, Price codes: A07 in paper copy, A01 in microfiche.

Masters of Arts Thesis, August, 1977. 131 p, 23 fig, 3 tab, 21 ref, 2 append. OWRT B-074-IND(3), 14-31-0001-5143.

Descriptors: *Chemical analysis, *Discharge measurement, *Dissolved solids, *Discharged(Water), *Indiana, *Stratification, Ion transport, Ions, Reservoirs, Streams, Streamflow, Turnovers, Chemical stratification, Dry seasons, Wet seasons, Input streams, Flushing, Dissolved solids concentration, Ion concentration, *Monroe Reservoir(IND), Salt Creek, Stephens Creek.

The chemical nature of the input streams (the North, Middle and South Forks of Salt Creek and Stephens Creek) to Monroe Reservoir was analyzed; the input flow was measured at four stream gauging stations. Samples were collected at different flow regimes and analyzed for temperature, pH, conductivity, dissolved oxygen, alkalinity, hardness, turbidity, suspended sediment, Cl(-), PO4(---), SO4(--), NO3(-), Ca(++), Mg(++), K(+), and total Fe. Of the 3 forks of Salt Creek, there are no significant differences between the North and South Forks in mean chemical concentrations. The Middle Fork is higher in Mg(++), and SO4(--) and lower in Cl(-) than the other forks. There is no difference between the major inputs in terms of mean nutrient concentration (phosphate and nitrate). Major cations and bicarbonates decrease with increasing discharge; nitrates, sulphates, and chlorides are not related to discharge. Phosphate and suspended sediment increase exponentially with discharge; by controlling sediment and phosphate input during periods of high discharge, the overall input of these factors can be greatly reduced. The two primary source basins which discharge into the reservoir are described and differ only in Ca(++) mean concentrations. Wet and dry hydrologic periods, with water replacement times of 4.3 months and 21.3 months respectively, were studied. The dry season is characterized by low input flow and lake stage, high concentrations of total dissolved solids and ions, little exchange of water through the reservoir, and water stratification lasting for about one-third of the year. The wet season begins after turnover and a large input of water with low total dissolved solids enters the reservoir. The chemical system may be flushied during the short replacement time of 4.3 months for the wet season. (Seip-IPA)
W78-05805

SEDIMENTATION AND SOIL ALTERATION, MONROE RESERVOIR, INDIANA,
Indiana Univ., Bloomington. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-05815

OPTIMAL STATE ANALYSIS OF RESERVOIRS,
California Univ., Riverside. Dry Lands Research Inst.
For primary bibliographic entry see Field 4A.
W78-05817

DIURNAL TEMPERATURE DISTRIBUTION IN SMALL WATER RESERVOIRS (PHASE II),
Missouri Water Resources Research Center.
B. F. Armaly, and D. Prouty.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 587, Price codes: A07 in paper copy, A01 in microfiche. Completion Report, October 10, 1976. 139 p, 20 fig, 59 ref, 3 append. OWRT A-080-MO(4), 14-31-0001-4025 and 6026.

Descriptors: *Stratification, *Thermocline, *Temperature distribution, Solar load, Epilimnion, *Reservoirs, Diurnal, *Turbidity, Impoundments, *Solar radiation, Convection, *Evaporation, Model studies, *Simulation analysis, *Mathematical models, Water temperature, *Ambient conditions, *Computer programs.

The influence of turbidity on the diurnal temperature distribution and thermocline development in a deep water impoundment which is exposed to heating and cooling loads by convection, evaporation, and radiation is examined. The diurnal behavior of the solar load, directional and spectral, is used with an isotropic multiple scattering model to simulate the attenuation of solar flux by turbid water. The diurnal behavior of the ambient temperature, humidity and wind speed were mathematically modeled to simulate the local spring time of the year. The combined conduction and radiation energy transfer through the water was treated as a one dimensional problem and the governing energy equation was numerically solved through an explicit finite difference method. The resulting temperature distribution is significantly affected by the turbidity level of the water and the behavior is similar to the natural temperature distribution in water reservoir. The surface temperature, however, appears to be affected more directly by the ambient conditions and not by the turbidity level of the water. (See also W75-04443)
W78-05818

PHYSICAL AND CHEMICAL LIMNOLOGY AND CHLOROPHYLL-A CONTENTS IN THE PHYTOPLANKTON OF A MOUNTAIN LAKE LAKE SANTO PARMENSE, ITALY, (IN ITALIAN),
Parma Univ. (Italy). Lab. di Ecologia.
For primary bibliographic entry see Field 5C.
W78-05820

BIOLOGICAL ACTIVITY OF SODDY-PODZOLIC SOILS UNFLOODED AND FLOODED BY THE WATER OF MOZHAISK RESERVOIR, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics; and Moscow State Univ. (USSR). Dept. of Soil Melioration.
For primary bibliographic entry see Field 2G.
W78-05827

PRODUCTIVITY OF ZOOPLANKTON IN DUVANKUL' LAKE IN THE SOUTHERN URALS, (IN RUSSIAN),
Siberian Research Inst. of the Fish Industry, Sverdlovsk (USSR). Ural Div.
For primary bibliographic entry see Field 5C.
W78-05854

CORRELATION OF THE PROCESSES OF SYNTHESIS TO DESTRUCTION OF ORGANIC MATTER IN RELATION TO THE ANNUAL WATER CONTENT IN THE MOZHAISK RESERVOIR, (IN RUSSIAN),
Moscow State Univ. (USSR). Probl. Lab. Interaction Surface Underground Waters.
For primary bibliographic entry see Field 5C.
W78-05874

EFFECTS OF TEMPERATURE FACTORS IN THE ACCUMULATION OF RADIOACTIVE NUCLIDES IN FISH, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W78-05891

HYDROGEOLOGY OF THE LAKE METIGOSHE BASIN NORTH DAKOTA AND MANITOBA,
North Dakota Univ., Grand Forks. Dept. of Geology; and Geological Survey, Grand Forks, ND.
For primary bibliographic entry see Field 5B.
W78-05933

THE USE OF SATELLITE IMAGERY FOR LAKE CLASSIFICATION IN WISCONSIN,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
K. W. Holmquist, and F. L. Scarpace.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 628, Price codes: A03 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, WIS-WRC-77-08, 1977. 35 p, 9 fig, 2 table, 1 ref, 1 append. OWRT A-062-WIS(1). 14-34-0001-6052, 14-34-0001-5050.

Descriptors: *Lakes, *Eutrophication, *Computer programs, *Remote sensing, *Lake classification, *Trophic level, Time series analysis, Water pollution, *ERTS, *LANDSAT imagery.

A cooperative program between the Wisconsin Department of Natural Resources (DNR) and the University of Wisconsin has resulted in an initial assessment of the trophic status of inland lakes in the State of Wisconsin from LANDSAT data. The feasibility of using both the photographic representation of the LANDSAT imagery as well as the digital representation of the LANDSAT imagery to classify lakes was investigated. It was determined that LANDSAT imagery can be used to predict lake water parameters or trophic classification. Time series data analyses indicated the necessity of a periodic rather than a one-time data extraction process. The best lake classification can be derived from the digital representation of LANDSAT. Accounting for the differences in atmospheric conditions from day to day is an important consideration in the analysis of LANDSAT imagery. A collection of computer programs has been developed to derive lake trophic status from LANDSAT imagery which correlates well with ground calibration. This analysis technique has been a cost-effective method of classifying inland lakes in Wisconsin.
W78-05935

THE WHITE AMUR AS A BIOLOGICAL CONTROL FOR AQUATIC WEEDS IN INDIANA,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 4A.
W78-05936

CRITERIA FOR THE USE OF VERTICAL AVERAGING IN GREAT LAKES DISPERSION MODELS,
Cleveland State Univ., OH. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W78-05947

POTENTIAL TOXICITY OF TACONITE TAILINGS TO AQUATIC LIFE IN LAKE SUPERIOR,
Reserve Mining Co., Silver Bay, MN.
For primary bibliographic entry see Field 5C.
W78-05954

DIVERSITY AND DISTRIBUTION OF MUSSELS (BIVALVIA: UNIONACEA) IN A EUTROPHIC RESERVOIR, LAKE ASHTABULA, NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Geology.
For primary bibliographic entry see Field 5C.
W78-05959

THE CYCLE OF HEAVY METALS IN LAKES, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switzerland). Seenforschungslab.
For primary bibliographic entry see Field 5B.
W78-05962

PHOSPHORUS LOADING AND RESPONSE IN LAKE VANERN NEARSHORE AREAS,
National Swedish Environmental Protection Board, Uppsala.
For primary bibliographic entry see Field 5C.

W78-05966

PRODUCTION OF CHIRONOMUS, PROCLADIUS, AND CHAOBORUS AT DIFFERENT LEVELS OF PHYTOPLANKTON BIOMASS IN LAKE MEMPHREMAGOG, QUEBEC-VERMONT,
McGill Univ., Montreal (Quebec). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-05968

NUTRIENT ENRICHMENT AND EUTROPHICATION OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W78-05970

ASSESSMENT OF WHITEFISH AND RELATED SPECIES IN LAKES MICHIGAN AND SUPERIOR,
Wisconsin Dept. of Natural Resources, Madison.
J. D. Moore, and B. L. Swanson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 022, Price codes: A03 in paper copy, A01 in microfiche. Report to NOAA National Marine Fisheries Service, Washington, D.C., June 1976. 24 p, 2 fig, 23 tab. 3-169-R.

Descriptors: *Fish year class strength, *Whitefish, *Lake Michigan, *Lake Superior, *Commercial fishing, *Fish populations, Coregonus clupeaformis, Fish, Great Lakes, Fisheries, Fishing, Meteorological data, Wisconsin, Fish management, Temperature.

Year class strengths of lake whitefish (Coregonus clupeaformis) were determined for lakes Michigan and Superior, and factors which regulate year class stength and influence survival to maturity were investigated. Whitefish currently is the most valuable commercial fish in Wisconsin waters of the two lakes, but extreme fluctuations in abundance have occurred for reasons not completely understood. Between 1941 and 1974, Lake Superior production ranged from a low of 46,000 lbs in 1965 to a high of 764,000 lbs in 1949; in 1974 production was 212,000 lbs. In Lake Michigan the low was 9,219 lbs in 1958, and the high was 1,806,174 lbs in 1947; in 1974 the figure was 1,174,208 lbs. Assessment of whitefish stocks was conducted through monitoring commercial gill net and pound net fisheries, evaluation of commercial fishermen's catch reports, and catch sampling of pound net catches. For Lake Superior, year class strengths for 1961-75 are available. The year classes 1966, 1970 and 1973 appear to be strong, while 1961, 1962, 1963, 1969, 1971, 1974, and 1975 are weak to moderately weak. In Lake Michigan, two strong year classes were 1968 and 1969. Year class strengths may be based on climatological factors, direct human influences (fishery), and indirect human influences (environmental or fish species alteration). Warm May-August air temperatures appear to correlate with strong year classes for Lake Superior. (Lynch-Wisconsin)
W78-05971

BACTERIAL CONTAMINATION OF LAKE POWELL WATERS: AN ASSESSMENT OF THE PROBLEM,
New Mexico Univ., Albuquerzque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-05972

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 4. PHYTOPLANKTON OF LAKE MICHIGAN,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environment Research Lab.
For primary bibliographic entry see Field 5C.
W78-05973

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 6. ZOOBENTHOS OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W78-05974

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 14. BIRDS OF THE LAKE MICHIGAN DRAINAGE BASIN,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 5C.
W78-05975

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 16. AMPHIBIANS AND REPTILES OF THE LAKE MICHIGAN DRAINAGE BASIN,
Wisconsin Univ.-Madison. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-05976

EUTROPHICATION IN VERMONT,
Vermont Dept. of Water Resources, Montpelier. Water Quality Div.
For primary bibliographic entry see Field 5C.
W78-05977

UTILIZATION OF SATELLITE DATA FOR INVENTORYING PRAIRIE PONDS AND LAKES,
Environmental Research Inst. of Michigan, Ann Arbor.
E. A. Work, Jr, and D. S. Gilmer.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-28596, Price codes: A02 in paper copy, A01 in microfiche. Photogrammetric Engineering and Remote Sensing, Vol. 42, No. 5, p 685-694, May 1976. 11 fig, 12 ref. Report NASA-CR-14654. NASA S-70243AG-4.

Descriptors: *Remote sensing, *Satellites(Artificial), *LANDSAT-1, *Lakes, *Ponds, *Wildlife habitats, *Analytical techniques, Migratory birds, Prairies, ERTS-2, Mapping, Waterfowl, Infrared radiation, Wildlife management, North Dakota, Multispectral scanners.

Two techniques based on remote sensing imagery from the LANDSAT-1 (formerly ERTS-1) satellite were used to map open surface water features in glaciated prairies, in support of studies of waterfowl habitat quality of lakes and ponds in east-central North Dakota. The two recognition techniques were: (1) a single waveband thresholding approach, and (2) proportion estimation, a multiple waveband approach. The single waveband technique was simple to implement, and prairie lakes and large ponds were rapidly and accurately recognized. It was used to generate thematic maps and statistical tabulations describing open surface-water conditions; the maps, however, required additional manual interpretation. The proportion estimation technique estimates the fraction of a resolution cell composed of open water, permitting recognition of a greater number of small ponds and providing improved apparent spatial data resolution by a factor of three. Development of an operational system using high-altitude sensors for synoptically characterizing wetland habitat conditions seems possible using a combination of the two techniques. The single waveband method would identify resolution cells composed totally of water, while the more costly proportion estimation technique would delineate only water peripheral to already identified ponds and lakes, and water features smaller than one resolution cell. (Lynch-Wisconsin)
W78-05979

EFFECTS OF SUBMERGED MACROPHYTES ON HELEOPLANKTONIC CLADOCERA,
Rhode Island Univ., Kingston.
For primary bibliographic entry see Field 5C.
W78-05980

UTAH LAKE-JORDAN RIVER BASIN MODELING PROJECT. VOLUME I. SUMMARY REPORT. VOLUME II. APPENDIX.
Environmental Dynamics Inc., Los Angeles, CA.
For primary bibliographic entry see Field 5B.
W78-05983

ABOUT THE EUTROPHICATION PROCESS OF LAKES, (IN HUNGARIAN),
Lajos Kossuth Univ., Debrecen (Hungary). Dept. of Anthropology; and Lajos Kossuth Univ., Debrecen (Hungary). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-06005

NUTRIENT RELEASE FROM ANAROBIC SEDIMENTS,
Limno-Tech Inc., Ann Arbor, MI.
For primary bibliographic entry see Field 5C.
W78-06007

INVESTIGATION OF THE SUSPENDED SOLIDS FROM LAKE CONSTANCE AFFLUENTS, (IN GERMAN),
Staatliches Inst. fuer Seenforschung und Seenbewirtschaftung, Langenargen (West Germany).
For primary bibliographic entry see Field 5B.
W78-06016

ORGANIC MATTER DISTRIBUTION CHARACTERISTICS IN THE SHOAL SEDIMENTS OF THE SELENGA DELTA IN LAKE BAIKAL, (IN RUSSIAN),
Limnologicheskii Inst., Irkutsk (USSR).
For primary bibliographic entry see Field 5B.
W78-06034

MORTALITY OF FISH AND ENVIRONMENTAL CONDITIONS IN LAKE CHAD DURING A PERIOD OF DROUGHT, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de N'Djamena.
V. Benech, J. Lemoalle, and J. Quensiere.
Cah Orstrom Ser Hydrobiol 10(2), p 119-130, 1976.

Descriptors: Lake Chad(Chad), Water level fluctuations, Water loss, *Anoxia, Decomposition, *Drought, Environmental effects, *Fish mortality, Lakes, Macrophytes, Turbulence.

During the 1972-74 drought, Lake Chad (Chad) was split into 3 separate basins as a result of the water level decrease. The variations of some chemical and physical parameters are described for the northern basin and for the eastern archipelago at Bol. Mass fish mortalities were observed in both basins. They are associated with water turbulence during the decrease of the water level but anoxia due to macrophyte decomposition is the main cause for mortalities during the annual flood at Bol. Relative catch per unit effort of some species are given. A criteria level, below which mortalities occurred, was determined for both basins.--Copyright 1977, Biological Abstracts, Inc.
W78-06037

SEASONAL ABUNDANCE AND SPATIAL DISTRIBUTION OF LAKE MICHIGAN MACROBENTHOS, 1964-67,
California State Univ., Los Angeles. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-06046

FEDERAL LAKE ERIE WATER QUALITY STANDARDS PROPOSALS.
Environmental Protection Agency, Region V, Chicago, IL.
For primary bibliographic entry see Field 5G.
W78-06048

MERCURY CONCENTRATIONS IN FISH IN LAKE OAHE, SOUTH DAKOTA, APRIL 16 TO SEPTEMBER 27, 1972.
Environmental Protection Agency, Denver, CO.
For primary bibliographic entry see Field 5C.
W78-06051

INLAND WETLAND DEFINITIONS,
Connecticut Univ., Storrs. Biological Sciences Groups.
M. W. Lefor, and W. C. Kennard.
University of Connecticut Institute of Water Resources, Report No. 28, November, 1977. 63 p, 4 fig, 39 ref.

Descriptors: *Wetlands, *Northeast U.S., *Connecticut, *Reviews, Marshes, Swamps, Bogs, Freshwater marshes, Administration, Marsh management, Documentation, Classification, *Definitions(Wetlands), *Inland wetlands, *Descriptions(Wetlands).

This multidisciplinary project was designed to study wetland definitions in depth and to develop definitions suitable for widespread use. Reviewed are inland wetland definitions from: geology, hydrogeology, hydrology, pedology, biology, systems ecology, sociology, economics, political science, public health and law. Of these, geology, hydrogeology, hydrology, biology, systems ecology, and economics are discussed in detail and are used in writing a final theoretical (ideal) definition of inland wetlands for the glaciated northeastern United States. A proposed legal definition for Connecticut is also offered with descriptions and explanations of terms. (Steiner-Mass)
W78-06083

A GUIDE TO UNDERSTANDING AND ADMINISTRATING THE MASSACHUSETTS WETLANDS PROTECTION ACT.
Massachusetts Audubon Society, Lincoln.
For primary bibliographic entry see Field 6E.
W78-06084

ALTERNATIVE MANAGEMENT STRATEGIES FOR VIRGINIA'S COASTAL WETLANDS: A PROGRAM OF STUDY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6G.
W78-06086

THE USE OF WATER AND MINERALS BY EVERGREEN AND DECIDIOUS SHRUBS IN OKEFENOKEE SWAMP,
California Univ., Santa Barbara. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2I.
W78-06087

DISTRIBUTION, SEASONALITY, AND BIOMASS OF AQUATIC MACROPHYTES IN LAKE OPINICON (EASTERN ONTARIO),
Queen's Univ., Kingston (Ontario). Dept. of Biology.
A. A. Crowder, J. M. Bristow, M. R. King, and S. Vanderkloet.
Le Naturaliste Canadien, Vol. 104, p 441-456, 1977. 7 fig, 4 tab, 31 ref, 1 append.

Descriptors: *Submerged plants, *Biomass, *Distribution patterns, *Phenology, Aquatic plants, Rooted aquatic plants, Pondweeds, Aquatic habitats, Lakes, Ecological distribution, Plant growth, *Seasonal, *Canada, *Lake Opinicon(Ontario), *Aquatic macrophytes.

The biomass, frequency, abundance, distribution, and phenology of the submerged macrophytes in the lake were investigated. Mean organic biomass was 248 g per sq m with a range of 1 to 1,154 g per sq m; biomass decreased significantly with depth. The most frequent plants were Chara globularis, Lemna triscula, Vallisneria americana, Potamogeton robbinsii, Potamogeton friesii, Myriophyllum spp., Najas flexilis, Najas guadalupensis and Ceratophyllum demersum, which were all positively associated. N. guadalupensis and C. demersum occurred in deeper water. Time of flowering varied considerably from species to species. A comparison with a 1947 survey showed no major changes (Myriophyllum spicatum has however increased since 1974). A checklist of the macrophytes of both the deep and shallow water is appended. (Steiner-Mass)
W78-06088

FORESTS AND WATER: EFFECTS OF FOREST MANAGEMENT ON FLOODS, SEDIMENTATION, AND WATER SUPPLY,
Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.
For primary bibliographic entry see Field 4C.
W78-06089

WETLAND MAPPING IN NEW JERSEY AND NEW YORK,
Earth Satellite Corp., Washington, DC.
For primary bibliographic entry see Field 7C.
W78-06092

COMPARATIVE CHEMISTRY OF A COOLING RESERVOIR AND ITS WATER SOURCE,
North Texas State Univ., Denton. Dept. of Biological Science.
For primary bibliographic entry see Field 5B.
W78-06114

THE ARRESTED TOPOGRAPHIC WAVE,
Woods Hole Oceanographic Institution, MA.
G. T. Csanady.
Journal of Physical Oceanography, Vol. 8, No. 1, p 47-62, January 1978. 8 fig, 1 tab, 23 ref.

Descriptors: *Circulation, *Water circulation, *Ocean circulation, *Waves(Water), *Model studies, *Lake Ontario, Mathematical models, Winds, Ocean waves, Topography, Shores, Coasts, Oceans, Continental Shelf, Lakes, Oceanography, Limnology, Topographic waves.

The mean circulation in a coastal zone of variable depth, under certain circumstances, may be modeled by linear equations, including a bottom friction linear in the depth-averaged velocity. The resulting steady-state problem is similar to the problem of topographic wave generation by wind. The equation governing the pressure field has the form of a one-dimensional heat conduction equation, with longshore distance in the direction of topographic wave propagation playing the role of time. The effects of wind stress or of freshwater influx are felt only over the forward portion of a long shelf (i.e., that portion to which topographic waves propagate from the source region). Various simple solutions can be written down for the arrested topographic wave problem in virtue of the heat conduction analogy. Generally the solutions show the presence of a pressure field trapped in a nearshore band. For periodic wind stess, for example, the scale width of the trapped pressure field is L = sq rt of (2r/fks), where r is a bottom resistance coefficient (dimension velocity), f the Coriolis parameter, k the longshore wavenumber of the wind stress, and s bottom slope, assumed constant. The model was applied to the eastern North Ameican continental shelf in an attempt to determine the physical origin of the southwestward pressure gradient which has recently been identified as the main driving force of the observed longshore flow. It was shown that neither wind stress nor freshwater influx can be held reasonably accountable for this pressure gradient. On the other hand, a longshore surface elevation gradient imposed at the shelf break by the dynamics of a deepwater current produces exactly the type of response observed over the shelf. The same model also accounts for the mean circulation in winter of Lake Ontario, as well as for some features of the summer circulation. (Sims-ISWS)
W78-06117

AN ECOLOGICAL MODEL FOR LAKE ONTARIO MODEL FORMULATION, CALIBRATION, AND PRELIMINARY EVALUATION,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
D. Scavia, B. J. Eadie, and A. Robertson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 412, Price codes: A04 in paper copy, A01 in microfiche. NOAA Technical Report ERL 371-GLERL 12, June 1976. 68 p, 23 fig, 5 tab, 92 ref, 3 append.

Descriptors: *Ecology, *Great Lakes, *Lake Ontario, *Model studies, Mathematical models, Phytoplankton, Zooplankton, Detritus, Nitrogen, Ammonia, Nitrates, Phosphorus, Carbonates, Benthos, Benthic fauna, Fish, Lakes, Limnology, Biological properties.

A simulation model was developed for the Lake Ontario ecosystem. The model described the dynamics of four types of phytoplankton and six types of zooplankton, detritus, organic nitrogen, ammonia, nitrate, available phosphorus, the carbonate system, and benthic invertebrates. The equations were described. The ecological model was driven by a physical model designed to predict average temperature, segment thicknesses, and vertical diffusion coefficients for the three-layer model. In addition, an original formulation for calculating sedimentation rates was shown to predict accurately community settling rates. The simulated processes and predicted variables follow ecologically realistic patterns and compare favorably to measured parameters in Lake Ontario. Sensitivity analyses revealed that modeled phosphorus was quite responsive to changes in diffusion, sedimentation was critical to predicting benthic dynamics, and self-shading by phytoplankton was not critical due to the relationship between light limitation and phosphorus depletion. Changes in temperature resulted in predicted shifts in the peaks of the phytoplankton and zooplankton, and the sensitivity of the model to fish predation indicated the need for better descriptions of fish dynamics. (Sims-ISWS)
W78-06119

REVIEW AND APPRAISAL OF NUMERICAL CIRCULATION MODELS FOR LAKE MICHIGAN,
Argonne National Lab., IL. Energy and Environmental Systems Div.
J. H. Allender.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/WP-76-6, Price codes: A06 in paper copy, A01 in microfiche. Report ANL/WR-76-6, September 1976. 111 p, 40 fig, 4 tab, 68 ref, 1 append. ERDA W-31-109-Eng-38.

Descriptors: *Lake Michigan, *Great Lakes, *Water circulation, *Model studies, Mathematical models, Currents(Water), Winds, Lakes, Numerical analysis, Theoretical analysis, Mathematics, Bathymetry, Meteorological data, Current meters, Limnology.

Output from four numerical-hydrodynamical models for the lake was compared to data from the field program of the Federal Water Pollution Control Agency (FWPCA) for September 1963 and/or to other limited data from which lake currents could be inferred. The comparisons between model-generated and observed currents were made by using real-time graphs for fixed locations, power spectra, lakewide plots of average motion, progressive vector diagrams, cumulative scalar- and vector-averaged currents at fixed locations; horizontal scalar averages at various depths; and Fourier norms. The major merit of the models was their apparent ability to simulate circulation patterns. This ability can be used to expose important avenues of exchange between the northern and southern basins of the lake and to locate dominant features in the motion of the lake. The major failing of the models was their inability to simulate time-series currents at a fixed location. This failing was shown to be primarily the result of inadequate knowledge of wind and temperature fields. Choice of an appropriate means for data and model comparison evolves as a difficult and important task. Suggestions were made for model improvement and synthesis with future observations in order to focus on average motion in the deep lake. (Sims-ISWS)
W78-06122

WATER RESOURCES RESEARCH PROGRAM, NEARSHORE CURRENTS AT POINT BEACH, WISCONSIN (1974-1975),
Argonne National Lab., IL. Energy and Environmental Systems Div.
K. D. Saunders, L. VanLoon, C. Tome, and W. Harrison.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/WR-76-1, Price codes: A12 in paper copy, A01 in microfiche. Report ANL/WR-76-1, March 1976. 270 p, 198 fig, 10 tab, 23 ref, 3 append. ERDA W-31-109-Eng-38.

Descriptors: *Currents(Water), *Lake Michigan, *Wisconsin, *Surveys, *Great Lakes, Winds, Instrumentation, Equipment, Current meters, Circulation, Water circulation, Lakes, On-site investigations, Data processing, Analytical techniques, Powerplants, Shores, Limnology, Meteorology, *Point Beach(Wis), *Nearshore currents.

Coastal currents were monitored at stations 0.4, 1.1, and 3.8 km from shore along a coast-perpendicular transect located 1 km south of the Wisconsin Electric Power Company's nuclear generating station. Complete specifications were given for current meter calibrations, electronics used, winter and summer mooring configurations, and for the performance of each meter and mooring assembly. Local winds were monitored at the power plant intake using a mechanical, MRI wind system. The following types of graphs were presented for current and wind observations: (1) U, V flow components versus time, (2) specific kinetic energy versus time, (3) flow speeds and directions versus time, (4) composite velocity histograms and associated U, V-component histograms, and (5) progressive vector diagrams. A linear, optimal-filter design technique (Wiener filter) was used to estimate the efficiency of wind-driven, linear, nearshore current-prediction models. The poor predictions of the models probably relate to such factors as lack of input for superimposed lake currents, time-base errors, and wind-stress formulas. (Sims-ISWS)
W78-06123

I. DYNAMICS OF MERCURY IN LAKE SEDIMENTS. II. STUDIES ON ORGANIC PHOSPHORUS IN SOILS IRRIGATED WITH MUNICIPAL WASTEWATERS,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 5C.
W78-06137

AERATION/CIRCULATION KEEPS ALGAL BLOOMS IN CHECK,
Tetra Tech, Inc., Lafayette, CA.
For primary bibliographic entry see Field 5G.
W78-06140

DISSOLVED ORGANIC MATTER AND LAKE METABOLISM,
Michigan State Univ., Hickory Corners. W. K. Kellogg Gull Lake Labs.
For primary bibliographic entry see Field 5C.
W78-06142

BENTHOS OF AN ACID LAKE,
Uppsala Univ. (Sweden). Dept. of Entomology.
For primary bibliographic entry see Field 5C.
W78-06154

MAINTENANCE OF A TROUT FISHERY BY AERATION IN A EUTROPHIC LAKE,
Adelphi Univ., Oakdale, NY. Inst. of Marine Science; and Adelphi Univ., Garden City, NY.
For primary bibliographic entry see Field 5G.
W78-06171

SEDIMENTATION IN SANTA MARGARITA LAKE, SAN LUIS OBISPO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2J.
W78-06182

PALEOGEOCHEMISTRY AND INTERSTITIAL WATER CHEMISTRY FROM SEDIMENTS OF FIVE MAINE LAKES,
Maine Univ. at Orono. Dept. of Geological Sciences.
D. R. Sasseville, and S. A. Norton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 799, Price codes: A03 in paper copy, A01 in microfiche. Completion Report (1976). 42 p, 11 fig, 4 tab, 18 ref. OWRT A-026-ME(5).

Descriptors: *Connate water, *Water chemistry, *Sediments, *Maine, Lakes, Watershed management, Trophic level, Geochemistry, Limnology, *Lake sediments, *Pollutant identification, Eutrophication, *Annabessacook Lake(ME), Paleogeochemistry.

Paleochemistry and interstitial water investigated by analyzing undisturbed cores of profundal sediments collected from five noncalcareous lakes in Maine. K20, Na20, Mg0, and Al203 normally increase in concentration in the cultural sediments, indicating erosion of unweathered aluminosilicate minerals from watershed soils. Marked increases in concentration of P, S, and organic matter in the sediments of Annabessacook Lake confirmed that the lake is culturally eutrophic. The lakes exhibited much individually in concentrations and trends of their sediments. Interstitial chemistry profiles and upper sediment composition appeared controlled by diffusion and diagenesis. Significant contributions of components, especially Fe, Mn, P, and Si, to the overlying waters resulted from upward diffusion of dissolved species. The upper zone of lake sediment was identified as a region of substantial chemical reactions involving especially Si, Fe, Mn, P, and other redox-sensitive elements. Near-surface reactive layers with greater than normal concentrations of various dissolved species were present in most of the cores. General levels of K, Na, Ca, Mg, and Si in the interstitial water were not directly related to bulk chemistry of the solid sediment. The conclusion was that interstitial water concentrations in sediment are more affected by sediment character and composition than by the lake's trophic conditions or degree of cultural development. (Wares-IPA)
W78-06199

A TWO DIMENSIONAL LAKE CIRCULATION MODEL USING THE METHODS OF FINITE ELEMENTS,
Massachusetts Univ., Amherst. Water Resources Research Center.
P. A. Mangarella.
Research Report, June, 1976, 35 p, 1 fig, 25 ref. OWRT A-061-MASS(1), WR-61 FY-74.

Descriptors: *Stratification, *Lakes, *Wind velocity, *Thermal stratification, *Finite element analysis, *Mathematical models, Computer models, Mathematical studies, Currents(Water), Water circulation, Analytical methods, *Finite element method.

A mathematical model is applied in the analysis of the currents system and thermal stratification created by the interaction of the wind with a stratified lake. The steady and unsteady responses (in terms of current magnitude and direction, temperature, and free surface location) to varying wind regimes, initial stratification, and lake geometry are examined. A two-dimensional vertical plane solution for continuity, incompressibility, and momentum equations of flow and for the convective diffusion equation for temperature is proposed using the Finite Element Method. The model takes into consideration the effects of stratification and turbulence through an eddy viscosity model in which the eddy viscosities are assumed to be constant in any given direction over any element. Eddy viscosity and eddy diffusion models are used to describe the turbulent transport of momentum and energy (enthalpy), respectively. (Scip-IPA)
W78-06200

2I. Water In Plants

STUDY OF THE PHYSICAL CHARACTERISTICS OF THE ACTIVE HORIZON OF UNDRAINED BOGS (ISSLEDOVANIE FIZICHESKIKH KHARAKTERISTIK DEYATELNOGO GORIZONTA NEOSUSHENNYKH BOLOT),
P. K. Vorob'ev.
Available from the National Technical Information Service, Springfield, Va 22161 as TT-71-51010, Price codes: A03 in paper copy, A01 in microfiche. Translation TT-71-51010, 1974. 43 p. 12 fig, 3 tab, 18 ref, append.

Descriptors: *Bogs, *Sphagnum moss, *Active horizon, *Peat, *Water yield coefficients, Wetlands, Undrained bogs, India, Lammin-Suo bog(India), Hydrology, Hydrologic aspects, Water yield.

In a study of the physical characteristics of undrained sphagnum moss bogs in India, a method is described for determining water yield coefficients from the data of field equipment emplaced to register the reaction of the ground water table to precipitation. Two peat deposit horizons in undrained bogs are customarily distinguished, which differ considerably in relation to hydrological processes and moisture and energy exchanges between bogs and the surrounding area. The lower horizon of an undrained bog is inert, while in the active horizon fluctuations in moisture reserve, water table, precipitation absorption, capillary rise of moisture to the surface, and water filtration occur. Important hydrological and physical components of the active horizon include: (1)

thickness of the layer; (2) slope of bog surface and water table; (3) average depth of the water table; (4) average water flow rate per unit length of the flow front; (5) chemical composition of the water; (6) function for the distribution of the filtration coefficient over active layer depth; and (7) distribution of the water yield coefficients of different layers over the active layer depth. Physical characteristics investigated were: (1) volumetric weight and distribution of dry vegetable matter; (2) peat moisture in the aeration layer; (3) pore surface in sphagnum floss; (4) and water loss in the active horizon. Peat samples were collected in the upland bog, Lammin-Suo (India). (Lynch-Wisconsin)
W78-05760

COMPUTATION OF PRECIPITATION INTERCEPTION BY THE PLANT COVER,
V. V. Golubtsov, and V. I. Li.
Soviet Hydrology: Selected Papers, Vol 15, No 1, p 39-40, 1976. 16 ref. Translated from Transactions of the Kazakh Hydrometeorological Scientific Research Institute (Trudy KazNIGMI), No 48, p 65-69, 1975.

Descriptors: *Interception, *Throughfall, *Estimating, Precipitation(Atmospheric), Canopy, Vegetation effects, Rainfall, Snowfall, Forests, Trees, Evaporation, Equations, Hydrology, Foreign research, Foreign countries, *USSR.

Since it is extremely difficult to determine precipitation interception experimentally, it becomes necessary to develop and use computation methods. A proposed computation method determines the accumulation of intercepted water. From the result of verification of the proposed method by means of observational data, it was established that the errors in the determination of the monthly values of interception of liquid and solid precipitation generaly range within + or - 20% and may reach 25-30% in some cases. It was concluded that the proposed method can be used successfully in hydrologic investigations for estimating the dynamics of precipitation interception and for computing throughfall. (Humphreys-ISWS)
W78-05796

RESPONSE OF THE DEVIL'S RIVER (TEXAS) FISH COMMUNITY TO FLOODING,
Baylor Univ., Waco, TX. Dept. of Biology.
H. L. Harrell.
Copeia, 1978, No. 1, February, p 60-68, 3 fig, 2 tab, 27 ref.

Descriptors: *Environmental effects, Floods, Biological communities, Rivers, Fish reproduction, Habitats, Texas, *Devil's River(Tex), Ecosystems, Flood damage, Succession, Biomass.

A description is presented of species associations of dominant fishes in the free-flowing Devil's River, their responses to flooding, and relationships between these changes and total fish community stability. During flooding, habitat distinctness and species diversity declined as did the population of 6 to the 8 subdominant fishes. Most species associations were dissolved and new ones formed. Four of the 6 dominants among Devil's River fishes increased in abundance after flooding. The dominants retained ecologic importance despite pronounced shifts in their use of habitats. It is suggested that, in the comparative measurement of ecosystem stability, continued or increased dominance by a few species be considered typical of naturally stressful environments. (Chilton-ORNL)
W78-05951

PHOTOSYNTHESIS AND SOLAR ENERGY CONVERSION,
Cornell Univ., Ithaca, NY. Div. of Biological Sciences.
For primary bibliographic entry see Field 8C.
W78-05969

A METHOD OF MEASURING AIRBORNE ACIDITY: ITS APPLICATION FOR THE DETERMINING OF ACID CONTENT ON LONG-DISTANCE TRANSPORTED PARTICLES AND IN DRAINAGE WATER FROM SPRUCES,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5A.
W78-06003

SEASONAL NUTRIENT AND SODIUM ACCUMULATION IN THE MACROPHYTE PONTEDERIA CORDATA,
Carleton Univ., Ottawa (Ontario). Dept. of Biology.
I. L. Bayly, and M. E. Shibley.
Canadian Journal of Botany, Vol. 56, No. 4, p 417-425, 1978. 6 fig, 19 ref.

Descriptors: *Rooted aquatic plants, *Marsh plants, *Seasonal, *Soil-water-plant relationships, *Nutrient requirements, *Plant physiology, Wetlands, Marshes, Aquatic plants, Nutrients, Cycling nutrients, Plant growth, Soil chemical properties, Sodium, Phosphorus, Calcium, Magnesium, Potassium, *Pontederia cordata, Aquatic macrophytes.

A seasonal study of the accumulation of calcium, magnesium, sodium, potassium, and phosphorus was made on Pontederia cordata L., an important component of wetlands in North America. Calcium accumulation by the plants increased throughout the growing season. The major accumulation was in the root system, the plant part that overwinters. A marked decline in potassium content was evident at the end of the growing season in all tissues except the rhizomes. A concomitant potassium increase occurred in the soil horizon in which the plants were rooted. Sodium and magnesium were accumulated in all plant parts, although the trends were only moderately significant. Soil magnesium showed a decrease over this same period. Phosphorus accumulation was high at the initial stage of declined throughout the season. (Steiner-Mass)
W78-06085

THE USE OF WATER AND MINERALS BY EVERGREEN AND DECIDIOUS SHRUBS IN OKEFENOKEE SWAMP,
California Univ., Santa Barbara. Dept. of Biological Sciences.
W. H. Schlesinger, and B. F. Chabot.
Botanical Gazette, Vol. 138, No. 4, p 490-497, 1977. 3 fig, 5 tab, 40 ref.

Descriptors: *Swamps, *Moisture uptake, *Shrubs, *Nutrient requirements, Wetlands, Aquatic plants, Consumptive use, Circulation(Plants), Nutrients, *Georgia, *Okefenokee Swamp(Geo), Deciduous shrubs, Evergreen shrubs, Foliar concentrations.

Shoot water potentials, leaf diffusion resistances, and foliar concentrations of Ca(++), Mg(++), K(+), N, and P were measured in an evergreen shrub, Lyonia lucida, and a deciduous shrub, Clethra alnifolia. An upland, evergreen species, Lyonia ferruginea, was included for comparison. C. alnifolia generally had the highest mineral contents (percentage of dry weight) and the highest water loss in transpiration. During several 24-hour monitoring periods, the lowest observed water potentials (L. lucida, --10.1 bars; C. alnifolia, --12.5 bars; L. ferruginea, --17.2 bars) did not suggest 'physiological drought' in the swamp species. Only L. lucida showed any evidence of midday stomatal closure. In this warm-temperate swamp, evergreen species have the potential for greater efficiency of mineral use and productivity, largelty due to their leaf longevity. In addition, sclerophyllous tissue is probably useful in defense against herbivores. (Steiner-Mass)
W78-06087

DISTRIBUTION, SEASONALITY, AND BIOMASS OF AQUATIC MACROPHYTES IN LAKE OPINICON (EASTERN ONTARIO),
Queen's Univ., Kingston (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 2H.
W78-06088

SEASONAL MEASUREMENTS OF CARBON, NITROGEN, ASH, IRON, CARBOHYDRATES, AND PIGMENTS FROM GEOGRAPHICALLY DIFFERENT SPARTINE ALTERNIFLORA MARSHES IN THE SOUTHEAST,
Skidway Inst. of Oceanography, Savannah, GA.
G. L. McIntire, and W. M. Dunstan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 983, Price codes: A04 in paper copy, A01 in microfiche. Technical Report Series Number 76-5, Georgia Marine Science Center, University System of Georgia, Skidway Island, Georgia. 20 p, 2 fig, 10 tab, 19 ref. (1976).

Descriptors: *Marshes, *Marsh plants, Period of growth, *Nutrient requirements, *Southeast U.S., Wetlands, Coastal marshes, Salt marshes, Rooted aquatic plants, Halophytes, Grasses, *Seasonal, *Carbon, *Nitrogen, *Carbohydrates, Nutrients, *Ash, *Iron, *Spartina alterniflora.

Average seasonal nitrogen levels for Spartina show higher percentages of nitrogen in the early part of the growing season dropping to relatively constant levels by late spring. Carbon to nitrogen levels for leaves were within the range of terrestrial plants (30-40) which contain a higher percentage of structural carbohydrates. Stem percentages were higher reflecting the accumulation of cellulitic compounds during the year. The carbon:nitrogen values illustrated the generally nitrogen poor status of Spartina. Tissue concentrations of iron dropped from January to July in both leaf and stem samples while percent ash content decreased during the year probably to the time of peak standing crop, increasing thereafter with the death of the plants. Nonstructural carbohydrates (NSC) values for leaves and stems average approximately 45 and 55 mg NSC/dry gram wt respectively through the July samples. Reduced NSC levels occur in late fall which may reflect greater percentages of dead and dying materials within the samples. Temperature and environmental effects on photosynthesis and/or translocation of photosynthetic production may also be responsible for reduced NSC levels in leaf and stem tissues. Pigment concentrations generally decreased from January to October. (Steiner-Mass)
W78-06093

NITROGEN UPTAKE CHARACTERISTICS OF CORN ROOTS AT LOW N CONCENTRATION AS INFLUENCED BY PLANT AGE,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
J. H. Edwards, and S. A. Barber.
Agronomy Journal, Vol 68, No 1, p 17-19, January-February 1976. 1 fig, 2 tab, 9 ref. OWRT B-026-IND(6).

Descriptors: *Nitrogen, *Corn(Field), Fertilizers, Fertilization, Roots, Soil investigations, Greenhouse experiments, *Absorption.

Information is needed on the relation between concentration of N in solution, CN, and the rate of N uptake by corn roots in order to evaluate the soil and crop parameters affecting N fertilizer efficiency. Data on net N influx, In, vs. CN were obtained for N levels below 150 micro M on corn plants of seven ages ranging from 15 to 58 days (2 weeks after tasseling). It was determined by measuring rate of N depletion from the solution in which corn plants grew. Both NH+4 and NO-3 forms of N were used. Th experiments were conducted in the

growth chamber and greenhouse. (See also W76-11519 and W74-05404) (Skogerboe-Colorado State)
W78-06097

INTERCEPTION BY PINUS PATULA IN RELATION TO RAINFALL PARAMETERS,
Natal Univ., Pietermaritzburg (South Africa). Dept. of Agricultural Engineering.
R. E. Schulze, C. R. Scott-Shaw, and U. W. Nanni.
Journal of Hydrology, Vol. 36, No. 3/4, p 393-396, February 1978. 2 fig, 1 tab, 5 ref.

Descriptors: *Rainfall, *Africa, *Interception, *Pine trees, On-site investigations, Forests, Coniferous forests, Coniferous trees, Vegetation, Precipitation(Atmospheric), Canopy, Water loss, Rain, Rainfall intensity, Data processing, Forestry, *South Africa, Pinus patula.

Relationships between gross daily rainfall and interception and between rainfall duration and interception for four categories of rainfall intensity were given for a 10-year old stand of Pinus patula at Cathedral Peak in South Africa. Interception was shown to increase with rainfall intensity for given durations of a storm. (Sims-ISWS)
W78-06104

UPTAKE BY BARLEY OF WATER TABLE- OR SURFACE-APPLIED CADMIUM,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-06111

2J. Erosion and Sedimentation

MEASUREMENT OF SEDIMENT CONTROL IMPACTS ON AGRICULTURE,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W78-05701

FALLOUT CESIUM-137 IN CULTIVATED AND NONCULTIVATED NORTH CENTRAL UNITED STATES WATERSHEDS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W78-05779

EFFECTS OF SOIL, COVER CROP, AND NUTRIENT SOURCE ON AMOUNTS AND FORMS OF PHOSPHORUS MOVEMENT UNDER SIMULATED RAINFALL CONDITIONS,
Ohio Agricultural Research and Development Center, Wooster.
For primary bibliographic entry see Field 5B.
W78-05780

AQUEOUS- AND SEDIMENT-PHASE PHOSPHORUS YIELDS FROM FIVE SOUTHERN PINE WATERSHEDS,
Southern Forest Experiment Station, Oxford, MS.
For primary bibliographic entry see Field 5B.
W78-05781

STATISTICAL EVALUATION OF RAINFALL-SIMULATOR AND EROSION TESTING PROCEDURE,
Louisiana Dept. of Highways, Baton Rouge. Research and Development Section.
S. M. Law.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 469. Price codes: A03 in paper copy, A01 in microfiche. Research Report 106, January 1977. 43 p, 6 fig, 4 tab, 11 ref, 1 append.

Descriptors: *Rainfall simulators, *Statistics, *Erosion, Statistical methods, Soils, Hydrology, Laboratory tests, Instrumentation, Testing procedures, Mulching, Stabilization, *Soil loss, Statistical repeatability.

Much money, time, and work are expended each year in evaluating new erosion products. Test locations in the field are now hard to find; therefore, a better method of first checking erosion products had to be found. A tentative laboratory test procedure had been developed by which these products could be evaluated. A rainfall-simulator had been designed and operated using this test procedure; however, complete testing for statistical purposes had not been accomplished. The specific aims of the study were: (1) to supply documentation of statistical repeatability of the rainfall-simulator and the soil-loss data using the test procedure, (2) to reevaluate the design and operation of the rainfall-simulator, and (3) to reevaluate the test procedure. These aims were carried out in a series of repetitive tests. Principal conclusions were as follows: (1) the revised rainfall-simulator was capable of statistically repeatable operation, (2) use of the revised tentative laboratory test procedure was justified, (3) revisions were necessary in the original design and operation of the rainfall-simulator, and (4) revisions were necessary in the original tentative laboratory test procedure. Principal recommendations were: (1) that the research study statistical data be accepted as documentation of completion of specific aims of the study, and (2) that the construction of the rainfall-simulator be accepted as a necessary tool in performance of laboratory testing of new products in the erosion field through the use of the revised tentative laboratory test procedure. (Lee-ISWS)
W78-05785

ORGANIC MATTER IN THE SUSPENDED LOAD OF THE RIVERS AND IRRIGATION SYSTEMS OF SOVIET CENTRAL ASIA,
For primary bibliographic entry see Field 5B.
W78-05799

SEDIMENTATION AND SOIL ALTERATION, MONROE RESERVOIR, INDIANA,
Indiana Univ., Bloomington. Dept. of Geology.
K. R. Bradbury.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 553, Price codes: A05 in paper copy, A01 in microfiche. Report, Master of Arts, Thesis, April, 1977. 83 p, 21 fig, 11 tab, 31 ref, 5 append. OWRT B-074-IND(2), 14-31-0001-5143.

Descriptors: *Sedimentation rates, *Sediment load, *Reservoirs, *Indiana, *Cores, *Suspended load, *Sedimentation, Iron compounds, Soil water, Soil properties, Measurements, Sediment analysis, Flooded soils, *Monroe Reservoir(IND), Sediment thickness, Sediment budget, Floodplain soils, Sediment cores.

The physical sedimentation system and the sediment and flooded soil properties of Monroe Reservoir in south-central Indiana, were studied. An input-output sediment budget was calculated by relating water discharge through input and output gauges to the amount of sediment transported by the water. Sediment thickness measurements in reservoir bottom cores and detailed profile of bottom topography were made. Suspended sediment in the reservoir water varies with water depth and position on the lake. Sediment load decreases linearly downlake toward the Salt Creek Dam and suspended sediment concentrations are higher near the bottom of the reservoir than near the surface. Sediment thicknesses measured in 46 cores range from 0 to 10 inches with a mean thickness of 2.5 in the upper basin, decreasing to 1.1 in lower basins; this distribution agrees with the prediction of the sediment-load measurements. Averaging results of the input-output and coring studies, the mean total sediment thickness is about 1.2 inches, and the annual storage loss to sediment is 0.05%. No sedimentation problems are foreseen for the reservoir. Bottom cores were analyzed and compared to modern floodplain soils. Flooded soils beneath the reservoir differ from comparable non-flooded soils in the reduction of iron from ferric to ferrous forms due to bottom water chemistry. Extractable calcium and magnesium are significantly lower in flooded soils than in modern floodplain soils. Phosphorous, iron, manganese, carbon, and a large fraction of clay-size particles accumulate in the reservoir sediment. Phosphorous accumulation may be due to bonding between phosphate ions and clay minerals in the sediments. (Seip-IPA)
W78-05815

DETERMINATION OF SOIL HUMUS CONTENT WHEN CONDUCTING FIELD EXPERIMENTS ON ERODED SOILS, (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Geography.
For primary bibliographic entry see Field 2G.
W78-05943

THE INTERTIDAL SEDIMENT HABITATS OF THE LOWER MEDWAY ESTUARY, KENT,
Sir John Cass Coll., London (England). School of Science and Technology.
For primary bibliographic entry see Field 5C.
W78-06002

NUTRIENT RELEASE FROM ANAROBIC SEDIMENTS,
Limno-Tech Inc., Ann Arbor, MI.
For primary bibliographic entry see Field 5C.
W78-06007

MIGRATION OF TRACE METALS IN INTERFACES OF SEAWATER AND POLLUTED SURFICIAL SEDIMENTS,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5B.
W78-06022

ORGANIC MATTER DISTRIBUTION CHARACTERISTICS IN THE SHOAL SEDIMENTS OF THE SELENGA DELTA IN LAKE BAIKAL, (IN RUSSIAN),
Limnologicheskii Inst., Irkutsk (USSR).
For primary bibliographic entry see Field 5B.
W78-06034

ENGINEERING AND PEDOLOGICAL PROPERTIES OF SOILS AS THEY AFFECT SOIL ERODIBILITY,
California Univ., Davis. Dept. of Land, Air, and Water Resources; and California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-06036

LAST-GLACIAL ALLUVIAL FAN SEDIMENTATION IN THE LOWER DERWENT VALLEY, TASMANIA,
Macquarie Univ., North Ryde (Australia). School of Earth Sciences.
R. J. Wasson.
Sedimentology, Vol. 24, No. 6, p 781-799, December 1977. 11 fig, 3 tab, 40 ref.

Descriptors: *Alluvial fans, *Geomorphology, *Sedimentology, *Pleistocene epoch, Glaciology, Sediments, Deposition(Sediments), Surveys, Particle size, Velocity, Soil properties, Mudflows, On-site investigations, Foreign countries, Foreign research, Petrology, *Tasmania, Debris flow.

Alluvial fans of the last glacial age in the lower Derwent Valley in southeastern Tasmania were

built by debris flows and stream flows. The deposits were derived from periglacial and nivational slope mantles at the highest altitudes in the fan catchments and from regolith of uncertain affinities at the lowest elevations. The apical and middle parts of the fan commonly consist of coarse-grained debris flow and water-laid deposits, while the distal deposits are predominantly water-laid sheetflood silts and clays. Channels are important in the proximal parts of the fans and are mostly filled with water-laid sediments, less commonly by debris flow deposits. A first approximation to the mean velocity of the last stage of debris flow in a channel is between 4 m/sec and 6 m/sec. A group of 'water-laid' sediments showed very poor separation of particle sizes, and two explanations were offered for these sediments. Firstly, the large quantities of unsorted debris available from the catchments produced moderately well-sorted slurries, or, secondly, openwork stream gravels were infiltrated by later water flows charged with fines. The streams crossing the fans also produced water flows relatively low suspended sediment concentrations resulting in reasonably good sorting. The debris flows and 'water-laid' muddy sediments cannot be distinguished using CM plots. The debris flows display considerable variation in thickness and grain-size characteristics, which is attributable to properties inherent in debris flow behavior. (Humphreys-ISWS)
W78-06105

PACKING AND ANGLE OF REPOSE OF NATURALLY SEDIMENTED FINE SILICA SOLIDS IMMERSED IN NATURAL AQUEOUS ELECTROLYTES,
Imperial Coll. of Science and Technology London (England). Dept. of Civil Engineering.
P. A. Mantz.
Sedimentology, Vol. 24, No. 6, p 819-832, December 1977. 5 fig, 2 tab, 24 ref.

Descriptors: *Sedimentology, *Soil compaction, *Laboratory tests, *Aqueous solutions, Silica, Sediments, Sands, Electrolytes, Soil stability, Soil properties, Soil physical properties, Testing procedures, Angle of repose, Packing coefficient.

Six grades of near uniformly sized silica solids (ranging in median size from 15 micrometers to 160 micrometers) were sedimented in various natural aqueous electrolytes. The influence of surface forces on these silica-electrolyte systems was then inferred from measurements of the packing coefficient, C, of each sediment. It was found that the packings were uninfluenced by surface chemical forces when the grade size was greater than about 100 micormeters. For smaller grades immersed in naturally concentrated aqueous electrolytes, C was found to decrease from an initial value of about 0.50, and this was explained by the onset of surface chemical attractive forces. For smaller grades immersed in pure water, C was found to increase to a maximum of 0.58. Three explanations for this phenomenon, namely a difference in shape with grade size, a decrease in intensity of deposition, and the onset of surface chemical repelling forces, were examined, and the latter explanation seemed the most probable. Measurements of the angle of repose for the sediments also showed the influence of surface chemical repelling as well as attractive forces in fine silica solids. The results may be used to aid interpretation of the fabric and stability of pre-lithified sedimentary units. (Humphreys-ISWS)
W78-06106

TRENDS OF SEDIMENT REMOVAL FROM ARID SCREE SLOPES UNDER SIMULATED RAINSTORM EXPERIMENTS,
Hebrew Univ., Jerusalem (Israel). Dept. of Geography.
A. Yair, and H. Lavee.
Hydrological Sciences Bulletin, Vol. 22, No. 3, p 379-391, September 1977. 7 fig, 2 tab, 20 ref.

Descriptors: *Sediment transport, *Storms, *Simulated rainfall, Sediment yield, Erosion, Rainfall simulators, Raindrops, Sediment discharge, Hydrology, Runoff.

In the framework of an experiment devoted to the study of runoff generation on six arid talus mantled slopes, runoff samples loaded with fine sediment were taken at short intervals. The samples allowed an analysis to be made of the relationships existing between sediment concentration and sediment discharge to the runoff discharge of such slopes. Sediment concentrations varied from 0.5 to 59 g/l, and sediment yields from 0.9 to 24.2 g/sq m. Whereas a positive linear relationship was obtained between runoff discharge and sediment discharge, no clear relationship was obtained between runoff discharge and sediment concentration. The highest concentrations were recorded in the initial runoff, followed by a rapid decrease in concentration during the rising flow stage. A second part of sediment concentration appeared at the fall stage of the flow. These results were explained tentatively by the varying role of splash and flow velocity on sediment detachment and transport processes during the flow event. (Lee-ISWS)
W78-06108

I. DYNAMICS OF MERCURY IN LAKE SEDIMENTS. II. STUDIES ON ORGANIC PHOSPHORUS IN SOILS IRRIGATED WITH MUNICIPAL WASTEWATERS,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 5C.
W78-06137

SEDIMENTATION IN SANTA MARGARITA LAKE, SAN LUIS OBISPO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
G. D. Glysson.
Water-Resources Investigations 77-56, September 1977. 15 p, 7 fig, 6 tab, 11 ref.

Descriptors: *Reservoir storage, *Sedimentation, Deposition(Sediments), *Sedimentation rates, *California, Inflow, Streamflow, Sediment yield, *Santa Margarita Lake(Calif), San Luis Obispo County(Calif), Salinas River(Calif).

The 1975 storage capacity of Santa Margarita Lake in San Luis Obispo County, Calif., was 41,400 acre-feet, a decrease of 3,400 acre-feet since 1941. Usable capacity decreased from 25,800 to 23,000 acre-feet. Long-term sediment yield for the Salinas River basin upstream from the lake was estimated at 1,150 tons per square mile per year. A correlation between the annual water discharge of the Salinas River near Pozo and the annual quantity of sediment deposited in the lake was developed that can be used to stimate future sediment deposition. (Woodard-USGS)
W78-06182

HYDROLOGY AND WATER QUALITY OF THE ATCHAFALAYA RIVER BASIN,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06184

PALEOGEOCHEMISTRY AND INTERSTITIAL WATER CHEMISTRY FROM SEDIMENTS OF FIVE MAINE LAKES,
Maine Univ. at Orono. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2H.
W78-06199

2K. Chemical Processes

CHEMICAL SYSTEMS MONROE RESERVOIR, INDIANA,
Indiana Univ., Bloomington. Dept. of Geology.
For primary bibliographic entry see Field 2H.
W78-05805

ANALYSIS OF THE FLUORINE ION IN THE PRESENCE OF AL AND CA IONS IN AIR AND WATER WITH THE USE OF ZR-SPADNS REAGENT, (IN RUSSIAN),
For primary bibliographic entry see Field 5A.
W78-06008

A PROPOSED MODIFICATION TO THE CLASSICAL METHOD OF CALCULATING ALKALINITY OF NATURAL WATERS,
Auburn Univ., AL.
For primary bibliographic entry see Field 5A.
W78-06019

HYDROGEN INPUT TO THE HUBBARD BROOK EXPERIMENTAL FOREST, NEW HAMPSHIRE, DURING LAST DECADE,
Cornell Univ., Ithaca, NY. Section of Ecology and Systematics.
For primary bibliographic entry see Field 5A.
W78-06026

THE CHEMICAL COMPOSITION OF ATMOSPHERIC PRECIPITATION FROM SELECTED STATIONS IN MICHIGAN,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5A.
W78-06027

THE COLLECTION OF PRECIPITATION FOR CHEMICAL ANALYSIS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
J. N. Galloway, and G. E. Likens.
Tellus, Vol 30, No 1, p 71-82, February 1978. 2 fig, 6 tab, 12 ref.

Descriptors: *Precipitation(Atmospheric), *Sampling, *Chemical analysis, *Chemistry of precipitation, Equipment, Precipitation gages, Rain gages, Rain, Rain water, Snow, Fallout, Data collections, Chemical analysis, Chemistry, Meteorology, Collectors.

This paper was one of a series of publications on the collection and chemical analysis of precipitation. While the first paper presented the results from an intercalibration of 10 different designs of precipitation collectors, this paper presented results of experiments on the collection efficiency of collectors, preservation of samples, monthly variation of wet and dry deposition, sample storage, length of sampling period, choice of collector location, and sources of variability in precipitation data. The primary conclusions were that dry fallout usually should be excluded from rain and snow samples, sampling should be on an event basis, all biocides tested have some detrimental effect on sample composition, and that the major sources of variability in precipitation data are due to sampling errors and choice of collector location. (Sims-ISWS)
W78-06112

GROUND-WATER RESOURCES OF EMMONS COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06179

2L. Estuaries

PROPAGATION AND USE OF SPARTINA ALTERNIFLORA FOR SHORELINE EROSION ABATEMENT,
North Carolina State Univ. at Raleigh.
For primary bibliographic entry see Field 4A.
W78-05751

INTERACTION OF TSUNAMIS WITH THE HAWAIIAN ISLANDS CALCULATED BY A FINITE-ELEMENT NUMERICAL MODEL,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
J. R. Houston.
Journal of Physical Oceanography, Vol 8, No 1, p 93-102, January 1978. 8 fig, 17 ref.

Descriptors: *Tsunamis, *Hawaii, *Model studies, *Mathematical models, *Pacific Ocean, Waves(Water), Ocean waves, Coasts, Islands, Gages, Equations, Finite element analysis, Analytical techniques, Mathematics, Oceanography.

A finite element numerical model was used to determine the interaction of tsunamis with the Hawaiian Islands. The model employs a finite element grid which telescopes from a large cell size in the deep ocean to a very small size in shallow coastal waters and covers a region which included the eight major islands of the Hawaiian Islands. The numerical model solves the problem of tsunami propagation from the deep ocean to the coasts of these islands. Although time periodic motion was assumed in the solution, the interaction of an arbitrary tsunami waveform with the islands can be determined easily within the framework of a linear theory by superposition. The deep ocean waveforms of the 1960 and 1964 Alaskan tsunamis were determined for use as input to verify the finite element model by employing a finite difference numerical model which assumes as an initial condition that the uplift movement of the sea floor in the source regions during an earthquake is instantaneous and results in a water surface elevation identical to the known permanent vertical displacement of the sea floor. The finite difference model propagates the waves radiated from the source regions to a deep ocean area near the Hawaiian Islands using a two-dimensional spherical coordinate grid to solve the linear long wave equations. The finite element model was deep water time histories as input. Numerical model calculations were shown to be in good agreement with tide gage recordings of the 1964 Alaskan tsunami at Kahului, Maui; Honolulu, Oahu; Hilo, Hawaii; and the 1960 Chilean tsunami at Honolulu, which was the only location where the 1960 tsunami did not destroy the gage. (Sims-ISWS)
W78-05772

DRIFT RESPONSE OF MONOMOLECULAR SLICKS TO WAVE AND WIND ACTION,
Hamburg Univ. (West Germany).
P. Lange, and H. Huhnerfuss.
Journal of Physical Oceanography, Vol 8, No 1, p 142-150, January 1978. 7 fig, 3 tab, 40 ref.

Descriptors: *Monomolecular films, *Drifting(Aquatic), *Waves(Water), *Winds, Laboratory tests, On-site investigations, Ocean waves, Gravity waves, Velocity, Alcohols, Evaporation, Air-water interfaces, Oceanography, Path of pollutants, *Sylt(Germany), *North Sea, Monomolecular slicks, Ocean slicks.

The drift responses of monomolecular slicks to wind and wave action were investigated in a laboratory wind-wave tunnel and in the field. The wind-wave tunnel was fitted with a mechanical wave generator which produced uniform, long-crested gravity waves. The field studies were performed off the island of Sylt (German Bight) in the North Sea. Laboratory results for the slick drift response to deep water gravity waves only were in excellent agreement with the Stokes irrotational mass transport drift velocity theory. The purely wind-induced slick drift was in good agreement with the results obtained by previous investigators using a variety of other floats. A number of laboratory and field investigatons were compared and showed that the surface drift to wind speed ratio lies between 2.6-5.5%. A difference between the average ratios for the collected laboratory and field results indicated that the pure gravity wave drift component probably comprises 25-30% of the total surface drift. A qualitative example confirming this was demonstrated in the field studies. A laboratory treatment of the combined wind and wave slick drift showed that the effects of wind and waves cannot be simply superimposed. In some cases, the gravity waves appear to decouple the wind drift, especially at lower wind speeds. (Sims-ISWS)
W78-05773

THE USE OF FAECAL BACTERIA AS A TRACER FOR SEWAGE SLUDGE DISPOSAL IN THE SEA,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 5B.
W78-05876

A FAECAL STEROL SURVEY IN THE CLYDE ESTUARY,
Bristol Univ. (England). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-05879

DISTRIBUTION OF VIRAL AND BACTERIAL PATHOGENS IN A COASTAL CANAL COMMUNITY,
Baylor Coll. of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
For primary bibliographic entry see Field 5B.
W78-05880

NEARSHORE SEDIMENT POLLUTION IN ISRAEL BY TRACE METALS DERIVED FROM SEWAGE EFFLUENT,
Hebrew Univ. of Jerusalem, Rehovot (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 5B.
W78-05887

DISCHARGE OF NITROGEN, PHOSPHORUS AND ORGANIC MATTER INTO THE GULF OF BOTHNIA,
National Swedish Environment Protection Board, Uppsala. Limnological Survey.
For primary bibliographic entry see Field 5B.
W78-05905

OIL POLLUTION ON THE POLISH COAST OF THE BALTIC SEA, (IN POLISH),
For primary bibliographic entry see Field 5C.
W78-05907

COASTAL WATER RESEARCH PROJECT. ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1977.
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-05911

COASTAL CURRENTS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-05916

POLLUTANTS IN SEDIMENTS OFF PALOS VERDES,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-05917

SATELLITE IMAGERY STUDIES,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-05919

EFFECTS OF CLIMATIC CYCLES ON THE RELATIVE ABUNDANCE AND AVAILABILITY OF COMMERCIAL MARINE AND ESTUARINE SPECIES,
Maine State Dept. of Marine Resources, Augusta.
R. L. Dow.
Journal of Conseil International Pour L'Exploration de la Mer, Vol. 37, No. 3, September 1977, p 274-280, 1 fig, 4 tab, 16 ref.

Descriptors: Environmental effects, *Seasonal, Temperature, Aquatic life, Estuaries, Populations, Fish, Climates, Cycles, Estuarine fisheries, Marine fisheries, Fish management, *Boothbay Harbor(Maine), *Sea water temperature.

Simple linear correlation utilizing arithmetic means of sea surface temperature at Boothbay Harbor, Maine, were used in the studies. Evidence showed that sea temperatures have been the principal environmental regulator of species abundance and availability. This dependence on periodic and widely varying sea temperature cycles for maximum abundance of each of more than 30 commercially important species creates major problems for effective fisheries management. (Chilton-ORNL)
W78-05957

IMPORTANCE OF EELGRASS BEDS IN PUGET SOUND,
National Marine Fisheries Service, Beaufort, NC. Beaufort Lab.
G. W. Thayer, and R. C. Phillips.
Marine Fisheries Review, Vol 39, No 11, November 1977, p 18-22, 2 fig, 1 tab, 8 ref.

Descriptors: *Ecology, Habitats, Aquatic habitats, Predation, Protection, Aquatic environment, Aquatic plants, Food chains, *Puget Sound(Wash), Washington, Detoitus, *Eelgrass.

Observations and research efforts have shown that the importance of eelgrass systems does not necessarily lie in their direct food value to organisms but in their multifaceted functions. They provide a habitat for the growth of ecologically important fish and invertebrates. Because of normally dense growth, seagrasses also provide small organisms a significant degree of protection from predators. Eelgrass leaves have a high rate of growth and although few organisms feed directly on the leaves, the major food chains are based on detritus derived from the leaves which may support food chains in adjacent waters. The blades support many small epiphytic organisms. The roots bind the sediments and remove nutrients from the substrate. (Chilton-ORNL)
W78-05958

STRUCTURE OF PELAGIC FOOD CHAIN AND RELATIONSHIP BETWEEN PLANKTON AND FISH PRODUCTION,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
R. W. Sheldon, W. H. Sutcliffe, Jr, and M. A. Paranjape.
Journal of the Fisheries Research Board of Canada, Vol. 34, 1977, p 2344-2353, 6 fig, 54 ref.

Descriptors: Biological communities, *Fish management, Production, Ecosystems, *Plankton, Phytoplankton, Fish, Estimating, Predation, Peru, North Sea, Gulf of Maine, *Food chains, *Pelagic ecosystems.

The simplified view of the pelagic food chain, based essentially on particle size spectra, shows that by considering the interactions of organisms relative to their size it is possible to arrive at a plausible structure for the pelagic food chain. From this, estimates of plankton and fish production are derived. Phytoplankton production is estimated from fishery production for the Gulf of Maine and the North Sea and fishery production is estimated from plankton production for an area off Peru. (Chilton-ORNL)
W78-05961

SEASONAL CHANGES IN THE COMMUNITY STRUCTURE OF THE MACROBENTHOS INHABITING THE INTERTIDAL SAND AND MUD FLATS OF BARNSTABLE HARBOR, MASSACHUSETTS,
Chicago Univ., IL. Committee on Evolutionary Biology.
R. B. Whitlatch.
The Biological Bulletin, Vol. 152, No. 2, April 1977, p 275-294, 6 fig, 2 tab, 64 ref.

Descriptors: Environmental effects, *Seasonal, Biological communities, Populations, Benthos, Intertidal areas, Mud flats, Sands, Massachusetts, *Barnstable Harbor(Mass), *Distribution patterns, *Classification.

Thirty two species of benthic macrofauna used in an inverse classification analysis were partitioned into 10 species groups, reflecting spatial distibutional patterns. More than 90% of all organisms sampled were deposit-feeders which normally dominate mud and muddy-sand sediments. Suspension-feeders were most abundant in fine sands. While no significant changes were evident in species diversity, eveness, or species number during the 19 month sampling period, classification analysis delimited seasonal clustering of both samples and species groupings. These patterns were repeatable over a two year period suggesting that dynamic equilibrium, not successional change was occurring. Seasonal clustering patterns of some species were related to the appearance of different zoogeographic faunal province elements. (Chilton-ORNL)
W78-05967

ALKALINE POTASSIUM PERMANGANATE DEGRADATION OF INSOLUBLE ORGANIC RESIDUES (KEROGEN) ISOLATED FROM RECENTLY-DEPOSITED ALGAL MATS,
California Univ., Berkeley. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-06000

THE INTERTIDAL SEDIMENT HABITATS OF THE LOWER MEDWAY ESTUARY, KENT,
Sir John Cass Coll., London (England). School of Science and Technology.
For primary bibliographic entry see Field 5C.
W78-06002

NITROGEN CYCLES IN A POLLUTED SEA AREA,
Tokyo Univ. (Japan). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5C.
W78-06004

DIELDRIN-INDUCED DESTRUCTION OF MARINE ALGAL CELLS WITH CONCOMITANT DECREASE IN SIZE OF SURVIVORS AND THEIR PROGENY,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 5C.
W78-06011

OCEAN DUMPING: PHILADELPHIA'S STORY.
For primary bibliographic entry see Field 5E.
W78-06021

MIGRATION OF TRACE METALS IN INTERFACES OF SEAWATER AND POLLUTED SURFICIAL SEDIMENTS,
University of Southern California, Los Angeles. Environmental Engineering Program.
For primary bibliographic entry see Field 5B.
W78-06022

A SEARCH FOR CYTOPATHOGENIC VIRUSES IN SURFACE AND COASTAL SEA WATER IN THE PROVINCE OF PISA (ITALY), (IN ITALIAN),
Pisa Univ. (Italy). Ist. di Igine.
For primary bibliographic entry see Field 5B.
W78-06023

ECOLOGICAL STUDIES IN THE WESTERN SACRAMENTO-SAN JOAQUIN DELTA DURING A DRY YEAR,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
C. A. Siegfried, A. W. Knight, and M. E. Kopache.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 665, Price codes: A07 in paper copy, A01 in microfiche. Water Science and Engineering Papers, No 4506, January, 1978. 121 p, 55 fig, 5 tab, 75 ref, append. (Funded by Dow Chemical Company, Pittsburg, CA. and Calif. Water Resources Council).

Descriptors: *Benthos, *Ecology, *Droughts, *Saline Water Intrusion, Encroachment, Saline-Freshwater interfaces, Low-flow, Water quality, Drought tolerance, *California, Deltas, Clams, Oligochaetes, Polychaetes, Amphipods, Standing crops, Deposition(Sediments), *Sacramento-San Joaquin(Calif).

A portion of the Western Sacramento-San Joaquin Delta was studied by the UCD Estuarine Research Group during 1976, a critical dry year. Particularly important to the ecology of the Delta, in 1976, was the low outflow, the fourth-lowest on record. The most important aspect of water quality during 1976 was salinity incursion accompanying low flows. The flow flows caused the entrapment zone to be located upstream from Chipps Island during much of 1976. The location of the entrapment zone in the San Francisco Bay Estuary is thought to be very important in the ecology of the Delta. The benthic community of the Western Delta was dominated by the Asiatic clam (Corbicula manilensis), oligochaetes, the amphipods Corophium stimpsoni and C. spinicorne, and a spionid polychaete, Boccardia ligrerica. These taxa averaged 98% of the total benthic macroinvertebrates collected at each study site. Changes in benthos composition are thought to be related to salinity incursion and changes in substate composition resuling from the deposition of fine sediments during summer. In general, the upstream channel stations had higher standing crops of benthos than the other stations in the study area in 1976. Total benthic standing crop was lowest near Chipps Island. The standing crop peaked in June and was lowest in November. (Snyder-Calif, Davis)
W78-06042

EFFECTS OF POLLUTION ON WATER QUALITY, PERDIDO RIVER AND BAY, ALABAMA AND FLORIDA.
Federal Water Pollution Administration, Athens, GA. Southeast Water Lab.
For primary bibliographic entry see Field 5C.
W78-06044

PHYTOPLANKTON GROWTH, DISSIPATION AND SUCCESSION IN ESTUARINE ENVIRONMENTS,
Johns Hopkins Univ., Baltimore, MD.
For primary bibliographic entry see Field 5C.
W78-06047

ANALYSIS OF OPERATION 'DEEP SIX' BENTHIC INVERTEBRATES.
Marine Research Inc., Falmouth, MA.
For primary bibliographic entry see Field 5C.
W78-06052

THE ENVIRONMENTAL IMPACT OF FRESHWATER WETLAND ALTERATIONS ON COASTAL ESTUARIES.
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 5C.
W78-06053

PRODUCTIVITY AND NUTRIENT EXPORT STUDIES IN A CYPRESS SWAMP AND LAKE SYSTEM IN LOUISIANA,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5C.
W78-06054

OBSERVATION ON PRODUCTIVITY OF SWAMP STREAMS IN EASTERN NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W78-06056

HYDROLOGIC AND ENVIRONMENTAL EFFECTS OF A LONG-TERM DRAINAGE ON A COASTAL AREA, (CASE STUDY: MELBOURNE TILLMAN DRAINAGE DISTRICT, PALM BAY, FLORIDA),
Florida Inst. of Tech., Melbourne. Center for Coastal Zone Research.
D. D. Barile.
In: The Environmental Impact of Freshwater Wetland Alterations on Coastal Estuaries, Conference held at Savannah, Georgia on June 23, 1976. p 47-59, 5 fig, 1 tab, 7 ref.

Descriptors: *Environmental effects, *Hydrologic aspects, Melbourne Tillman Drainage District(FL), *Palm Bay(FL), *Drainage effects, Drainage systems, Freshwater-saline water interfaces, Coastal marshes, Burning, Estuaries, Estuarine environment, Vegetation effects, Succession, Water levels, Salinity, Shellfish, Sediments, Nutrients, Flood protection, Saline water intrusion, Droughts, *Florida.

Operations of the Melbourne Tillman Drainage District (MTDD) Palm Bay, Florida were used for an analysis of consequences of large-scale and long-term drainage from wetlands into estuaries. A 98 sq m area of the St. Johns River marsh has been drained by the MTDD since 1924. Water is carried by a 200 m grid of canals through a drainage divide and introduced into the Indian River estuarine lagoon by way of a natural stream, Turkey Creek. Systems analysis was used to define changes in the area from 1900 to 1975 and to investigate effects of a future drainage plan. Effects of drainage and population growth were noted in the upland, the coastal area, and in the estuary. The incidence of fire increased as water was removed from marshes. Marshes were reduced in size, prairies were replaced by pine lands, and recently introduced exotics replaced native growth. The amount of water stored in the shallow ground aquifer has decreased by 13%. The amount of water flowing through Turkey Creek has increased from 5% of rainfall to 28%, thus decreasing the salinity and destroying the productive shellfish

beds. Water entering the estuary has decreased in quality through the additional nutrient and sediment loading from the sewer discharge and through the reduced time period that the water spent in the upland sloughs, swamps, and marshes. Planners in coastal areas face two problems: (1) drainage and flood protection; (2) water supply and prevention from salt water encroachment during drought conditions. (See also W78-06053) (Harris-Wisconsin)
W78-06057

PLANNING FOR CLEANING UP AN ESTUARY--PART II: PHYSICAL PLANNING FOR THE MERSEY,
For primary bibliographic entry see Field 5G.
W78-06062

ALTERNATIVE MANAGEMENT STRATEGIES FOR VIRGINIA'S COASTAL WETLANDS: A PROGRAM OF STUDY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6G.
W78-06086

WETLAND MAPPING IN NEW JERSEY AND NEW YORK,
Earth Satellite Corp., Washington, DC.
For primary bibliographic entry see Field 7C.
W78-06092

SEASONAL MEASUREMENTS OF CARBON, NITROGEN, ASH, IRON, CARBOHYDRATES, AND PIGMENTS FROM GEOGRAPHICALLY DIFFERENT SPARTINE ALTERNIFLORA MARSHES IN THE SOUTHEAST,
Skidway Inst. of Oceanography, Savannah, GA.
For primary bibliographic entry see Field 2I.
W78-06093

THE ARRESTED TOPOGRAPHIC WAVE,
Woods Hole Oceanographic Institution, MA.
For primary bibliographic entry see Field 2H.
W78-06117

A LABORATORY STUDY OF THE STABILITY OF SAND-FILLED NYLON BAG BREAKWATER STRUCTURES,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8G.
W78-06121

IDENTIFICATION OF RELEVANT CRITERIA AND SURVEY OF POTENTIAL APPLICATION SITES FOR ARTIFICIAL HABITAT CREATION, VOLUME I, RELEVANT CRITERIA FOR MARSH-ISLAND SITE SELECTION AND THEIR APPLICATION.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 5G.
W78-06128

ORGANOCHLORINE RESIDUES IN POTENTIAL FOOD ITEMS OF MARINE BALD EAGLES (HALIAEETUS LEUCOCEPHALUS), 1966 AND 1974,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
For primary bibliographic entry see Field 5A.
W78-06164

BLOOMS OF GYRODINIUM AUREOLUM (DINOPHYCEAE) IN NORTH EUROPEAN WATERS, ACCOMPANIED BY MORTALITY IN MARINE ORGANISMS,
Oslo Univ. (Norway). Dept. of Limnology. and Oslo Univ. (Norway) Inst. of Marine Biology.
For primary bibliographic entry see Field 5C.
W78-06165

THE EFFECT OF TEMPERATURE ON THE DISTRIBUTION AND BIOMASS OF MYTILUS EDULIS IN THE ALAMITOS BAY AREA,
Claremont Graduate Schools, CA. Dept. of Joint Science.
For primary bibliographic entry see Field 5C.
W78-06166

SOURCES OF VARIABILITY IN THE BENTHIC MACROFAUNA OFF THE SOUTH NORTHUMBERLAND COAST, 1971-1976,
Dove Marine Lab., Cullercoats, (England).
J. B. Buchanan, M. Sheader, and P. F. Kingston.
Journal of the Marine Biological Association of the United Kingdom, Vol 58, p 191-209, 1978. 18 fig, 4 tab, 10 ref.

Descriptors: *Spatial distribution, *Temporal distribution, *Variability, *Water temperature, *Seasonal, *Silts, *Sediments, Mortality, Population, *Aquatic populations, *Annual succession, *Fluctuations, Distribution, Biomass, *Benthic fauna, Diversity, *Northumberland Coast(England).

Spatial and temporal variability for the period 1971-76 has been assessed, using data from five monitoring stations and two broad surveys of the Northumberland coast. Ordination of the broad survey stations relates the faunal assemblages to depth and the silt content of the sediment, and suggests that their distribution has remained essentially stable for more than a decade. Diversity is negatively correlated with silt content of the sediment but shows no correlation with depth. Biomass is negatively correlated with depth but shows no correlation with sediment type. It is suggested that, in areas with un unstable temperature regime, different suites of species enjoy competitive advantage at different points of the temporal range of temperature variability. This in turn allows the community to maximize its performance throughout a broad range of environmental variability. (Dael-EIS)
W78-06167

HEAVY METALS IN THE BURROWING BIVALVE SCROBICULARIA PLANA FROM THE TAMAR ESTUARY IN RELATION TO ENVIRONMENTAL LEVELS,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5C.
W78-06169

FEEDING RATE OF MYTILUS EDULIS L. (BIVALVIA) FROM DIFFERENT PARTS OF DANISH WATERS IN WATER OF DIFFERENT TURBIDITY,
Copenhagen Univ. (Denmark). Zoological Lab.
B. F. Theisen.
Ophelia, Vol 16, No 2, p 221-232, 1977. 6 fig, 2 tab, 20 ref.

Descriptors: Animal behavior, *Yeasts, *Feeding rates, *Commercial shellfish, *Turbidity, *Suspended solids, *Filters, Animal physiology, *Mollusks, Aquatic environment, *Denmark, *Wadden Sea(Denmark), Limfjord(Denmark), Bivalve, Gills.

The feeding rate of Mytilus edulis was measured in different concentrations of talcum simulating different concentrations of mud. Dyed yeast was used as food. The feeding rate decreased drastically with increased concentrations of talcum. At high concentrations of talcum Mytilus from the Wadden Sea fed at about twice the rate as Mytilus from other Danish waters. This is correlated with the size of the labial palps which are about twice as large in Mytilus from the Wadden Sea as in Mytilus from other Danish waters. (Dael - EIS)
W78-06170

PUBLIC WATER SUPPLIES OF NORTH CAROLINA, PART 5. SOUTHERN COASTAL PLAIN,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06178

REPORT OF THE RIVER MASTER OF THE DELAWARE RIVER FOR THE PERIOD DECEMBER 1, 1975 -- NOVEMBER 30, 1976,
Geological Survey, Reston, VA. Water Resources Div., and Geological Survey, Milford, PA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06181

SIMULATION OF WASTEWATER INJECTION INTO A COASTAL AQUIFER SYSTEM NEAR KAHULUI, MAUI, HAWAII,
Geological Survey, Reston, VA. Water Resources Div., and Geological Survey, Tallahassee, FL. Water Resources Div., and Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06186

COASTAL WETLANDS: THE PRESENT AND FUTURE ROLE OF REMOTE SENSING,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7B.
W78-06188

LAND-SURFACE SUBSIDENCE IN THE HOUSTON-GALVESTON REGION, TEXAS,
Geological Survey, Houston, TX. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06195

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

EVALUATION OF NEW REVERSE OSMOSIS MEMBRANES FOR THE SEPARATION OF TOXIC COMPOUNDS FROM WASTEWATER,
Illinois Univ. at Urbana-Champaign. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W78-05950

SALT EXTRACTION FROM SULFATE SALINIZED SOIL IN THE KOPET-DAG PIEDMONT PLAIN STUDIED BY MODELING OF LEACHING, (IN RUSSIAN),
For primary bibliographic entry see Field 3C.
W78-06009

PRESSURE DRIVEN MEMBRANE PROCESSES IN THE TREATMENT OF INDUSTRIAL EFFLUENTS,
Israel Desalination Engineering Ltd. Tel Baruch.
For primary bibliographic entry see Field 5D.
W78-06075

MEMBRANE PROCESSES USED FOR THE TREATMENT OF INDUSTRIAL EFFLUENTS,
Istituto di Ricerca sulle Acque, Rome (Italy).
For primary bibliographic entry see Field 5D.
W78-06082

SEDIMENTATION ON THE MEMBRANE SURFACE OF A HYPERFILTRATION WATER-DISTILLING APPARATUS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
A. A. Khachaturyan, E. S. Yushkevich, and D. Dzhaparov.
Probl Osvo Pustyn 6, p 69-72, 1976.

Descriptors: *Sedimentation, Filtration, *Hyperfiltration, *Distrillation, Membranes, Deserts, Hydrogen ion concentration, Desalination, Irrigation, Pastures.

A system used for irrigating desert pastures is described. To avoid the formation of sediments (e.g., bacteria) on the membrane surface of the hyperfiltration distillator the composite forces must be directed either off the membranes or tangent to their surfaces. The water flow in the chambers of the distillator must remove compacted particles from the cells and the pH of the solution under distillation must be corrected.--Copyright 1978, Biological Abstracts, Inc.
W78-06091

3B. Water Yield Improvement

INTERFEROMETRIC OBSERVATIONS OF THE TEMPERATURE STRUCTURE IN WATER COOLED OR HEATED FROM ABOVE,
Purdue Univ., Lafayette, IN. Heat Transfer Lab.
For primary bibliographic entry see Field 2D.
W78-05942

FINAL REPORT TO THE NATIONAL SCIENCE FOUNDATION RESEARCH APPLIED DIRECTORATE WEATHER MODIFICATION ASSOCIATION,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
A. H. Auer, Jr., and F. D. Eaton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 029, Price codes: A03 in paper copy, A01 in microfiche. Final Report NSF/RA-760255, June 30, 1976. 45 p, 14 fig, 1 tab, 2 ref, 2 append. NSF AEN 76-00898.

Descriptors: *Weather, *Cities, *Missouri, *On-site investigations, *Remote sensing, Atmosphere, Clouds, Cloud physics, Weather modification, Precipitation(Atmospheric), Humidity, Instrumentation, Meteorology, *St Louis(Mo), Lidar.

The goal of the Metropolitan Experiment (Metromex) was to derive an understanding of the effects of urbanized and industrialized areas on the local and regional behavior of the atmosphere, with primary attention to modification of the precipitation-producing process. Within this framework, the study attempted to make comparative observations of urban and non-urban environments to determine processes responsible for differences in boundary layer signature, wind fields, and resultant convective cloud behavior, traceable to urban-induced changes in heat, humidity, and aerosols. Primarily, this research program provided objective documentation, on a diurnal basis, of urban influence on: (1) mixing depth and other boundary layer structures; (2) cloud base height and formation frequency; and (3) precipitation elements in the St. Louis urban/rural area. In addition, time and space variations of these observed atmospheric structures qualitatively were related to other meteorological measruements. It then was possible to identify dynamic, radiative, and physical processes that may contribute to the precipitation anomaly. (Sims-ISWS)
W78-06130

3C. Use Of Water Of Impaired Quality

SUPPLEMENTAL COLORADO RIVER WATER FOR A DEVELOPED GROUNDWATER AGRICULTURE: A PROBLEM OF QUANTITIES, QUALITIES AND CONJUNCTIVE USE,
Fish and Wildlife Service, Washington, DC. Office of Biological Services.
For primary bibliographic entry see Field 4B.
W78-05705

SALT EXTRACTION FROM SULFATE SALINIZED SOIL IN THE KOPET-DAG PIEDMONT PLAIN STUDIED BY MODELING OF LEACHING, (IN RUSSIAN),
Probl Osvo Pustyn 1, p 46-53, 1977.

Descriptors: *Saline soils, *Leaching, Model studies, *Sulfates, Soil profiles, *Salt leaching, Soil moisture, *Kopet-Dag piedmont plain(USSR), Turkman SSR, Desalination.

The succession in salt leaching from a soil profile by descending water flowing in it, and secondary salt formation were studied in leached soil profiles. The water rate needed to leach salts was 11,800 m3/ha for meadow solonchaks and 10,500 m3/ha for light serozems, which correlated with 4.3-4.5% of the moisture volume of maximum field moisture capacity. These rates were recommended to leach salts from soil profiles in the Kopet-Dag (Turkmen SSR, USSR) piedmont plain salinized with sulfates.--Copyright 1978, Biological Abstracts, Inc.
W78-06009

DYNAMICS OF WATER-SOLUBLE SALTS IN SOIL IRRIGATED WITH SEWAGE WATER,
For primary bibliographic entry see Field 5D.
W78-06010

SEDIMENTATION ON THE MEMBRANE SURFACE OF A HYPERFILTRATION WATER-DISTILLING APPARATUS, (IN RUSSIAN),
Desert Inst., Ashkhabad (USSR).
For primary bibliographic entry see Field 3A.
W78-06091

HERBICIDE REPORT: CHEMISTRY AND ANALYSIS, ENVIRONMENTAL EFFECTS, AGRICULTURAL AND OTHER APPLIED USES.
Environmental Protection Agency, Washington, D.C. Hazardous Materials Advisory Committee.
For primary bibliographic entry see Field 5A.
W78-06133

3D. Conservation In Domestic and Municipal Use

PRICE VARIABLE IN RESIDENTIAL WATER DEMAND MODELS,
Oregon State Univ., Corvallis. Dept. of Resource Recreation Management.
For primary bibliographic entry see Field 6D.
W78-05703

DECISION-MAKING IN THE DEVELOPMENT OF URBAN WATERFRONTS FOR PARK/BUSINESS USE,
Texas A and M Univ., College Station. Dept. of Recreation and Parks.
For primary bibliographic entry see Field 6B.
W78-05716

A PUBLIC EDUCATION CAMPAIGN TO CONSERVE WATER,
Washington Suburban Sanitary Commission, Hyattsville, MD.
A. P. Brigham.
Journal of American Water Works Association, Vol. 68, No. 12, p 665-668, December 1976. 2 fig, 1 tab.

Descriptors: *Public education, *Social aspects, *Water conservation, *Water demand, *Washington, D.C., Education, Water utilization, Water supply, District of Columbia, Maryland, Utilities, Attitudes, Motivation, Social participation, Washington Suburban Sanitary Commission.

A public water conservation campaign begun in 1970 by the Washington Suburban Sanitary Commission (WSSC) substantially reduced water use in the bi-country Maryland area adjacent to Washington, D.C. Between fall 1971 and June 1973 water use dropped from 101.6 gpcd to 100.2 gpcd, a net minimum saving of 1.7 mgd. Following a bottle kit project in summer and fall 1973, involving plastic quart bottles for toilet flush water displacement and dye for making leak checks, water consumption dropped further to 97.0 gpcd. This was a 4.42% reduction from the minimum projected average daily consumption of 122.2 mgd without the conservation program. In addition, sewage flows from the WSSC service area in late 1973 and 1974 dropped well below the levels of 1973-74; flow decreased from 128.5 mgd in September 1972 to 120.6 mgd in September 1973 and 114.44 mgd in August 1974. After preliminary flier and spot announcements in 1970, a water-saving idea contest launched late in 21971 resulted in publication and distribution of handbooks on water conservation to some 370,000 customer services and apartment dwellers. Subsequent projects from 1971-73 were water-saving workshops and slide presentations, a water-saving fixture list, public service announcements, an appliance testing program, and plumbing code changes. (Lynch-Wisconsin)
W78-05752

URBAN STORM WATER MANAGEMENT,
For primary bibliographic entry see Field 5G.
W78-05821

DOMESTIC WASTEWATER RECYCLING.
For primary bibliographic entry see Field 5D.
W78-05864

THE IMPACT OF WATER SAVING WATER CLOSETS ON BUILDING DRAINS AND SEWERS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
W. E. Sharpe, and C. A. Cole.
Plumbing Engineer, Vol. 5, No. 6, p 20-21, 60, November-December, 1977. 4 tab, 6 ref.

Descriptors: *Sewage disposal, *Drainage systems, *Plumbing, *Waste water disposal, *Water conservation, Pipelines, Sewerage, Water consumption, Sanitary engineering.

The effect of the use of water-saving toilets on drainage and sewage systems has been evaluated. Water closets with discharges ranging 0.25-5.25 gallons per flush were compared in terms of solid sewage velocity, sewer pipe diameter, sewer pipe slope, and depth of flow. The average water-saving water closet discharges 3.5 gallons per flush. Necessary velocities for the transport of solid sewage were calculated as 1.5-2.0 ft/sec. The velocity for a water-saving toilet with a discharge of 3.50 gallons per flush was discovered to be 1.88 ft/sec. This velocity was considered adequate for sewage transport. The depth of flow was considered a potential problem in the use of water closets with a discharge of less than two gallons per flush. Large scale installation of low flow water closets in a Pennsylvania resort did not present adverse effects to the sewage system, although detailed data was not available. (Lisk-FIRL)
W78-05904

3E. Conservation In Industry

THE WELMM APPROACH TO ENERGY STRATEGIES AND OPTIONS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-05704

ARE NATURAL RESOURCES CAPITAL USING A MICROANALYTIC APPROACH,
Tulane Univ., New Orleans, LA.
For primary bibliographic entry see Field 6C.
W78-05732

THIS PLANT MARRIES TWO WASTES,
Wiley and Wilson, Inc., Lynchburg, VA.
For primary bibliographic entry see Field 5D.
W78-05845

THE DEVELOPMENT OF HETEROTROPHIC BACTERIA IN CIRCULATING WATER SYSTEMS, (IN RUSSIAN),
Vsesoyuznyi-Nauchnyi Planovii Otdel Tsellyulozno-Bumazhnoi Promyshlennost, Leningrad (USSR).
For primary bibliographic entry see Field 5C.
W78-05893

CONCEPTS AND TECHNIQUES FOR EVALUATION OF ENERGY-RELATED WATER PROBLEMS,
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 6A.
W78-05940

PHOTOSYNTHESIS AND SOLAR ENERGY CONVERSION,
Cornell Univ., Ithaca, NY. Div. of Biological Sciences.
For primary bibliographic entry see Field 8C.
W78-05969

WATER RECYCLING FLOW SCHEME FOR TOMATO PROCESSING PLANT CONTROLS SOIL ACCUMULATIONS,
For primary bibliographic entry see Field 5D.
W78-06067

SPRAY DRYING TECHNIQUES FOR BY-PRODUCT RECOVERY,
Niro Atomizer, Soeborg (Denmark).
For primary bibliographic entry see Field 5D.
W78-06068

HEAT RECOVERING INCINERATION OF ORGANIC EMISSIONS SAVES $970/000/YR IN FUEL COSTS,
Amoco Chemicals Corp., Joliet, IL.
For primary bibliographic entry see Field 5E.
W78-06072

DYEBATH REUSE IN BATCH DYEING,
George Inst. of Tech. Atlanta. School of Textile Engineering.
For primary bibliographic entry see Field 5D.
W78-06081

OFF-PEAK HOUR PUMPING RATE REDUCTION: ARE THE BENEFITS WORTH THE COSTS,
Boyle Engineering Corporation, Ventura, CA.
For primary bibliographic entry see Field 6B.
W78-06134

3F. Conservation In Agriculture

ECONOMIC ANALYSIS OF IRRIGATION PRODUCTION FUNCTIONS: AN APPLICATION OF LINEAR PROGRAMMING,
International Bank for Reconstruction and Development, Washington, DC. Development Research Center.
C. Pomareda.
Water Resources Bulletin, Vol 14, No 1, p 24-34, February 1978. 1 fig, 4 tab, 9 ref.

Descriptors: *Economic analysis, *Irrigated agriculture, *Linear programming, *Water utilization, *Production function, Optimization, Resource allocation, Profit maximization, Farm model, Constraints, Crops, Mathematical models, Equations, Systems analysis.

For estimating the yield response to irrigation water, good and varied information is available; however little and only partial (for individual crops) economic analysis has been made of this information. Herein, the economic analysis of irrigation production functions is discussed and a modified separable linear programming model is used for examining optimal levels of water use when, at the farm level, various crops with different water response functions compete for the same scarce resource. The effects of alternative water availabilities on the optimal levels of water use are explored using a multicrop farm model in which, in principle, the full water response function for each crop can be included. The farm objective function is specified as the maximization of profits from various crops, given a restriction in the availability of water and other inputs. This method provides advantage over the partial one-crop type of analyses because it captures intercrop tradeoffs in water and land use in response to economic policies or changes in water supply. (Bell-Cornell)
W78-05714

POLICY OF PRICING IRRIGATION WATER,
Ministry of Agriculture and Irrigation, New Delhi (India).
J. K. Jain.
ICID Bulletin, Vol. 26, No. 1, p 41-49, January 1977. 2 tab, 14 ref.

Descriptors: *Pricing, *Water policy, *Irrigation, *Water rates, *India, Economics, Governments, Cost-benefit analysis, Economic development, Developing countries, Economic impact, Political constraints, Subsidization, Crop production, Agriculture, Water management(Applied), Cost recovery.

Based on analysis of irrigation water pricing issues and theory, a guideline is suggested for formulating governmental pricing policy and its application is described for India. Major aspects are: (1) Subsidies up to 50% may encourage irrigation use and minimize inflation in the initial stages of irrigation development. (2) Assessment may be based on crop area in the interests of practicality and convenience but volumetric pricing should be promoted wherever possible, especially on tube wells. (3) In areas where farmers are not yet accustomed to irrigation, a two-part tariff may be introduced in place of the simpler single charge based on crop area. (4) Irrigation rates should be uniform unless there are strong reasons to introduce variable rates, such as variations in climate, soil, irrigation systems, crop irrigation requirements, or utilization of irrigation potential. Pre-independence Indian pricing policy was based on strict adherence to financial return, but since 1947 this criterion was initially relaxed and subsequently replaced by a cost-benefit standard in order to achieve rapid development of irrigation. The result was very low water rates, heavy government subsidization, and considerable diversity in the fixing of rates. Recent through on pricing is reviewed, with attention to quantum of water rates, mode of assessment, water rate structure, and water rate uniformity/diversity. (Lynch-Wisconsin)
W78-05730

RATIONALISATION OF IRRIGATION RATES IN A DEVELOPING COUNTRY,
Central Water Commission, New Delhi (India)
C. V. Gole, V. N. Amble, and M. M. L. Chopra
ICID Bulletin, Vol. 26, No. 1, p 31-40 and 49, January 1977. 1 tab, 6 ref.

Descriptors: *Developing countries, *India, *Irrigation, *Water policy, *Water rates, *Pricing, Water management(Applied), Costs, Cost recovery, Economic development, Economic impact, Agriculture, Crop production, Cost-benefit analysis, Benefit sharing, Benefits, Governments, Economics.

Current methods of fixing irrigation rates in India's 18 states and regions as well as in several foreign countries are analyzed, and criteria are proposed for formulating a rational rate structure for India. The irrigation rate system adopted must balance two opposing goals: (1) recover costs and a portion of the benefits, but (2) provide the producer with incentive for increasing production through greater use of irrigation. It is concluded that: (1) Great variation exists among the Indian states and regions in irrigation rate-setting policy, with rates fixed largely on an ad-hoc basis. (2) At the beginning of a new irrigation project it may be necessary to limit cost recovery to annual operation and maintenance expenses in order to promote irrigation use. (3) In later stages rates should be increased to recover part of the interest charges and depreciation on invested capital. (4) Cost of nonstate irrigation sources should be considered in setting minimum state rates; (5) Benefits derived by irrigators should be measured as the excess of net benefits with irrigation compared with net benefits before irrigation. (6) As an interim measure, rates should be assessed on the basis of gross income from irrigated crops until data are available for net benefit determination. (7) Rate assessment based on volumetric supply is scientific and ensures optimum water use, but administration costs are prohibitively high. (8) Rates should be uniform over broad geographical areas. Several additional considerations are discussed. (Lynch-Wisconsin)
W78-05731

DEVELOPMENT OF A VERSION OF STANFORD MODEL AND ITS EVALUATION FOR STREAMFLOW SYNTHESIS FROM SMALL WATERSHEDS IN WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2E.
W78-05808

WATER USE RATES FOR RURAL WATER SYSTEMS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W78-05809

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

MEASURING CONSUMER SURPLUS BENEFITS OF WATER SUPPLY EXTENSIONS IN DEVELOPING COUNTRIES,
Texas Univ. at Dallas, Richardson.
For primary bibliographic entry see Field 6D.

W78-05710

REGIONAL WATER SUPPLY PLANNING BY INTERACTIVE SYSTEMS ANALYSIS,
Army Engineer District, Sacramento, CA.
P. E. Pugner, and T. C. Hughes.
Water Resources Bulletin, Vol 14, No 1, p 157-168, February 1978. 3 fig, 1 tab, 5 ref.

Descriptors: *Water supply, *Planning, *Mixed integer programming, *Computer programs, *Computer models, Cost minimization, Optimization, Regional analysis, Sensitivity analysis, Interactive, Systems analysis, Reservoirs, Treatment facilities, Data flow, Methodology.

Described is an interactive data and model generator that is intended to bridge the gap between the water resource engineer and planner and the mathematical programming systems approach to regional water supply planning. The procedure involves the use of: (1) a model generating program called GAMMA which is available as an addition to the Burroughs TEMPO mathematical programming package on B6700 computer systems; (2) a series of subroutines which obtain problem input data from the user; and (3) a series of computer control statements which link the subroutines, the data generator, and the mathematical programming package in order to obtain the optimal solution without requiring programming or modeling expertise from the user. The optimization objective is to minimize total annual cost with respect to capital investment and operation and maintenance costs. The matrix generator formulates the necessary hydrologic, demographic and stochastic water supply data input by the user into the format of a mixed integer linear programming problem for system optimization. The interactive program guides the user through the input and optimization segments, totally eliminates the chore of manually structuring the model matrix, and helps to eliminate errors. A hypothetical, sample problem is used to illustrate application of the methodology. (Bell-Cornell)
W78-05712

PROGRAMMER'S AND USER'S MANUAL FOR THE TRIBUTARY WATER QUALITY MODEL (FINAL REPORT ON PHASE 2),
Center for the Environment and Man, Inc., Hartford, CT.
For primary bibliographic entry see Field 5B.
W78-05717

A STUDY OF APPLICATION OF REMOTE SENSING TO RIVER FORECASTING, VOLUME II.
IBM Federal Systems Div., Huntsville, AL.
Available from the National Technical Information Service, Springfield, VA 22161 as N75-25265, Price codes: A18 in paper copy, A01 in microfiche. IBM No 75W00056. Final Report. (1975). Volume II - Detailed Technical Report: NASA-IBM Streamflow Forecast Model User's Guide. NASA-CR-143859. 409 p, 15 fig, 20 tab, 26 ref, 3 append.

Descriptors: *Remote sensing, *River forecasting, *Streamflow, *Computer models, Hydrologic aspects, Hydrologic data, Parametric hydrology, Simulation analysis, Watersheds(Basins), Computer programs, Optimization, Equations, Systems analysis.

This volume is intended to aid prospective users in operating the NASA-IBM Streamflow Forecast Model. Included are data preparation, determining model parameters, initializing and optimizing parameters (calibration), selecting control options, and interpreting results. Background material is given; appendices contain a dictionary of variables, a source program listing and flow charts. The model has been operated for this study on an IBM System/360 Model 44, using a Model 2250 keyboard/graphics terminal for interactive operation. The model can be set up and operated in a batch processing mode on any System/360 or 370 that has the memory capacity. The models described herein have evolved from the well-known Stanford Watershed Models. Modifications introduced by IBM under NASA contract consist mainly of adding routines for man-machine interfaces, multi-year simulations, statistical analysis of results, and plot output options. Shortened variable simulation periods have been introduced for forecast applications. (Bell-Cornell)
W78-05719

A MATHEMATICAL MODEL FOR THE ANALYSIS OF MULTI-RESERVOIR FLOOD CONTROL SYSTEMS,
Natal Univ., Durban (South Africa).
J. S. Windsor.
In: Mathematical Models for Environmental Problems. Proceedings of the International Conference, University of Southampton, England, September 8-12, 1975. C.A. Brebbia (Ed.), Southampton University. John Wiley & Sons, N.Y., N.Y., p 87-98, 1976. 3 fig, 3 ref.

Descriptors: *Reservoir operation, *Flood conrol, *Mixed integer programming, *Methodology, *Optimization, *Design, Economic efficiency, Cost minimization, Constraints, Linear programming, Decision making, Reservoir storage, Mathematical models, Equations, Operations research.

A methodology is presented which employs mixed integer programming to derive the least-cost design and operation alternatives for a multi-reservoir flood control system. At the first level of optimization, it is assumed that the nonlinear cost functions for the reservoirs and damage centers are known and that the flood variability at all significant points within the system is accounted for by using representative sets of recorded or synthetically derived flood hydrographs. At the second level, a short-run optimization model is designed to permit regulation of the entire system on a strictly foresight basis. This is accomplished by subdividing the flood period into shorter operational periods and updating the system release schedule as more information becomes available regarding the changing runoff and climatic conditions. This approach recognizes component interaction in space and time and therefore offers a potentially powerful method for the analysis of integrated flood control systems involving a large number of interdependent decision variables. (See also W78-05720) (Bell-Cornell)
W78-05721

A STOCHASTIC MODEL OF LEVEE FAILURE,
Eotvos Lorand Univ., Budapest (Hungary). Dept. of Numerical Methods.
For primary bibliographic entry see Field 8D.
W78-05724

A WATER QUALITY OPTIMIZATION MODEL FOR NONSERIAL RIVER SYSTEMS,
Calgary Univ. (Alberta).
For primary bibliographic entry see Field 5B.
W78-05725

SELECTING ALTERNATIVES IN WATER RESOURCES PLANNING AND THE POLITICS OF AGENDAS,
Johns Hopkins Univ., Baltimore, MD.
For primary bibliographic entry see Field 6B.
W78-05736

ENVIRONMENTAL PROTECTION GUIDELINES FOR CONSTRUCTING PROJECTS,
East Bay Municipal Utility District, Oakland, CA.
For primary bibliographic entry see Field 6G.
W78-05742

MOSQUITOES OF MIDDLE AMERICA,
California Univ., Los Angeles.
J. N. Belkin.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A035 346, Price codes: A03 in paper copy, A01 in microfiche. Report No. 12, U.S. Army Medical Research and Development Command, Washington, D.C., September 1976. 29 p, 55 ref, 5 append. DA-49-193-MD-2478.

Descriptors: *Mosquitoes, *Middle America, *Insects, *Ecology, *Classification, *Systematics, Distribution, Animal populations, Human diseases, Invertebrates, Public health, Basic data collections.

The project 'Mosquitoes of Middle America,' begun in 1962, is a cooperative enterprise of the University of California at Los Angeles, the U.S. Army Medical Research and Development Command, and the U.S. National Institutes of Health. Although the study is concerned with detailed studies of the systematics, ecology, distribution, and vector potential of the mosquitoes of Central America, the West Indies, and adjacent North and South America, the principal objective is gathering of data for mosquito-borne disease control. The ultimate goal of publication of a multivolume monograph has not been realized, but much has been accomplished, including: (1) a methodology for collecting, rearing, and preserving specimens; (2) research procedures for taxonomic studies; (3) methods for illustration, presentation of data, and publications; (4) over 11,500 individual collections in all locations except Cuba; (5) over 86,000 individual rearings from larvae or pupae; (6) more than 400,000 specimens, including 284,700 slides of larvae, male genitalia, and adults; (7) seven installments of the Collection Records of the Projects; (8) a nearly complete file of reprints of taxonomic papers; and (9) data on the types of all nominal species described from the New World have been assembled, with types from Europe and South America studied in detail. Only about 25% of total existing mosquito species in the study area (261 named species) have treated in detail, but 55 studies have been published. (Lynch-Wisconsin)
W78-05743

HARVESTING A NUISANCE,
Florida Univ., Gainesville.
J. Queijo.
Environment, Vol. 19, No. 2, p 25-29, May 1977. 3 fig, 9 ref.

Descriptors: *Water hyacinth, *Aquatic weed control, *Beneficial use, *Sewage treatment, *Feeds, Harvesting, Biocontrol, Mechanical control, Chemcontrol, Southeast US, Proteins, Nutrients, Nitrogen, Phosphorus, Herbicides, Nutrient removal, Water pollution control, Eichhornia crassipes.

While mechanical, chemical, and biological control efforts against water hyacinth (Eichhornia crassipes) continue, attention is now being directed to beneficial aspects of floating plant. Within ten years of its introduction into the United States at a New Orleans exposition in 1884, the plant had spread to North Carolina, South Carolina, Georgia, Alabama, Mississippi, and Florida. Still a major problem, water hyacinth will normally double in weight in 7-10 days, and ten plants can theoretically multiply to 600,000 in eight months. Dense mats clog waterways, cause suffocation of fish, and provide breeding grounds for disease-carrying mosquitoes and snails. Control efforts were begun in 1898 with a mechanical cropper; two years later the 35-year reign of the deadly sodium arsenite started, finally replaced in 1937 with use of a crusher boat. The herbicide 2,4-D, first used in the mid-1940s, to date is the most effective chemical control agent. Natural predators, including water hyacinth weevils and a water snail, are being tested. Water hyacinth can absorb nutrients and chemicals from sewage and industri-

al wastes at high rates, and a sewage treatment plant has been started in Mississippi using the plants to remove nitrogen and phosphorus, with production of methane and fertilizer as by-products. Research is underway to convert hyacinths into cattle feeds. Three kg dried hyacinth can supply a steer with daily nutritional requirements of calcium, phosphorus, potassium, magnesium, and sodium. (Lynch-Wisconsin)
W78-05745

INTERNATIONAL CO-OPERATION AND INLAND WATERS: THE INFLUENCE OF FEDERALISM,
United Nations Secretariat.
For primary bibliographic entry see Field 6E.
W78-05746

PROPAGATION AND USE OF SPARTINA ALTERNIFLORA FOR SHORELINE EROSION ABATEMENT,
North Carolina State Univ. at Raleigh.
W. W. Woodhouse, Jr., E. D. Seneca, and S. W. Broome.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 423, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No. 76-2, Army, Corps of Engineers, Coastal Engineering Research Center, Fort Belvoir, Virginia, August 1976. 31 fig, 20 tab, 5 ref. G31530, DACW72-70-C-0015, DACW72-72-C-0012, DACW72-74-C-0014.

Descriptors: *Erosion control, *Spartina alterniflora, *Marsh plants, *Bogue Sound(NC), *Shore protection, *Vegetation establishment, Shoreline cover, *North Carolina, Waves(Water), Planting management, Nutrients, Marsh management, Coasts, Beach erosion, Transplanting.

Successful experiments were conducted to protect the eroding south shore of Bogue Sound, North Carolina by means of planktings of the marsh plant, Spartina alterniflora. The test area was located near Pine Knoll Shores, a residential development, and the Pine Knoll Shores Golf Course. During development a channel was dredged parallel to and about 100-150 ft offshore from the present high-tide line, and dredgings were deposited along waterfront lots, killing existing S. alterniflora vegetation. Shoreline erosion followed, and in 1973 a concrete bulkhead was installed just above the high-tide line. When erosion continued, planting experiments were begun in 1974. Results of the planting and laboratory nutrition experiments showed that: (1) A local plant stock was superior to plants grown locally from foreign seed during the first growing season, but such differences disappeared by the fourth year. (2) Rhizomes of S. alterniflora without attached, well-developed culms were worthless as propagules in the intertidal zone. (3) Neither fertilization in the nursery nor in the furrow at transplanting affected final establishment of vegetation on the shoreline. (4) Plants grown from seeds in peat pots were as successful as field-grown transplants, but were more expensive to produce and more difficult to transplant. (5) Seeding was unsuccessful on the shoreline because of wave action. Details of planting techniques are given. (Lynch-Wisconsin)
W78-05751

FLOOD PLAIN INFORMATION: MONONGAHELA, WEST FORK AND TYGART RIVERS, MARION COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Marion County Planning Commission, June 1975, 34 p, 13 fig, 12 plates, 7 tab.

Descriptors: *West Virginia, *Streamflow forecasting, *Flood data, Floods, Flood flow, Indirect flood measurement, Maximum probable flood, Flood forecasting, Flood profiles, Historic floods, Flood frequency, Flood stages, Peak discharge, Stage-discharge relations, Flood damage, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Dams, Reservoirs, *Monongahela River(WV), *West Fork River(WV), *Tygart River(WV), Marion County(WV), 100-year flood, 500-year flood, Fairmont(WV), Rivesville(WV), Monongah(WV), Worthington(WV).

The study area involves the portions of Marion County, West Virginia that are subject to flooding by the Monongahela, West Fork, and Tygart Rivers. Included are the cities of Fairmont, Rivesville, Monongah, and Worthington. The flood plain consists mostly of a thin strip of land between the river and the railroad tracks and for the most part consists of undeveloped land, except in urban areas, where residential, commercial, and industrial land uses exist. Flood data were obtained from topographic maps, field studies, historical souces, and stream gage records. The main flood season occurs from December through March, and results from heavy general rainfall combined with snowmelt. Tygart Dam controls about 86% of the watershed, so there is rarely serious flooding on the Tygart River. It helps to reduce major flood crests in Marion County by 4-6 feet. Another flood control dam has been authorized for construction, but it would have little effect on Marion County. The worst flood recorded at the Fairmont gage on the Monongahela River occurred in March 1967, cresting at 27.9 feet mean sea level (msl) and discharging 65,400 cubic feet per second (cfs). At the same location, the 100-year flood would crest at 30.4 feet msl and would discharge 80,500 cfs, while the 500-year flood would crest at 34.1 feet msl and would discharge 98,700 cfs. Only 2 of 19 bridges would obstruct the 100-year flood flow. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-05761

FLOOD PLAIN INFORMATION: WEST FORK RIVER AND ELK CREEK, CLARKSBURG AND VICINITY, HARRISON COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Clarksburg Planning Commission, WV, March 1973, 37 p, 8 fig, 9 plates, 9 tab.

Descriptors: *West Virginia, *Streamflow forecasting, *Flood forecasting, *Flood data, *Flow characteristics, *Stage-discharge relations, Floods, Flood flow, Indirect flood measurement, Flood profiles, Historic floods, Flood stages, Peak discharge, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Clarksburg(WV), Harrison County(WV), *West Fork River(WV), *Elk Creek(WV), Intermediate Regional Flood.

The study area includes West Fork River and Elk Creek, and their floodplains, in the vicinity of Clarksburg, Harrison County, West Virginia. The flood plain is largely developed, containing residential, commercial, and transportation land uses. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs from December through May and results from heavy rain combined with snowmelt. Serious flooding may occur at any time. The worst flood recorded at the Clarksburg gage on the West Fork River occurred March 7, 1967. It crested at 946.22 feet mean sea level (msl) and discharged 17,800 cubic feet per second (cfs). At the same location, the Intermediate Regional Flood (IRF) would crest at 947.2 feet msl and would discharge 20,500 cfs, while the Standard Project Flood would crest at 952.4 feet msl and would discharge 30,000 cfs. Five of the ten bridges in the study area would interfere with these flood flows. A proposed flood control project upstream of Weston, WV, should reduce major floods at Clarksburg by one to two feet. Elk Creek, a major tributary of the West Fork River, enters at River Mile 31.65, flowing in a northwest direction through the study area. Historic and future flood profiles are also presented for Elk Creek. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-05762

FLOOD PLAIN INFORMATION: LITTLE WHEELING CREEK, TRIADELPHIA TO VALLEY GROVE, OHIO COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Wheeling-Ohio County Planning Commission, WV, October 1970, 22 p, 4 fig, 6 plates, 2 tab.

Descriptors: *West Virginia, *Streamflow forecasting, *Flood data, *Stage-discharge relations, Floods, Flood flow, Indirect flood measurement, Historic floods, Flood stages, Flood peak, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, Flood profiles, *Little Wheeling Creek(WV), Triadelphia District(WV), Valley Grove(WV), Ohio County(WV), Intermediate Regional Flood.

The study area involves Little Wheeling Creek and its flood plain within the limits of Triadelphia District and the towns of Triadelphia and Valley Grove in Ohio County, West Virginia, covering a stretch of about 8.5 miles. The flood plain contains many commercial, residential and industrial land uses. Flood data were obtained from topographic maps, historical sources, and short term stream gage records. The main flood season occurs from June through October and results from intense local rainfall. The worst known flood occurred in July 1937. Its magnitude was equivalent to the Intermediate Regional Flood (IRF). It crested at 693.0 feet mean sea level (msl) and discharged 18,000 cubic feet per second (cfs). At the same location, the Standard Project Flood would crest at 702.5 feet msl and would discharge 30,000 cfs. Twenty one of the 41 bridges crossing the stream in the study area would obstruct the IRF flow. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-05763

FLOOD PLAIN INFORMATION: FULTON BRANCH, WEBSTER CREEK AND TRIBUTARIES, WAMAC, ILLINOIS.
Army Engineer District, St. Louis, MO.
Prepared for City of Wamac, IL, June 1977, 30 p, 10 fig, 19 plates, 5 tab.

Descriptors: *Illinois, *Flood flow, *Streamflow forecasting, *Flood data, Floods, Flood profiles, Historic floods, Flood frequency, Peak discharge, Stage-discharge relations, Flood plains, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, *Fulton Branch(IL), *Webster Creek(IL), Wamac(IL), 100-year flood, 500-year flood.

The study area includes Fulton Branch and Webster Creek in the vicinity of Wamac, Illinois. The flood plains are mostly undeveloped or agricultural, with some residential land uses in Wamac. Flood data were obtained from topographic maps, historical sources, field studies, and rainfall intensity information. No stream gage records were available. Flooding may occur at any time of year and results from intense local rainfall. Data on historic floods are imprecise, but do indicate that the worst flood occurred in May 1961. At Township Road on Fulton Branch at the downstream study limit, the 100-year flood would discharge 2,800 cubic feet per second (cfs) and would crest at 467 feet mean sea level (msl), while the 500-year flood would discharge 3,850 cfs and

would crest at 467.3 feet msl. Numerous bridges would interfere with these flood flows. Historic and future flood profiles are provided for the rest of the study area. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-05764

FLOOD PLAIN INFORMATION: SILVER CREEK AND TRIBUTARIES, ST. CLAIR COUNTY, ILLINOIS - NO. 1.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6F.
W78-05765

ANALYSIS OF HYDROLOGICAL RECESSION CURVES,
Commonwealth Scientific and Industrial Research Organization, Brisbane (Australia). Div. of Mathematics and Statistics.
For primary bibliographic entry see Field 2E.
W78-05769

TRANSPORT OF ATRAZINE AND SIMAZINE IN RUNOFF FROM CONVENTIONAL AND NO-TILLAGE CORN,
Ohio Agricultural Research and Development Center, Wooster.
For primary bibliographic entry see Field 5B.
W78-05782

WINTER FLOOD IN LENINGRAD ON DECEMBER 20, 1973,
For primary bibliographic entry see Field 2E.
W78-05800

COST OPTIMIZATION OF RURAL WATER SYSTEMS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-05810

ESTIMATION OF BENEFITS AND ANALYSIS OF FACTORS INFLUENCING LAND USE CHANGE IN THE IOWA RIVER FLOOD PLAIN,
Iowa Univ., Iowa City. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-05811

OPTIMAL STATE ANALYSIS OF RESERVOIRS,
California Univ., Riverside. Dry Lands Research Inst.
W. W-G. Yeh, L. Becker, W. J. Trott, G. W. Tauxe, and L. F. Hancock.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 571, Price codes: A05 in paper copy, A01 in microfiche. Report No. UCLA-ENG-7390, November, 1973. 75 p, 2 fig, 2 tab, 32 ref, 2 append. OWRT C5184(4208)(1), Bur Reclam 14-06-200-5882A.

Descriptors: *Optimization, *Reservoirs, *Dynamic programming, *Least squares method, *Linear programming, Operations research, Sampling, Water utilization, Reservoir storage, Computer programs, Management, Streamflow, Bibliographies, California, Water policy, Methodology, *California Central Valley Project(CA), *Shasta Reservoir(CA), *Clair Engle Reservoir(CA).

A methodology for optimal state analysis of reservoirs was developed and applied to the reservoirs and hydroelectrical facilities associated with the Shasta, Trinity, and Folsom subsystems of the California Central Valley Project. With a typical requirement of real time, multiple reservoir operation, the methodology was evolved utilizing a form of dynamic programming for selection of an optimal reservoir storage policy path through a specified number of policy periods; a linear programming routine was used for period by period optimization. Relatively easy computer implementation and high flexibility resulted; the method is valuable for determination of release policies in real time operation of an existing system. A two-stage least squares estimation method is also presented to support optimization; it gives unbiased estimators when the system is described by a set of simultaneous equations in which each equation contains several dependent variables which also occur in other equations. Application was made to the forecasting of stream flows into the Shasta and Clair Engle reservoirs, showing that dependent variables are the February-July inflows and independent variables include snow water contents and precipitation indices at several stations within the watersheds. An annotated bibliography on the available practical techniques for considering adverse effects of daily/weekly operations on the risk of not meeting firm water and power commitments at some future date is included; the sparsity indicated the need for future research. Appendices contain programs for the linear-dynamic programming algorithm and for two-stages regression. (Wares-IPA)
W78-05817

SIMPLE METHODS FOR RAINFALL-RUNOFF-PROCESS. RUNOFF HYDROGRAPH CURVES FOR RAIN AND MIXED WATER CANALS (EINFACHE MODELLE FUER NIEDERSCHLAG-ABFLUSS-PROZESSE. ABFLUSSGANGLINIEN FUER REGEN UND MISCHWASSERKANAELE),
For primary bibliographic entry see Field 5D.
W78-05823

ADEQUACY OF HYDROLOGIC DATA FOR APPLICATION IN WEST VIRGINIA,
West Virginia Univ., Morgantown. Water Research Inst.
For primary bibliographic entry see Field 7C.
W78-05931

DEVELOPMENT OF A SUBSURFACE HYDROLOGIC MODEL AND USE FOR INTEGRATED MANAGEMENT OF SURFACE AND SUBSURFACE WATER RESOURCES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W78-05934

THE WHITE AMUR AS A BIOLOGICAL CONTROL FOR AQUATIC WEEDS IN INDIANA,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
C. A. Lembi, and B. G. Ritenour.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 611, Price codes: A06 in paper copy, A01 in microfiche. Technical Report No 95, December 1977. 95 p, 8 fig, 15 tab, 54 ref, 3 append. OWRT A-032-IND(1).

Descriptors: *Aquatic weed control, Aquatic plants, *Aquatic algae, Fresh water algae, Plankton, Dragonflies, Diptera, Midges, Zooplankton, Weed control, Phosphorus, Potassium, Dissolved oxygen, Nitrogen, *Biocontrol, *Indiana, *White amur, *Grass carp, *Biological weed control, Spirogyra, Watermilfoil, Myriophyllum, Ceratophyllum, Potamogeton, Najas, Elodes, Lemna, Wolffia.

Water quality parameters, plankton, and benthic invertebrates in ponds stocked with white amurs (Ctenopharyngodon idella Val.) and in control ponds were compared during the summers of 1975 and 1976. Amurs rapidly consumed available aquatic vascular plants. The filamentous green alga, Spirogyra, was the least desired. Dissolved oxygen levels in amur ponds remained high as long as bottom growths of Spirogyra were present, but consumption of this alga in addition to vascular vegetation led to significantly lower oxygen concentrations in the water directly above the sediments. The other parameters consistently affected during the 2 year study were turbidity and potassium concentration; both were significantly higher in amur ponds. Potassium in the water appeared to be an excellent indicator of vegetation consumption. In laboratory studies, amurs and large mouth bass were exposed to varying concentrations of rotenone. Results indicated that amurs can not be selectively removed from a fish population containing largemouth bass.
W78-05936

INTERFEROMETRIC OBSERVATIONS OF THE TEMPERATURE STRUCTURE IN WATER COOLED OR HEATED FROM ABOVE,
Purdue Univ., Lafayette, IN. Heat Transfer Lab.
For primary bibliographic entry see Field 2D.
W78-05942

ESTIMATES OF LOW FLOWS USING WATERSHED AND CLIMATIC PARAMETERS,
Stephen F. Austin State Univ., Nacogdoches, TX. School of Forestry.
For primary bibliographic entry see Field 2E.
W78-05944

GENERATING RAINFALL EXCESS BASED ON READILY DETERMINABLE SOIL AND LAND-USE CHARACTERISTICS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2A.
W78-05945

UTILIZATION OF SATELLITE DATA FOR INVENTORYING PRAIRIE PONDS AND LAKES,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 2H.
W78-05979

UTAH LAKE-JORDAN RIVER BASIN MODELING PROJECT. VOLUME I. SUMMARY REPORT. VOLUME II. APPENDIX.
Environmental Dynamics Inc., Los Angeles, CA.
For primary bibliographic entry see Field 5B.
W78-05983

SHOULD DAMS BE BUILT. THE VOLTA LAKE EXAMPLE,
United Nations Environment Program, Nairobi (Kenya).
For primary bibliographic entry see Field 5C.
W78-06033

CASE STUDY: THE SANTEE RIVER, S.C.,
South Carolina Univ., Columbia.
For primary bibliographic entry see Field 5C.
W78-06055

HYDROLOGIC AND ENVIRONMENTAL EFFECTS OF A LONG-TERM DRAINAGE ON A COASTAL AREA, (CASE STUDY: MELBOURNE TILLMAN DRAINAGE DISTRICT, PALM BAY, FLORIDA),
Florida Inst. of Tech., Melbourne. Center for Coastal Zone Research.
For primary bibliographic entry see Field 2L.
W78-06057

INLAND WETLAND DEFINITIONS,
Connecticut Univ., Storrs. Biological Sciences Groups.
For primary bibliographic entry see Field 2H.

W78-06083

A GUIDE TO UNDERSTANDING AND ADMINISTRATING THE MASSACHUSETTS WETLANDS PROTECTION ACT.
Massachusetts Audubon Society, Lincoln.
For primary bibliographic entry see Field 6E.
W78-06084

FORESTS AND WATER: EFFECTS OF FOREST MANAGEMENT ON FLOODS, SEDIMENTATION, AND WATER SUPPLY,
Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.
For primary bibliographic entry see Field 4C.
W78-06089

THE ANALYSIS OF MULTIVARIATE TIME SERIES APPLIED TO PROBLEMS IN HYDROLOGY,
International Inst. of Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2E.
W78-06102

STATISTICAL METHODS IN HYDROLOGY,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 7C.
W78-06125

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1975.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06175

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1975.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06176

WATER RESOURCES DATA FOR MONTANA, WATER YEAR 1976.
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06177

PUBLIC WATER SUPPLIES OF NORTH CAROLINA, PART 5. SOUTHERN COASTAL PLAIN,
Geological Survey, Raleigh, NC. Water Resources Div.
T. M. Robison, and L. T. Mann, Jr.
North Carolina Department of Natural Resources and Community Development, Raleigh, July 1977. 333 p, 5 fig, 13 ref.

Descriptors: *Water supply, *North Carolina, *Water sources, *Surface waters, *Groundwater, Water works, Water quality, Water treatment, Water utilization, Water users, Water storage, Water management(Applied), Appraisals, Water resources development, Southern Coastal Plain(NC), Counties.

This report contains information on the water resources and the larger public water supplies in 17 counties in the southern Coastal Plain section of North Carolina for the use of planners and water managers concerned with water-supply availability, water-resources development, and water quality. The report is divided into two sections. The first describes the method of investigation, an explanation of the information reported for each water supply and its significance to planning, a discussion of the chemical analyses included in the report, and a discussion of some of the problems noted during the investigation. The second includes a water-resources appraisal and a map of each county showing the general area served by public water supplies and an inventory of each public supply in the county with 500 or more customers. Water supplies for large military bases have been included in the study. Data presented in the second section includes: (1) the population served, (2) the adjacent communities served, (3) the number of customers, (4) the source of water, (5) estimated allowable draft, (6) total and industrial water use, (7) raw- and finished-water storage, (8) raw- and finished-water pumping capacity, (9) future plans, (10) a water-resources appraisal in the immediate vicinity of the supply and, (11) the results of chemical analyses of raw and finished water. (Woodard-USGS)
W78-06178

SELECTED HYDROLOGIC DATA, PAROWAN VALLEY AND CEDAR CITY VALLEY DRAINAGE BASINS, IRON COUNTY, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06180

REPORT OF THE RIVER MASTER OF THE DELAWARE RIVER FOR THE PERIOD DECEMBER 1, 1975 -- NOVEMBER 30, 1976,
Geological Survey, Reston, VA. Water Resources Div., and Geological Survey, Milford, PA. Water Resources Div.
F. T. Schaefer, and R. E. Fish.
Report of the River Master of the Delaware River for the Period Dec 1, 1975 -- Nov. 30, 1976, (USGS, Reston, Va.), 1977. 91 p, 5 fig, 1 plate, 18 tab.

Descriptors: *Reservoir operation, *Delaware River, *Reservoir storage, *Reservoir releases, *Water quality, New Jersey, New York, Pennsylvania, Hydrologic data, Streamflow, Flow control, Hydrologic budget, Water supply, Water distribution(Applied), Diversion, Estuaries, Water analysis, Saline water intrusion.

The report on the hydrologic and hydraulic operations of the Delaware River basin is for the year ending November 30, 1976. This marks the twenty-third year of such activities since the inception of the Amended Decree of the United States Supreme Court, dated June 7, 1954. Hydrologic conditions in the Delaware River basin during the year were generally in the above-normal range. Diversions from the basin to New York City and to New Jersey were below limits authorized in the Decree. Releases from reservoirs were made as prescribed under the Decree. During the first half of the report year, December to May, precipitation that was slightly above average resulted in stream runoff slightly above median. Runoff of the Delaware River at Montague was the highest of record for February. Cannonsville Reservoir spilled throughout the period, Pepacton Reservoir spilled during every month, and Neversink Reservoir did not spill. During the summer and fall, part of the storage and inflow to the New York City reservoirs was required for diversions and releases. Diversions to Rondout Reservoir during June 1 to November 30 totaled 135,398 billion gallons. During June 1-14, the flow required to be maintained in the Delaware River at Montague was the minimum basic rate of 1,750 cfs and the forecasted discharge exclusive of releases from Papacton, Cannonsville, and Neversink Reservoir was greater than 1,750 cfs each day. On June 15, the seasonal period began for release of the excess quantity of water from the reservoirs, and the design rate to be maintained at Montague became 2,160 cfs. Data are presented for water quality of the Delaware River Estuary between Trenton, N.J. and Ship John Shoal Lighthouse, N.J. (Woodard-USGS)
W78-06181

SEDIMENTATION IN SANTA MARGARITA LAKE, SAN LUIS OBISPO COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2J.
W78-06182

WATER RESOURCES INVENTORY OF NORTHWEST FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-06183

HYDROLOGY AND WATER QUALITY OF THE ATCHAFALAYA RIVER BASIN,
Geological Survey, Baton Rouge, LA. Water Resources Div.
F. C. Wells, and C. R. Demas.
In Cooperation with Louisiana Department of Transportation and Development, Baton Rouge, Office of Public Works, Water Resources Technical Report No 14, 1977. 53 p, 22 fig, 1 plate, 9 tab, 19 ref.

Descriptors: *Streamflow, *Discharge(Water), *Water quality, *Sediment transport, *Louisiana, Gaging stations, Flow rates, Tracking techniques, Path of pollutants, Dye releases, Tracers, Water analysis, Chemical analysis, Inorganic compounds, Water temperature, Dissolved oxygen, Nutrients, Pesticides, Bacteria, Heavy metals, Hydrologic data, *Atchafalaya River basin(La), Time of travel.

The Atchafalaya River in Louisiana receives its water from the Red River, the Black River, and the Mississippi River by way of the Old River Control Structure. Ninety-five percent of the time the Mississippi River supplies at least 50 percent of the flow of the Atchafalaya River at Simmesport, La. Since completion of the Old River Control Structure, approximately 30 percent of the flow of the Mississippi River is diverted to the Atchafalaya River. Since 1964, the 50-percent flow duration (median flow) of the Atchafalaya River has increased from 140,000 to 190,000 cfs. The average suspended-sediment load transported past Simmesport, La., is 260,000 tons per day. The median suspended-sediment load is 150,000 tons per day. The maximum recorded suspended-sediment load was 2,120,000 tons per day (March 1968), and the minimum suspended-sediment load was 3,000 tons per day (November 1964). The chemical quality of the Atchafalaya River is controlled by the discharge and chemical quality in the Red, Black, and Mississippi rivers. The dominant anion and cation present in the Atchafalaya River at Simmesport are bicarbonate and calcium, respectively. Tracer studies were made during a relatively low-flow period, 137,000 cfs in August 1975. The tracer was injected into the Atchafalaya River approximately 1 mile below the confluence of the Red River and Old River outflow channel. Complete lateral mixing was first observed at Melville, approximately 32 miles below the injection site. (Woodard-USGS)
W78-06184

BED CONDUCTION COMPUTATION FOR THERMAL MODELS,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
For primary bibliographic entry see Field 8B.
W78-06185

A TECHNIQUE FOR DETERMINING DEPTHS FOR T-YEAR DISCHARGES IN RIGID-BOUNDARY CHANNELS,
Geological Survey, Menlo Park, CA. Water Resources Div.
D. E. Burkham.
Water-Resources Investigations 77-83, December 1977. 38 p, 6 fig, 2 tab, 7 ref.

Descriptors: *Floods, *Channel flow, *Depth-area-duration analysis, *Streamflow forecasting, Natural streams, Hydraulics, Analytical techniques, Flood frequency, Discharge(Water), Depth, Roughness(Hydraulic), Flood profiles, Flood plain zoning, 100-year discharge, Simplified flood-mapping techniques, Federal Insurance Administration flood studies.

A simplified technique is presented for determining depths for T-year discharges (the discharge that will occur, on an average, once in T-years--10 years, 50 years, 100 years) for natural channels (channels not significantly affected by manmade structures) having channel-control conditions and rigid boundaries (channels having a low probability of change that would significantly affect the hydraulic characteristics of a T-year discharge). Channel-control conditions usually exist during T-year discharges in natural rigid-boundary channels and, therefore, the simplified technique probably would be applicable for flood-inundation studies for many natural rigid-boundary channels. The technique requires that the T-year discharge for a reach be known or readily available; also, a channel-shape factor, a width at a reference altitude, a channel-bottom slope (or a water-surface slope), and the Manning's roughness factor, n, must be estimated or determined at representative sections having channel-control conditions. The standard error of estimate for depths determined according to the simplified technique is probably 25-30 percent. In comparison, the standard error of estimate for the depths determined according to the step-backwater procedure and to guidelines and specifications for flood-insurance studies of the Federal Insurance Administration is about 23 percent. (Woodard-USGS)
W78-06189

WATER RESOURCES OF NO NAME VALLEY, COLVILLE INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06194

4B. Groundwater Management

SUPPLEMENTAL COLORADO RIVER WATER FOR A DEVELOPED GROUNDWATER AGRICULTURE: A PROBLEM OF QUANTITIES, QUALITIES AND CONJUNCTIVE USE,
Fish and Wildlife Service, Washington, DC. Office of Biological Services.
M. A. Boster, and W. E. Martin.
Advances in Water Resources, Vol 1, No 2, p 103-109, December 1977. 11 ref, append.

Descriptors: *Colorado River, *Groundwater development, *Water importing, *Irrigated agriculture, *Linear programming, *Conjunctive use, Surface waters, Water quality, Farms, *Arizona, Costs, Salinity, Projects, Optimization, Benefit maximization, Economic efficiency, Crop yield, Mathematical models, Systems analysis.

Upon completion of the Central Arizona Project, Colorado River water will be delivered some 200 miles inland for agricultural, domestic, and industrial use. Any new importation of water to an area implies adjustments in the organization of the economy of the area. For irrigated agriculture, adjustments will occur in input mix, output mix, acreage farmed, and in gross and net incomes. A complicating factor associated with importation of Colorado River water is that the imported water will contain different dissolved salt concentrations than the groundwater and surface water currently being used. Linear programming models of representative irrigated farms in Pinal County, Arizona are used to project adjustments implied under several assumptions as to the availability, cost and salinity of the various sources of irrigation water. The models are designed to maximize net farm returns above variable production costs subject to the resource constraints faced by the representative farmers. Conclusions are drawn as to the potential winners and losers from project development: Increased salinity should not be of concern to the farmers in the county and Indian farms will reap the greatest share of benefits from the Project. (Bell-Cornell)
W78-05705

COMPUTER MODELLING OF GROUNDWATER 13C AND 14C ISOTOPE COMPOSITIONS,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
For primary bibliographic entry see Field 2F.
W78-05767

DETERMINATION OF UNIFORM AND GRANULAR AQUIFER CHARACTERISTICS BY LINEAR METHODS,
Gerede Sokat, Ankara (Turkey).
For primary bibliographic entry see Field 2F.
W78-05775

IMPACT OF LAND USE ON GROUND WATER QUALITY IN THE GRAND TRAVERSE BAY REGION OF MICHIGAN,
Duke Univ., Durham, NC. School of Forestry and Environmental Studies.
For primary bibliographic entry see Field 5A.
W78-05778

CHARACTERISTICS OF THE INTERRELATION OF SURFACE AND GROUND WATERS IN THE KARAKENGIR RIVER BASIN WITH A DISTURBED NATURAL REGIME,
For primary bibliographic entry see Field 2F.
W78-05794

UNDERGROUND INJECTION OF LIQUID WASTE CAN BE ENVIRONMENTALLY SOUND,
Texas Water Quality Board, Austin.
For primary bibliographic entry see Field 5E.
W78-05899

APPLICATION OF HEAT-FLOW TEMPERATURE MODEL FOR REMOTELY ASSESSING NEAR SURFACE SOIL MOISTURE BY THERMOGRAPHY,
South Dakota State Univ., Brookings. Dept. of Physics.
For primary bibliographic entry see Field 2G.
W78-05932

HYDROGEOLOGY OF THE LAKE METIGOSHE BASIN NORTH DAKOTA AND MANITOBA,
North Dakota Univ., Grand Forks. Dept. of Geology; and Geological Survey, Grand Forks, ND.
For primary bibliographic entry see Field 5B.
W78-05933

DEVELOPMENT OF A SUBSURFACE HYDROLOGIC MODEL AND USE FOR INTEGRATED MANAGEMENT OF SURFACE AND SUBSURFACE WATER RESOURCES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 629, Price codes: A03 in paper copy, A01 in microfiche. Environmental Resources Center, Fort Collins, Colorado Water Resources Research Institute, Completion Report No 82, December 1977. 27 p, 11 fig, 2 tab, 13 ref. OWRT B-144-COLO(6). 14-34-0001-6064.

Descriptors: *Conjunctive use, *Model studies, River basin management, Surface water, Groundwater, Aquifer management, Subsurface water, Water management(Applied), *Simulation analysis, Return flows, Drawdown, Cost effeciencies, *Colorado, *South Platte River(Colo).

Two new concepts useful in studies of conjunctive management of surface and ground waters are introduced. In order to model both accurately and cost-effectively the effect of initial aquifer drawdowns on the future state of the system, artificial pumping rates for one period prior to the initial time are introduced. With this approach it is possible to simulate the effect of initial conditions in the same way pumping effects are predicted. In addition, for long-term simulation the concept of sequential reinitialization is introduced. In this manner daily simulation over many years can be carried with pumping and relaxation discrete kernels calculated for only a few periods. The concept of reach transmissivity introduced in earlier studies is verified by comparison with observations of return flows to a reach of the South Platte River. The study indicates the approach is sound.
W78-05934

A PUMP TEST IN THE DAKOTA SANDSTONE AT WALL, SOUTH DAKOTA,
South Dakota School of Mines and Technology, Rapid City. Dept. of Geology and Geological Engineering.
J. P. Gries, P. H. Rahn, and R. K. Baker.
South Dakota Geological Survey, Vermillion, 1976. Circular 43, 8 fig, 11 ref. OWRT A-034-SDAK(2).

Descriptors: *Wells, *Pumping, *Testing, *South Dakota, Water wells, Drawdown, Sandstones, Groundwater, Aquifers, Aquifer testing, Groundwater availability, Geology, Geologic formations, Water resources, Water supply, *Wall(SD), *Dakota sandstones, Pump tests.

A pump test was conducted in the Dakota Sandstones at Wall, South Dakota, on October 7, 1972. Two observation wells responded to the pumping, and an average value of permeability was calculated to be 9.42 gpd/sq ft. No deviation from the Theis type curve was observed during the 44 hours of pumping at 120 gpm. (Sims-ISWS)
W78-05946

EFFECT ON GROUNDWATER OF INFILTRATION AND WASTE WATER TREATMENT NEAR ANN, JAMTLAND COUNTY, (IN SWEDISH),
Chalmers Univ. of Technology, Goteborg (Sweden). Vatten Inst. Tek.
For primary bibliographic entry see Field 5B.
W78-06028

THE BIOGENIC CARBON BALANCE IN A GROUND WATER INFILTRATION ENRICHMENT SYSTEM, (IN RUSSIAN),
Academy of Municipal Economy, Moscow (USSR). Research Inst. of Public Water Supply, Water Purification.
For primary bibliographic entry see Field 5B.
W78-06030

PROCEEDINGS OF THE ELEVENTH BIENNIAL CONFERENCE ON GROUND WATER.
California Univ., Davis. Water Resources Center; and California State Dept. of Water Resources, Sacramento.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 669, Price codes: A09 in paper copy, A01 in microfiche. California Water Resources Center Report No. 41, November 1977, 189 p.

Descriptors: Groundwater, *Management, *Groundwater potential, Groundwater basins,

*Groundwater availability, *Groundwater recharge, Groundwater resources, Water rights, Conjunctive use, Legal aspects, Water policy, Storage, *California.

This conference held in Fresno on September 15-16, 1977, concentrated on ground water and ground water management in California. Many aspects of ground water management are examined including water rights, legal aspects, storage, public policy, recharge, and conjunctive use of ground water and surface water. (Snyder-Calif, Davis)
W78-06039

SEEPAGE FROM A TRAPEZOIDAL AND A RECTANGULAR CHANNEL USING VARIATIONAL INEQUALITIES,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
J. C. Bruch, Jr., F. C. Sayle, and J. M. Sloss.
Journal of Hydrology, Vol. 36, No. 3/4, p 247-260, February 1978. 3 fig, 2 tab, 18 ref.

Descriptors: *Seepage, *Channels, *Soil water movement, *Model studies, Mathematical models, Permeability, Infiltration, Soil water, Open channels, Soils, Flow, Groundwater, Groundwater movement, Hydrology.

A variational inequality method was applied to the problem of two demensional seepage from trapezoidal channels and a rectangular channel into permeable soil underlain at a finite depth by a drain. Location of the free surface, shape of the seepage region, and seepage flow rate all appeared as solutions through the utilization of this method. The numerical portion of the problem was solved using successive overrelaxation methods with projection. Both finite-difference and finite-element methods were used. A discussion of the computer approach as given along with comparisons of the results. (Sims-ISWS)
W78-06098

IDENTIFICATION OF DISTRIBUTED PARAMETERS IN GROUNDWATER BASINS,
James Cook Univ. of North Queensland, Townsville (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-06100

CHEMICAL ASPECTS OF GROUND WATER RECHARGE WITH WASTEWATERS,
California Univ., Berkeley.
For primary bibliographic entry see Field 5B.
W78-06141

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1975.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06175

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1975.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06176

WATER RESOURCES DATA FOR MONTANA, WATER YEAR 1976.
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06177

PUBLIC WATER SUPPLIES OF NORTH CAROLINA, PART 5. SOUTHERN COASTAL PLAIN,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06178

GROUND-WATER RESOURCES OF EMMONS COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
C. A. Armstrong.
North Dakota County Ground-Water Studies 23--Part III, and North Dakota Geological Survey Bulletin 66--Part III, (Bismarck), 1978. 43 p, 10 fig, 2 plates, 3 tab, 34 ref.

Descriptors: *Groundwater resources, *North Dakota, *Aquifer characteristics, *Water yield, Water quality, Water supply, Water users, Hydrogeology, Groundwater availability, Water wells, Water level fluctuations, Groundwater recharge, Transmissivity, Water analysis, Chemical analysis, Water types, Emmons County(N Dak).

Ground water in Emmons County, N. Dak., generally is obtained from glacial-drift aquifers of Quaternary age and the Fox Hills and Dakota aquifers of Cretaceous age. Glacial-drift aquifers with the greatest potential for development are the Strasburg, Long Lake, Braddock, and Winona. Properly constructed wells in the more permeable parts of these aquifers will yield from 500 to 1,000 gpm (gallons per minute). Water from these glacial-drift aquifers differs in chemical quality depending on sources of recharge. Dissolved-solids concentrations in samples from these aquifers ranged from 269 to 2,150 mg/liter. The Fox Hills aquifer underlies about 80 percent of the county and supplies water to about 75 percent of the wells. Yields from wells tapping the Fox Hills aquifer range from 0.5 to 40 gpm. The water generally is a sodium bicarbonate type that commonly contains less than 1,000 mg/liter dissolved solids in areas where sandstone crops out. It contains less than 1,500 mg/liter in areas where siltstone and silty shale crop out. The Dakota aquifer underlies Emmons County at depths that range from 2,200 to 2,530 feet. Unrestricted flows from wells in the aquifer range from 30 to 60 gpm. Water in the Dakota aquifer is a sodium sulfate type. Dissolved-solids concentrations ranged from 2,220 to 2,640 mg/liter and sulfate concentrations ranged from 1,140 to 1,440 mg/liter. (Woodard-USGS)
W78-06179

WATER RESOURCES INVENTORY OF NORTHWEST FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 6D.
W78-06183

USE OF THERMAL-INFRARED IMAGERY IN GROUND-WATER INVESTIGATIONS IN MONTANA,
Geological Survey, Helena, MT. Water Resources Div.; and Kansas Univ., Lawrence. Space Technology Labs.
For primary bibliographic entry see Field 7B.
W78-06187

RECORD OF GROUND-WATER EXPLORATION AND DEVELOPMENT, 1975-76, MOEN, TRUK, EASTERN CAROLINE ISLANDS,
Geological Survey, Honolulu, HI. Water Resources Div.
D. A. Davis.
Open-file report 77-739, September 1977. 358 p, 1 fig, 2 ref.

Descriptors: *Groundwater resources, *Drilling, *Exploration, *Drillers logs, *Foreign projects, Water wells, Test wells, Pumping, Water yield, Water analysis, Chlorides, Water levels, Well data, Water supply, *Truk Islands, *Moen, Well construction.

The exploration for and development of ground water described in this report consisted of the drilling and testing of 22 holes and the conversion of 8 of the holes into production wells on the island of Moen, Truk Islands, in the period November 1975 to July 1976. The objective of the program was to find sources of water to provide an improved supply for the reservoirs and pipelines of the Moen water system. The bulk of the report consists of records collected at the drilling sites during drilling and testing. Given for each test hole are a description of the drilling operation; a record of development of the hole; a record of each pumping test; and a log of the hole giving a summary description of rock units penetrated by the bit. For wells, there are records, where they are available, of the reaming of test holes to production-well diameter; data on casing, screens, gravel pack, and grout seal; and records of pumping tests. (Woodard-USGS)
W78-06193

WATER RESOURCES OF NO NAME VALLEY, COLVILLE INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
D. R. Cline.
Open-file report 78-122, 1978. 105 p, 30 fig, 27 tab, 5 ref.

Descriptors: *Water resources, *Streamflow, *Groundwater resources, *Water storage, *Washington, Aquifer characteristics, Mapping, Water wells, Pumping, Water yield, Water level fluctuations, Hydrographs, Groundwater recharge, Water supply, Projections, Available water, Surface waters, Ponds, Streams, Flow rates, Hydrogeology, Hydrologic budget, *Colville Indian Reservation(Wash), *No Name Valley(Wash), *Omak Creek(Wash).

No Name Creek valley is a trough cut in granitic bedrock in north-central Washington. A low topographic divide in the northern third of the valley separates it into the No Name Creek basin on the south and Omak Creek basin on the north. Omak Creek is the larger stream and enters the valley through a narrow gorge in the eastern granite wall. Partly filled with unconsolidated sand, gravel, and silt to depths as great as 163 feet, the valley contains a ground-water reservoir which supplies four irrigation wells and several domestic-supply wells. The ground-water reservoir also feeds springs which give rise to No Name Creek, and it contributes some water to Omak Creek to the north. Under conditions of the pre-1976 development the ground-water divide was naturally about 3,000 feet north of Omak Creek gorge, and about 580 acre-feet of leakage from Omak Creek recharges the No Name Creek ground-water reservoir. By 1977, ground-water withdrawal of 994 acre-feet per year in No Name Creek basin had caused the ground-water divide to shift to a position about 4,000 feet north of the topographic divide. This increased the drainage area contributing to the No Name Creek ground-water reservoir for about three months so that during a year of normal flow a total of about 600 acre-feet of leakage from Omak Creek can be captured. It is postulated that as much as 1,100 acre-feet per year can be pumped in the central part of the reservoir. This pumpage would cause the ground-water divide to shift farther north, resulting in the capture of additional recharge from Omak Creek; the total leakage would be about 700 acre-feet per year. (Woodard-USGS)
W78-06194

LAND-SURFACE SUBSIDENCE IN THE HOUSTON-GALVESTON REGION, TEXAS,
Geological Survey, Houston, TX. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06195

ESTIMATING PARAMETERS OF COMPACTING FINE-GRAINED INTERBEDS WITHIN A CONFINED AQUIFER SYSTEM BY A ONE-DIMENSIONAL SIMULATION OF FIELD OBSERVATIONS,
Geological Survey, Sacramento, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06196

HYDROGEOLOGIC EFFECTS OF SUBSIDENCE, SAN JOAQUIN VALLEY, CALIFORNIA,
Geological Survey, Sacramento, CA. Water Resources Div.
B. E. Lofgren.
In: Proceedings of the Anaheim Symposium, December 1976: International Association of Hydrological Sciences Publication No 121, p 113-123, 1976. 7 fig, 4 ref.

Descriptors: *Land subsidence, *Compaction, *Pumping, *Aquifers, *California, Overdraft, Aquitards, Water management(Applied), Groundwater recharge, Water importing, Canals, Hydrology, Aquifer characteristics, Hydrologic data, Evaluation, *San Joaquin Valley(Calif).

Subsidence has slowed in most of the San Joaquin Valley, Calif., site of one of the most extensive manmade subsidence in the world. After 40 years of ground-water overdraft, canal imports have generally reversed declining water-level trends. As of 1976, artesian heads have recovered toward presubsidence levels, and subsidence rates have decreased from an earlier maximum 0.5 m/yr to near zero in much of the valley. Increasing irrigation demands, particularly during years of deficient precipitation, pose the threat of increased pumping and another cycle of widespread land subsidence. Because of significant hydrogeologic changes during the 1930-70 overdraft period, however, the ground-water basin will respond differently during a second cycle of overdraft. The close correlation between water-level decline, compaction of the aquifer systems, and land subsidence has been precisely monitored in the San Joaquin Valley for 2 decades. From these data, both the elastic and the 'virgin' inelastic stress-strain characteristics of the unconsolidated valley deposits and the response of the aquifer system to prolonged cyclic pumping overdraft have been determined. (Woodard-USGS)
W78-06197

LAND SUBSIDENCE STOPPED BY ARTESIAN-HEAD RECOVERY, SANTA CLARA VALLEY, CALIFORNIA,
Geological Survey, Sacramento, CA. Water Resources Div.
J. F. Poland.
In: Proceedings of the Anaheim Symposium, December 1976: International Association of Hydrologic Sciences Publication No 121, p 124-132, 1976. 7 fig, 6 ref.

Descriptors: *Land subsidence, *Compaction, *Pumping, *Aquifers, *California, Overdraft, Aquitards, Water management(Applied), Groundwater recharge, Water importing, Hydrogeology, Hydrologic data, Evaluation, *Santa Clara Valley(Calif).

From 1916 to 1966 in the San Jose area of Santa Clara Valley, California, generally deficient rainfall and runoff was accompanied by a fourfold increase in withdrawals of ground water. In response, the artesian head declined 180-250 ft. As a direct result of the artesian-head decline, the land surface subsided as much as 12.7 ft in San Jose, due to compaction of the fine-grained compressible aquitards as their pore pressures decreased. The subsidence caused flooding of lands bordering the southern part of San Francisco Bay; the compaction of the sediments caused compressional failure of well casings in several hundred wells. The gross costs of subsidence to date are estimated to be 15 to 20 million dollars. The recovery of artesian head since 1967 has been dramatic. In downtown San Jose, the artesian head in two index wells recovered about 100 ft in the 8 years from 1967 to 1975. Recovery of water levels was due to a fivefold increase in surface-water imports from 1965 to 1975, favorable local water supply, decreased withdrawal, and increased recharge. The subsidence has been stopped throughout the extent of the confined system as of 1974-75 by raising the artesian head in the aquifers until it equaled or exceeded the maximum pore pressures in the aquitards. However, Subsidence will resume if the artesian head is drawn down appreciably below the levels of 1971-73. (Woodard-USGS)
W78-06198

4C. Effects On Water Of Man's Non-Water Activities

EFFECTS OF DEICING SALTS ON WOODY VEGETATION ALONG MINNESOTA ROADS,
Minnesota Univ., St. Paul. Coll. of Forestry.
For primary bibliographic entry see Field 5B.
W78-05786

EFFECTS OF DEICING SALTS AND LEAD UPON TREES, SHRUBS AND SOILS IN CONNECTICUT,
Connecticut Dept. of Transportation, Wethersfield. Bureau of Planning and Research.
For primary bibliographic entry see Field 5B.
W78-05787

ECONOMIC AND ENVIRONMENTAL IMPACTS OF FOREST RESOURCE DEVELOPMENT,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 6A.
W78-05803

REVIEW OF THE FLINT CREEK SMALL WATERSHED PROJECT, DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE ONTARIO COUNTY ENVIRONMENTAL MANAGEMENT COUNCIL,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 6G.
W78-05814

JAMESPORT TRANSMISSION EXITS; A REVIEW FOR THE TOWN OF RIVERHEAD OF THE LONG ISLAND LIGHTING COMPANY APPLICATION TO THE NEW YORK PUBLIC SERVICE COMMISSION FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED FOR THE JAMESPORT TRANSMISSION EXITS,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 6G.
W78-05816

METHODOLOGY FOR ANALYZING EFFECTS OF URBANIZATION ON WATER RESOURCE SYSTEMS,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-05938

ENGINEERING AND PEDOLOGICAL PROPERTIES OF SOILS AS THEY AFFECT SOIL ERODIBILITY,
California Univ., Davis. Dept. of Land, Air, and Water Resources; and California Univ., Davis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2G.
W78-06036

FORESTS AND WATER: EFFECTS OF FOREST MANAGEMENT ON FLOODS, SEDIMENTATION, AND WATER SUPPLY,
Pacific Southwest Forest and Range Experiment Station, Berkeley, CA.
H. W. Anderson, M. D. Hoover, and K. G. Reinhart.
General Technical Report PSW-18, 1976. 115 p, 6 fig, 15 tab, 606 ref.

Descriptors: *Forests, *Forest management, Water resources, *Swamps, Wetlands, *Floods, *Water supply, Dikes, Bogs, Hydrologic aspects, Drainage effects, Lumbering, *Sedimentation, Bottomlands, Wet flats.

A summary is presented on the forest's influence on the water resource, particularly the effects of current forestry practices. Four types of wetland forests are discussed: (1) Wet Flats. Most efforts in water management are concentrated on wet flats supporting pines. One current practice is to remove surface water and lower ground water to increase trafficability of heavy equipment, (2) Bay, or Upland Bogs, typically produce little timber, water, forage, and wildlife. Not enough is known about the hydrochemical processes of the infertile soil to recommend measures to improve forest growth. Logging may increase water levels enough to endanger regeneration. (3) Swamps and Upland Ponds. Removal of surface water can kill older trees and destroy wildlife habitat. These values can be enhanced by installing dikes and water control structures. (4) Bottomlands are productive because of inherent fertility and abundant moisture. Uncontrolled drainage adversely affects stand compositon, tree growth, and regenerative potential. Current water management consists of a kind of flood irrigation. Hydrologic consequences of management of wetland forests have been little studied and are poorly understood. (Stihler-Mass)
W78-06089

THE EFFECT OF MILITARY TRANSPORTATION ACTIVITIES ON THE ENVIRONMENT,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
A. J. Green, D. D. Randolph, and A. A. Rula.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-032 971, Price codes: A04 in paper copy, A01 in microfiche. Miscellaneous Paper M-73-15, December 1973. 78 p, 3 fig, 36 tab, 14 ref. OCE 891-05-01-001.

Descriptors: *Transportation, *Military aspects, *Environment, Mathematical studies, Water quality, Vegetation, Air pollution, Water pollution, *Military transportation, Vehicles.

An evaluation is reported on the impact of military transportation activities upon related environmental attributes. The military activities were related to their impact on these attributes by means of a matrix. The matrix used a scale to identify the magnitude and probability of the impact. Additionally, known mitigation and abatement practices that can be used to minimize adverse environmental impacts were identified and briefly described. The principal conclusion was that this technique provides a first approximation for assessing the effect of military transportation on the environment. It was recommended that funding be provided to: (1) exploit existing data to generate quantitative relations to be used in developing en-

vironmental impact statements; and (2) finance research in those areas for which the need to quantify exists and the lack of data has been acknowledged. (Frolich-ISWS)
W78-06126

FINAL REPORT TO THE NATIONAL SCIENCE FOUNDATION RESEARCH APPLIED DIRECTORATE WEATHER MODIFICATION ASSOCIATION,
Wyoming Univ., Laramie. Dept. of Atmospheric Science.
For primary bibliographic entry see Field 3B.
W78-06130

HIGHWAY OPERATION AND PLANT DAMAGE-DATA APPENDIX (SOIL CHEMISTRY, SALT APPLICATION, OZONE, PRECIPITATION),
California State Dept. of Transportation, Sacramento. Transportation Lab.
D. I. Nakao, R. B. Howell, and E. C. Shirley.
Available from the National Technical Information Service, Springfield, VA 22161, Price codes: A09 in paper copy, A01 in microfiche. Report FHWA-CA-76-56, September 1976. 188 p, 3 fig, 3 ref. FHWA F-5-14 TL 657134.

Descriptors: *Highways, Effects, *Damages, *Salts, *California, Vegetation, Soil water, Soil chemistry, Sodium chloride, Ozone, Trees, Shrubs, Salt tolerance, Pollutants, Water pollution effects, Soil contamination effects, Vegetation effects, Data collections, Meteorological data, Temperature, Winds, Precipitation(Atmospheric), Water pollution, Salt application, Plant damage, Deicing salts, Salt concentrations.

The Transportation Laboratory is engaged in a study of the effects of deicing salts on roadside vegetation in and around the Lake Tahoe Basin. The portion of the study dealing with soil chemistry, salt application rates, ozone, and precipitation was reported in an Interim Report dated January 1976. This Appendix Report contains the backup data for that Interim Report. (Sims-ISWS)
W78-06131

4D. Watershed Protection

MEASUREMENT OF SEDIMENT CONTROL IMPACTS ON AGRICULTURE,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5G.
W78-05701

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS.
Ecosystems International, Inc., Gambrille, MD.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-18632, Price codes: A03 in paper copy, A01 in microfiche. Report ECO-76:C-2-2, January, 1976. 27 p, NASA-CR-144203.

Descriptors: *Remote sensing, *Watersheds(Basins), *Hydrology, *LANDSAT imagery, *Peak-rate model, Routing model, Simulation analysis, Planning, Systems analysis.

Three tasks were undertaken in this research effort: (1) the validation of the peak-rate model on an expanded set of watersheds; (2) the development of a routing model for complex basins; and (3) the quantitative hydrologic analysis of LANDSAT imagery. In the expanded validation of the peak-rate model, a thirty-one watershed example was selected with significant geographic and hydrologic diversity. The prediction supplied by the model was tested for each, with this output compared to the records and to forecasts computed by using three other conventional planning models. Discovered was that different geographic regions exhibit varying seasonal properties, but that within a region, the characteristics are similar. Next, a routing model was developed which approximated the watershed by a series of strips, each having its own set of surface and rainfall parameters. The output of these strips was summed using a simple time delay function accounting for the length of overland flow and the hydrologic characteristics of the channel. It was found that both the sensitivity of runoff to the basin slope and the areal extent of rainfall were significant and should be provided for by the planning model. The final task used remote sensing directly to determine the hydrologic information content of the LANDSAT bands and to attempt to extract the necessary hydrologic data. It was discovered that information sufficient to determine several of the important inputs to the model could be determined from LANDSAT data using relatively uncomplicated visual techniques. (See also W77-10296) (Bell-Cornell)
W78-05718

PROPAGATION AND USE OF SPARTINA ALTERNIFLORA FOR SHORELINE EROSION ABATEMENT,
North Carolina State Univ. at Raleigh.
For primary bibliographic entry see Field 4A.
W78-05751

EFFECT OF SOIL HEAT FLUX ON THE WATER BALANCE OF A SMALL CATCHMENT,
Waikato Univ., Hamilton (New Zealand). Dept. of Earth Sciences.
For primary bibliographic entry see Field 2G.
W78-05777

FALLOUT CESIUM-137 IN CULTIVATED AND NONCULTIVATED NORTH CENTRAL UNITED STATES WATERSHEDS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 5B.
W78-05779

AQUEOUS- AND SEDIMENT-PHASE PHOSPHORUS YIELDS FROM FIVE SOUTHERN PINE WATERSHEDS,
Southern Forest Experiment Station, Oxford, MS.
For primary bibliographic entry see Field 5B.
W78-05781

ECONOMIC AND ENVIRONMENTAL IMPACTS OF FOREST RESOURCE DEVELOPMENT,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 6A.
W78-05803

DEVELOPMENT OF A VERSION OF STANFORD MODEL AND ITS EVALUATION FOR STREAMFLOW SYNTHESIS FROM SMALL WATERSHEDS IN WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2E.
W78-05808

REVIEW OF THE FLINT CREEK SMALL WATERSHED PROJECT, DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE ONTARIO COUNTY ENVIRONMENTAL MANAGEMENT COUNCIL,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 6G.
W78-05814

SEDIMENTATION AND SOIL ALTERATION, MONROE RESERVOIR, INDIANA,
Indiana Univ., Bloomington. Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-05815

METHODOLOGY FOR ANALYZING EFFECTS OF URBANIZATION ON WATER RESOURCE SYSTEMS,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-05938

EFFECTS OF SILT AND TURBIDITY FROM AGRICULTURAL DRAINAGE ON BENTHIC INVERTEBRATES IN STREAMS IN WESTERN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
T. F. Waters.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 764, Price codes: A02 in paper copy, A01 in microfiche. Minnesota Water Resources Research Center, Minneapolis, March 1978. 12 p, 5 fig, 1 tab. OWRT B-120-MINN(1), 14-31-0001-6091.

Descriptors: *Silts, *Turbidity, *Minnesota, Streams, *Watershed management, Distribution, Clays, *Benthos, Stream ecology, *Agricultural drainage, Drift, *Aquatic invertebrates.

Four streams located in southwestern Minnesota were selected to study the effect of intensive agricultural drainage in their watersheds upon the abundance and ecology of benthic stream invertebrates. Abundance, species composition, and drift of stream invertebrates were determined at sites on the streams downstream from the drained region of the watershed. The headwaters and small tributaries in the watersheds of two streams had been intensively ditched, while the other two streams, with most of the headwater tributaries in a natural condition, served as controls. Preliminary results indicated no substantial differences between the two sets of streams in total abundance, distribution, or drift, although important differences on the species level are likely. Experiments were run in laboratory streams and in situ at the field sites, where silt and clay were applied experimentally to invertebrate populations; little adverse effects on the invertebrates were observed. (Waelti-Minnesota)
W78-06065

BACTERIAL VARIATIONS IN STREAMS FROM A SOUTHWEST IDAHO RANGELAND WATERSHED,
Agricultural Research Service, Boise, ID. Northwest Watershed Research Center.
For primary bibliographic entry see Field 5B.
W78-06116

EROSION AND SEDIMENT CONTROL. SURFACE MINING IN THE EASTERN U.S. VOLUME I. PLANNING. VOLUME II. DESIGN,
Hittman Associates, Inc., Columbia, MD.
For primary bibliographic entry see Field 5G.
W78-06127

WATER-QUALITY ASSESSMENT OF THE MIDDLE FORK ANDERSON RIVER WATERSHED, CRAWFORD AND PERRY COUNTIES, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-06190

A WATER-QUALITY ASSESSMENT OF THE BUSSERON CREEK WATERSHED, SULLIVAN,

VIGO, GREENE, AND CLAY COUNTIES, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06191

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

REMOTE SENSING OF LAND USE AND WATER QUALITY RELATIONSHIPS-WISCONSIN SHORE, LAKE MICHIGAN,
Cold Regions Research and Engineering Lab., Hanover, NH.
R. K. Haugen, H. L. McKim, and T. L. Marlar.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 746, Price codes: A04 in paper copy, A01 in microfiche. Report 76-30, August 1976. 47 p, 22 fig, 11 tab, 23 ref. NASA SR/T 160-75-89-05-10.

Descriptors: *Remote sensing, *Lake Michigan, Wisconsin, *Land use, *Water quality, Suspended load, Manitowoc River(WI), East Twin River(WI), Oconto River(WI), Water pollution, Monitoring, Mapping, Thermal imagery, Infrared imagery, Microwave imagery, Multispectral scanners, Aerial photography, Lakes, Shores, Watersheds(Basins), Rivers.

Various types of aerial imagery were evaluated for their usefulness in assessing effects of land use on sediment loading of streams on the Wisconsin shore of Lake Michigan. High altitude color infrared imagery acquired at 60,000 ft with a 9-in format RC-8 and Zeiss cameras was the most acceptable remote sensing technique for the mapping and measurement of land use types. Other sensors evaluated included: (1) High altitude RS-7 thermal scanner--useful for mappng major circulation patterns in large water bodies. (2) RS-14 thermal scanner--recommended for maping effluent plumes and differentiating within wetlands or inservious urban settings, although lack of geometric control, narrow field of view, and cost largely preclude its use. (3) High altitude multispectral 70mm photography (Hasselblad)-- the small format was difficult to work with, and data was more easily obtained with the 9-in format cameras. (4) High-altitude color (SO 397)--although applicable to small area, single flight line surveys, this method does not appear feasible for regional area surveys or with high altitude imagery due to wide variation in color balance and other factors. (5) PMIS (Passive Microwave Imaging System)--were limitations were encountered, and it was not possible to consistently identify major patterns in a 64 color photographic rendition of PMIS scanning data. Sample mapping was done for the Manitowoc, East Twin, and Oconto watersheds. (Lynch-Wisconsin)
W78-05749

IMPACT OF LAND USE ON GROUND WATER QUALITY IN THE GRAND TRAVERSE BAY REGION OF MICHIGAN,
Duke Univ., Durham, NC. School of Forestry and Environmental Studies.
R. Rajagopal.
Journal of Environmental Quality, Vol 7, No 1, p 93-98, January-March 1978. 6 fig, 5 tab, 17 ref. OWRT B-044-MICH(3), OAA 04-3-158-23.

Descriptors: *Groundwater, *Water quality, Land use, *Michigan, Surveys, Sampling, Pollutants, Water pollution, Path of pollutants, Water pollution sources, Septic tanks, Chemical analysis, Chemicals, Nitrates, Nitrites, Ammonia, Chlorides, Orchards, Fertilizers, Statistical analysis, Correlation analysis, *Grand Traverse Bay Region(Mich).

Investigations in townships surrounding the Grand Traverse Bay of Michigan showed an identifiable geographic relationship between groundwater quality and land use. Wells averaging 32 m deep in thinly populated areas measured an average of 3.75 ppm nitrate-N, indicating the effect of prolonged years of fertilizer application. Wells averaging 19 m deep in predominantly residential areas had an average of 1.31 ppm nitrate-N, indicating possible contamination from septic tank effluents. An average of 0.18 ppm of ammonia-N was detected in marshy wetlands. An analysis of temporal variations in groundwater quality with reference to precipitation, streamflow, and a trend component provided high as well as low R sq (0.92 to0.12; R sq = square of the multiple correlation coefficient) producing regression models, indicating the effect of site specific conditions. A year-long observation of a sample well (43 m deep) surrounded by cherry orchards had an average of 18.25 ppm nitrate-N in a range of 13.09 to 20.64 ppm, almost double the standard considered safe for human consumption. Ammonia-N and chloride measurements from a shallow well (12.5 m deep), surrounded by residential and commercial activities, showed synchronized variations over a year (correlation coefficient r = 0.75, significant at 1% level), suggesting the existence of a common source of contamination. In summary, it was reiterated that the analysis of groundwater quality problems requires a different philosophical approach fom the approaches used for water quantity and surface water quality modeling. (Sims-ISWS)
W78-05778

EFFLUENTS FROM CATFISH PONDS DURING FISH HARVEST,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
C. E. Boyd.
Journal of Environmental Quality, Vol 7, No 1, p 59-62, January-March 1978. 2 fig, 2 tab, 13 ref.

Descriptors: *Fish farming, *Alabama, *Catfishes, *Fish harvest, *Pollutants, Effluents, Ponds, Water quality, Fish, Channel catfish, Aquiculture, Water pollution, Water pollution sources, Organic matter, Biochemical oxygen demand, Chemical oxygen demand, Phosphates, Ammonia, Nitrates, Measurement, *Auburn(Ala).

Samples of effluents from eight channel catfish ponds at Auburn, Alabama, collected during fish harvest, were analyzed for BOD, COD, settleable matter, soluble orthophosphate, total phosphorus, total ammonia, and nitrate. Settleable matter concentrations, for which 3.3 ml/liter has been suggested as the instantaneous maximum for effluents from fish ponds, ranged from 0 to 1.2 ml/liter during the fraining phase when 95% of water was discharged. Water discharged during seining to remove fish usually contained greater than 3.3 ml/liter settleable matter (range 0.5 to 100 ml/liter). Concentrations of other potential pollutants, except nitrate, also increased during the seining phase. However, even effluents discharged during the draining phase had higher levels of most measured parameters than first-order streams draining forested or agricultural watersheds in the vicinity. (Sims-ISWS)
W78-05783

REMOTE DETERMINATION OF THE CONCENTRATION OF SUSPENDED PARTICLES IN THE WATER OF RESERVOIRS ON THE BASIS OF MEASUREMENTS OF SPECTRAL LUMINANCE COEFFICIENTS,
For primary bibliographic entry see Field 2H.
W78-05790

CHEMICAL SYSTEMS MONROE RESERVOIR, INDIANA,
Indiana Univ., Bloomington. Dept. of Geology.
For primary bibliographic entry see Field 2H.
W78-05805

OZONE OXIDATION OF ORGANIC SEQUESTERING AGENTS IN WATER PRIOR TO THE DETERMINATION OF TRACE METALS BY ANODIC STRIPPING VOLTAMMETRY,
California Univ., Berkeley. Lawrence Berkeley Lab.
R. G. Clem, and A. T. Hodgson.
Analytical Chemistry, Vol 50, No 1, p 102-110, January, 1978. 6 fig, 3 tab, 27 ref.

Descriptors: *Analytical techniques, *Water analysis, *Electrochemistry, *Ozone, *Oxidation, Chemical degradation, Heavy metals, *Pollutant identification, Effluents, Sewage, Chemical analysis.

Acids, normally used to destroy naturally occurring sequestering agents in water samples prior to trace metal analysis by anodic stripping voltammetry (ASV), can rapidly destroy the graphite electrodes used in the analysis. Ozone oxidation was evaluated as an alternative to acidification in the analysis of bay water and sewage effluents for Pb and Cd. Ozone is a strong oxidizing agent which has been observed to inactivate sequestering agents over a pH range of 2-10. Ethylenediaminetetraacetic acid (EDTA), ammonium pyrrolidine dithiocarbamate (APDC), tannic acid, and humic acid solutions were used to simulate the complexing agents present in sewage and natural waters. A corona discharge tube and a high-voltage transformer were used to generate ozone from oxygen which was introduced at a flow rate of 3 liters/min. Solutions containing 3 ppm EDTA, 25 ppm APDC, 25 ppm humic acid, 100 ppm tannic acid, and 20 ppb Cd and Pb were ozonized under acidic and basic conditions; and the relative metal recoveries were compared. Approximately 96% of the Cd and 99% of the Pb were recovered from a 100 ppm humic acid solution after 3 hours of ozonolysis. The adsorption of surface active compounds onto the graphite electrode produced a loss of sensitivity which increased in proportion to the length of contact time between the electrode and the sample solution. Ozonolysis was recommended for application to on-line ASV systems for measuring heavy metal concentrations in waste water effluents. (Schulz-FIRL)
W78-05871

THE APPLICABILITY OF TRACER TECHNIQUES FOR STUDIES ON SEWAGE TREATMENT PROCESS DYNAMICS,
Technical Research Center of Finland, Esbo.
For primary bibliographic entry see Field 5D.
W78-05872

A MICRO-KJELDAHL TECHNIQUE FOR NITROGEN DETERMINATION IN WATER, WASTEWATER, AND SLUDGE,
Butler, Fairman and Seufert, Inc., Carmel, IN.
R. L. Stephenson.
Journal Water Pollution Control Federation, Vol 49, No 12, p 2499-2502, December, 1977. 2 tab, 5 ref, 1 append.

Descriptors: *Nitrogen, *Ammonia, *Amino acids, *Acids, *Ammonium compounds, Testing procedures, Analytical techniques, Measurements, Nitrogen compounds, Nitrification, Application methods, Methods, Waste water treatment.

A modification of the micro-Kjeldahl technique was developed as a simplified method of measuring the nitrogen content in waste water, sludge, and water. A 5-ml sample containing ammonia nitrogen is subjected to a temperature of 340C, producing ammonium bisulfate and ammonium sulfate. The sample is diluted after digestion with ammonia-free water and its pH is raised to 10 with the addition of sodium hydroxide. The nesslerization technique is used to calculate the ammonia nitrogen concentration in the sample. The simplified technique was tested in laboratory experiments with four representative amino acids:

glycine, methionine, tryptophan, and diphenylcarbazone. The nitrogen concentrations of the samples were 500, 250, 50, and 10 mg/liter. Nitrogen recovery from glycine, used to represent a monoamino monocarboxy acid, ranged 92-100%. Nitrogen recovery with methionine, used as a long-change, sulfur-containing amino acid, ranged 96-124%. Tryptophan, as a heterocyclic acid, exhibited recoveries of 100-160%. Diphenylcarbazone, insoluble in acid solutions, showed poor recovery of nitrogen, ranging 8.4-120%. (Lisk-FIRL)
W78-05878

CONSERVATION OF SAMPLES OF WASTE WATER BY COOLING (KONSERVIERUNG VON ABWASSERPROBEN DURCH KUEHLUNG),
H. Gudernatsch.
Wasser, Luft, und Betrieb, Vol. 21, No. 11, p 598-600, 1977. 4 fig, 2 tab, 7 ref.

Descriptors: *Pollutant identification, Analytical techniques, *Chemical oxygen demand, *Water analysis, *Temperature, *Sampling, Industrial wastes, Municipal wastes, Carbon, Testing procedures, Variability, Waste water treatment.

The influence of sample treatment and storage temperature on the total organic carbon (TOC) and COD values of industrial and combined municipal-industrial waste waters was evaluated. Samples were collected at waste water treatment plants after the primary treatment stage and from the treated stream. Differences of not more than 10% in TOC and COD values measured in samples which had been subjected to various types of handling and storage were considered insignificant. The COD and TOC values obtained for most of the homogenized samples were significantly higher than those of filtered samples. The differences between sedimented and filtered samples were significant in 2 out of 8 cases only. Experiments on the effect of storage length and temperature revealed that storage at 20 C for more than 24 hours would result in erroneous TOC and COD data. Storage for up to 7 days at 4 C and for up to 28 days at -18 C did not affect TOC and COD determinations. (Takacs-FIRL)
W78-05882

DETERMINATION OF CHLORINE DIOXIDE IN SEWAGE EFFLUENTS,
Wastewater Technology Center, Burlington (Ontario).
J. R. Knechtel, E. G. Janzen, and E. R. Davis.
Analytical Chemistry, Vol. 50, No. 2, p 202-205, February, 1978. 5 fig, 3 tab, 14 ref.

Descriptors: *Pollutant identification, *Chlorination, *Analytical techniques, *Dyes, *Tracers, *Spectrophotometry, Colorimetry, Resonance, Chlorine, Nitrites, Waste water treatment, Municipal wastes.

An spectrophotometric technique with acid chrome violet K decolorization was developed for the measurement of chlorine dioxide in waste water. Maximum absorbance of acid chrome violet K in a dilute solution with chlorine dioxide occurred at 550 nm. The chlorine dioxide content was measured after solids removal with a spectrophotometer at pH 8.1-8.4. A similar procedure was devised for the reaction of acid chrome violet K with chlorine, hypochlorite, chlorite, chloramine T, and nitrite to determine interference. Effluent samples were also analyzed for chlorine dioxide content with an electron spin resonance technique for verification of the acid chrome violet K data. Simultaneous analysis for chlorine dioxide with the colorimetric and the electron spin techniques was necessary because of the decay rate of chlorine dioxide. Both techniques gave similar chlorine dioxide values in sample tests. (Lisk-FIRL)
W78-05884

TRACE METAL DISTRIBUTIONS AMONG THE HUMIC ACID, THE FULVIC ACID, AND PRECIPITABLE FRACTIONS EXTRACTED WITH NAOH FROM SEWAGE SLUDGES,
California Univ., Riverside. Dept. of Soil and Environmental Science.
K. H. Holtzclaw, D. A. Keech, A. L. Page, G. Sposito, and T. J. Gange.
Journal of Environmental Quality, Vol. 7, No. 1, p 124-127, January-March, 1978. 2 fig, 4 tab, 11 ref.

Descriptors: *Pollutant identification, *Path of pollutants, *Trace elements, *Humic acids, *Fulvic acids, *Chemical precipitation, *Sewage sludge, *Spectrophotometry, Aluminum, Cadmium, Copper, Iron, Nickel, Zinc, Carbon, Phosphorus, Waste water treatment, Municipal wastes.

Trace metal concentrations in the humic acid, fulvic acid, and precipitable fractions of four organic sludge-soil samples were measured in laboratory experiments with atomic absorption spectrophotometry. After extraction with sodium hydroxide, the humic acid, fulvic acid, and precipitable fractions were analyzed for concentrations of aluminum, cadmium, copper, iron, nickel, zinc, phosphorus, and carbon. Precipitation of the trace metals from solution with pH adjustments to 4.5, 6.5, and 8.5 was examined. Precipitation by pH adjustment of the trace metals, phosphorus, and carbon from the solutions suggested that most of the copper and carbon in the sludge samples was contained in the humic acid fraction. The precipitable fraction, a high ash precipitate formed after pH adjustment of impure fulvic acid, contained the highest concentrations of aluminum, iron, znc, and phosphorus. Cadmium and nickel were associated primarily with the fulvic acid extration and to a lesser extent, the precipitable fraction. (Lisk-FIRL)
W78-05888

SALMONELLA AND BACTERIAL INDICATORS IN OZONATED AND CHLORINE DIOXIDE-DISINFECTED EFFLUENT,
Ontario Ministry of Health, Toronto.
D. A. Schiemann, M. H. Brodsky, and B. W. Ciebin.
Journal Water Pollution Control Federation, Vol 50, No 1, p 158-162, January, 1978. 5 tab, 17 ref.

Descriptors: *Disinfection, *Chlorination, *Ozone, *Bioassay, *Salmonella, *Coliforms, *Bioindicators, Sewage bacteria, Microorganisms, Sewage treatment, Waste water treatment, Analytical techniques.

Studies were conducted to examine the incidence of Salmonella in secondary waste water effluent and to assess various methods for recovery. The relationship of Salmonella isolation to densities of three bacterial indicator groups (total coliforms, fecal coliforms, and fecal streptococci) in effluents disinfected by ozone and chlorine dioxide was also examined. Samples of effluent from a secondary activated sludge waste water treatment plant in Brampton, Ontario, were disinfected under controlled laboratory conditions. Salmonella recovery by a membrane filter and a glass fiber filter were compared; membrane filter and a glass fiber filter were compared; membrane filter and MPN counts were also compared for total and fecal coliforms in effluent disinfected by chlorine and ozone. Recovery rates for Salmonella from undisinfected primary and secondary effluents were 88.9 and 72.5%, respectively. Rates for effluents which has been treated with ozone, chlorine dioxide, and chlorine were 8.9, 12.5, and 0.0%, respectively. For undisinfected secondary effluent, incubation of the tetrathionate broth at 4.5C with OLD agar and brilliant green sulfa agar was most effective. Higher coliform densities were generally found in ozonated and chlorinated effluents in which Salmonella had been detected. (Schulz-FIRL)
W78-05890

HALOGENATED HYDROCARBONS IN WASTEWATERS: KNOWNS AND UNKNOWNS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-05914

PRECISION OF CHLORINATED HYDROCARBON MEASUREMENTS,
Southern California Coastal Water Research Project, El Segundo.
T. C. Heesen, and D. R. Young.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 69-74, 1977. 5 tab.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water pollution sources, *Pollutant identification, *Toxicity, DDT, Polychlorinated biphenyls, Sediments, Waste water, Runoff, Water pollution, *Outer Continental Shelf, Southern California Bight, Chlorinated hydrocarbons, Chlorinated benzene.

In the trace organics program for the past year, the degree of variability of measurements of chlorinated hydrocarbons in sediments, fish tissues, wastewaters, storm runoff, and aerial fallout have been investigated. The parameter selected for this purpose is the coefficient of variation (CV: expressed as a precentage), which is defined as 100 times the standard deviation of a set of values divided by its mean. The studies have shown that, when aliquots of a homogenized sample are considered, the majority of the CV's fall within the 10- to 20-percent range. Present techniques for analyzing DDT, dieldrin, PCB, and chlorinated benzene residues in samples of sediments, organisms, municipal wastewater, surface runoff, and dry aerial fallout appear to yield results that usually have a coefficient of variation of about 20% or less. (See also W78-05911) (Sinha-OEIS)
W78-05918

SATELLITE IMAGERY STUDIES,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-05919

A MODIFIED PERCHLORINATION PROCEDURE FOR THE DETERMINATION OF POLYCHLORINATED BIPHENYLS,
Wisconsin Univ.-Madison. Water Chemistry Lab.
L. P. Burkhard, and D. E. Armstrong.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 610, Price codes: A02 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison. Technical Report WIS WRC 78-01, 1978. 23 p, 3 tab, 8 fig, 4 ref, 2 append. OWRT A-067-WIS(1), 14-34-0001-6052, 14-34-0001-7105, 14-34-0001-7106.

Descriptors: *Organic compounds, *Waste water treatment, *Water supply, *Aroclors, *Pesticide residues, *Pollutant identification, *Polychlorinated biphenyls, Perchlorination procedure, Water treatment, Chlorination.

Accurate quantitative measurement of polychlorinated biphenyls in environmental samples poses a difficult analytical problem. This difficulty arises in part from the complexity of the commercial PCB mixture (Aroclors) which are the main source of PCBs in the environment. In theory, chlorination of biphenyl can produce 210 different compounds. Consequently, the Aroclors, produced by chlorination of biphenyl to a certain weight percentage of chlorine, contain more than 50 individual PCB compounds. The purpose of this investigation was to develop a perchlorination technique which would provide quantitative measurements of total PCB and biphenyl concentrations in extracts from environmental samples. The

technique should give quantitative recovery of PCBs containing low (e.g., Aroclor 1221) or high (e.g., Aroclor 1254) numbers of chlorine atoms substituted on the biphenyl molecule. Furthermore, since biphenyl may be present in environmental samples and is converted to decachlorobiphenyl by the perchlorination reaction, a method giving quantitative recovery of biphenyl is also needed. Perchlorination of Aroclor 1254, Aroclor 1221, and biphenyl standards using the stepwise increase in reaction temperature resulted in complete recovery of Aroclors 1254 and 1221. However, recovery of biphenyl was low. In summary, an improved perchlorination procedure has been developed which gives quantitative recovery of PCBs in various Aroclor standards, but biphenyl is somewhat low. (Diamantis-Wisconsin)
W78-05939

APPROACHES TO THE STUDY OF MICROBIAL TRANSFORMATIONS OF METALS,
National Bureau of Standards, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-05978

UTILIZATION OF SATELLITE DATA FOR INVENTORYING PRAIRIE PONDS AND LAKES,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 2H.
W78-05979

LEAD CONTAMINATION IN DRINKING WATER IN LJUBLIJANA, (IN SLOVENIAN),
V. Sirnik, A. Petelinsek, and I. Burgermeister.
Zb Biotch Fak Univ Ljublj Kmetijstvo 25, p 199-202, 1975.

Descriptors: *Yugoslavia(Ljubljana), *Lead, Potable water, Sampling, *Pollutant identification, Public health, *Photometry.

Samples of pipeline water in Ljubljana (Yugoslavia) were analyzed with the photometric dithizon-method in 3 town areas about 1 km from each other. Levels of 4.0, 9.6 and 16.0 ppb Pb were found. The Pb concentration did not reach the limit of injuriousness to health, 50 ppb. The reason for the highly significant differences between the town areas was not investigated.--Copyright 1978, Biological Abstracts, Inc.
W78-05981

A METHOD OF MEASURING AIRBORNE ACIDITY: ITS APPLICATION FOR THE DETERMINING OF ACID CONTENT ON LONG-DISTANCE TRANSPORTED PARTICLES AND IN DRAINAGE WATER FROM SPRUCES,
Swedish Water and Air Pollution Research Lab., Goteborg.
H. Brosset.
Water, Air, and Soil Pollution, Vol. 6, No. 2-4, p 259-275, 1976. 7 fig, 9 tab, 14 ref.

Descriptors: *Airborne acidity, *Acidity, *Gran's plot, Methodology, *Volumetric analysis, Sweden, Spruces, Trees, Coniferous trees, Particles, Drainage water, Equations, Sulfur compounds, Gothenburg(Sweden), Airborne transport, Deposition, Acids, Path of pollutants, *Air pollution, Measurement, Seasonal.

A method for measuring airborne acidity to lakes and land, using a titration procedure based on Gran's plot, is described and is demonstrated for transported acidic particles in southern Sweden and for drainage water from spruces in two forest areas near Gothenburg, Sweden. The method enables determination of stronger acids (p sub a < about 3). Since autumn 1972 a study of airborne particles at Rao, a remote coastal station 40 km south of Gothenburg, shows that during winter and under special meteorological conditions high concentrations of black particles can build up due to long-distance transport. During summer acid concentration is higher in the particles. Small white particles are transported to the Swedish west coast chiefly from the southwest, but acidification of land and lakes is probably limited as white episodes are infrequent. The water-soluble part of particles (phi < about 1 micrometer) mainly consist of relatively acid ammonium sulfates. The phases (NH4)2SO4, (NH4)3H(SO4)2, and NH4HSO4 have been identified. Acid particles are successively neutralized during transport over land by NH3 uptake. Experiments with drainage water from spruces indicate that dry deposition of particles on the trees with subsequent secondary washout can result in large acid depositions on the ground. (Lynch-Wisconsin)
W78-06003

ANALYSIS OF THE FLUORINE ION IN THE PRESENCE OF AL AND CA IONS IN AIR AND WATER WITH THE USE OF ZR-SPADNS REAGENT, (IN RUSSIAN),
G. S. Salyamon, and S. R. Ivanova.
Gig Sanit 1, p 64-65, 1977.

Descriptors: *Fluorine ions, Aluminum, Calcium, Ions, *Pollutant identification, *Photometry, Air analysis, Water analysis, Water analysis, Analytical techniques.

Photocolorimetric analysis was possible without preliminary distillations or other methods of separation with the use of a Zr-SPADNS (4-sulfophenylazo-1,8-dihydroxynaphthalene-3,6-disulfonic acid) reagent. High reagent specificity permitted F- analysis in the presence of 500 micro g Ca with direct photocolorimetric methods. Analysis in the presence of Al required heating the sample containing Zr-SPADNS to facititate the breaking of the Al-F complex. It was possible to analyze from .1-6 microg F in a sample with 100 microg of Al present. Details of analysis in air and water from sewage and melted snow were presented.--Copyright 1978, Biological Abstracts, Inc.
W78-06008

THE PROBLEM OF DETERMINATION OF CYANIDES IN WATER IN THE PRESENCE OF NITRILES, (IN RUSSIAN),
V. A. Panova, M. N. Brycheva, and Yu. Yu. Lure.
Gig Sanit 3, p 63-64, 1977.

Descriptors: *Cyanides, *Pollutant identification, *Nitriles, Industrial wastes, Chemical precipitation, Separation techniques, Water analysis, Acetone cyanchydrin, Acrylonitrile cyanchydrin.

The vase development of artificial fiber production and increased effluents in sewage from acrylonitrile and acetone cyanohydrin additives made it essential to test the effect of nitriles (organic cyanides) on determination of cyanides in water. Determination of cyanides in sewage must be preceded by their separation from nitriles. The most effective method was precipitation of cyanides with silver nitrate with subsequent careful washing of the precipitate with water and acetone, decomposition of the precipitate in a highly acidic medium and distillation of the hydrocyanic acid into a alkali. Relative error ranged from 2-7%, due to the large number of operations in the method.--Copyright 1978, Biological Abstracts, Inc.
W78-06013

LONG RANGE TRANSPORT OF AIR POLLUTANTS IN EUROPE AND ACID PRECIPITATION IN NORWAY,
Norwegian Meteorological Inst., Oslo; and Norsk Inst. for Luftforskning, Kjeller.
J. Nordo.
Water, Air and Soil Pollution, Vol. 6, No. 2-4, p 199-217, September-November 1976. 19 fig, 7 ref.

Descriptors: *Norway, *Europe, *Air pollution, *Airborne transport, *Path of pollutants, *Acid precipitation, *Dispersion models, Acidity, Scandinavia, Model studies, Trajectory models, Deposition, Precipitation(Atmospheric), Sulfur compounds, Winds, Aerosols.

Daily observations of river and lake acidification in Scandinavia have been made and acid precipitation episodes have been studied since the late 1960s, using back trajectories to trace the origin of air pollutants. In 1971 a large-scale dispersion model was developed to estimate long-range transport of air pollutants, and during 1972-73 several model studies were conducted. Emission data for 1972 shows highest concentrations of SO2 in parts of East Germany (1.3-1.7 million metric tons/yr), West Germany (1.8 million), and England (1.0-1.1 million). These sources may result in highly acid precipitation 500-1000 miles away. Acid precipitation episodes are usually most clearcut in southern Norway due to enhanced (orographical) precipitation for winds between SW and SE. When Atlantic lows move into the Norwegian Sea, converging air streams may transport pollutants from western and central Europe towards the Norwegian mountains. When polluted air masses approach the mountain slopes, cooling may result in intense scavenging of pollutants. Case studies of such events are described. The large-scale dispersion models take into account chemical transformation as well as deposition of pollutants. Results from the use of a simple and economical trajectory model are presented, using data for December 1973-March 1974 in Norway. (Lynch-Wisconsin)
W78-06018

A PROPOSED MODIFICATION TO THE CLASSICAL METHOD OF CALCULATING ALKALINITY OF NATURAL WATERS,
Auburn Univ., AL.
S. R. Jenkins, and R. C. Moore.
Journal of American Water Works Association, Vol. 69, No. 1, p 56-59, January 1977. 2 fig, 3 tab, 8 ref.

Descriptors: *Pollutant identification, *Alkalinity, *Methodology, *Analytical techniques, *Measurement, Manuals, *Standard methods, Bicarbonate alkalinity, Carbonate alkalinity, Hydroxide alkalinity, Waste water treatment, Phenolphthalein alkalinity.

The classical method for calculating alkalinity of natural waters as described in the 13th edition of 'Standard Methods for the Examination of Water and Wastewater' is inaccurate in certain cases due to the false assumption that hydroxide and bicarbonate alkalinity do not exist simultaneously. As it is an accepted fact that these species may in fact exist together, a modification of the classical method is proposed to correct the error which occurs whenever bicarbonate and hydroxide concentrations are approximately equal. In situations where one ion is negligible, calculations can be performed as described in 'Standard Methods.' Since error only occurs when bicarbonate and hydroxide concentrations are about equal, the modification proposes to assume them equal under such circumstances; the hydroxide alkalinity is determined directly from pH measurements, bicarbonate alkalinity is set equal to hydroxide alkalinity, and carbonate alkalinity is then the total alkalinity minus twice the hydroxide alkalinity. In the range of 0.4T < or =P < or =0.6T, the modified calculation method was 76% more accurate than the classical method for data sets taken from past literature. It is suggested that Table 102 in 'Standard Methods' be replaced by Table 3 of this paper, and the discussion following Table 102 amended. (Lynch-Wisconsin)
W78-06019

NUTRIENT CONTENT AND PRECIPITATION OVER IOWA,
Iowa State Univ., Ames. Dept. of Agronomy.
M. A. Tabatabai, and J. M. Laflen.

Water, Air, and Soil Pollution, Vol. 6, No. 2-4, p 361-373, September-November 1976. 5 fig, 4 tab, 29 ref.

Descriptors: *Precipitation(Atmospheric), *Chemical precipitation, *Iowa, *Cycling nutrients, Nutrients, Seasonal, Acidity, Nitrogen compounds, Sulfur compounds, Phosphorus compounds, Water pollution sources.

Six sites selected for the study of amounts of nitrogen, sulfur, and phosphorus in precipitation over Iowa were located on a line from northeast to southwest of the state. Precipitation samples collected for 27 months during 1971-1973 were analyzed for pH, NH4-N, NO3-N, PO4-P, SO4-S, and NO2-N. Average annual concentrations in precipitation ranged from 0.38 plus or minus 0.48 to 0.86 plus or minus 0.53 ppm for NH4-N, and from 0.36 plus or minus 0.24 to 0.99 plus or minus 0.98 ppm for NO3-N. Amounts of inorganic nitrogen added per hectare per year ranged from 10 kg in north-central to 14 kg in west-central Iowa. Amounts of SO4-S added ranged from 13 kg in the northeastern to 17 kg in north-central Iowa. Precipitation adds an estimated 0.6 kg of NH4-N, 0.6 kg NO3-N, and 1.5 kg of SO4-S per hectare monthly. PO4-P concentrations in precipitation were low. Only about 0.1 kg of PO4-P per hectare were added annually. NO2-N was not detected in any of the precipitation samples. Average pH values ranged from 5.8 plus or minus 0.8 to 6.5 plus or minus 0.3. Seasonal variation in concentration values was observed only for SO4-S. It was high during fall and winter and low during spring and summer. (Harris-Wisconsin)
W78-06020

HYDROGEN ION SPECIATION IN THE ACID PRECIPITATION OF THE NORTHEASTERN UNITED STATES,
Cornell Univ., Ithaca, NY. Section of Ecology and Systematics.
J. N. Galloway, G. E. Likens, and E. S. Edgerton.
Water, Air, and Soil Pollution, Vol. 6, No. 2-4, p 423-433, September-November 1976. 1 fig, 4 tab, 18 ref.

Descriptors: *Precipitation(Atmospheric), *Northeast U.S., *Chemistry of precipitation, *Water pollution sources, *Hydrogen ion concentration, Acidity, Free acidity, Total acidity, Eutrophication, Ithaca(NY), Hubbard Brook Experimental Farm(NH), Paul Smith(NY), White Mountains(NH).

In any water sample there are two types of acidity that can be measured: free and total. Free acidity is a measure of the concentration of protons in solution, regardless of source. Total acidity indicates protons in solution and those still undissociated. Free acidity and total acidity were determined for precipitation samples from Ithaca, New York (a semi-urban community), Hubbard Brook Experimental Forest, New Hampshire (a forested area in the White Mountains), and Paul Smith, New York (a forested area in the Adirondack Mountains). The samples were collected in February-May 1975. According to results of the chemical analysis, the primary sources of H ions that cause the phenomenon of acid precipitation are strong mineral acids, H2SO4 and HNO3. All other components (H2CO3, NH4, Al, Fe, and Mn), with the exception of an organic acid (RCOOH) contribute only to the total acidity. Although precipitation collected from rural, forested regions (Hubbard Brook and Adirondack Mountains) has less weak acids than that collected in the semi-urban area (Ithaca), the levels of free acidity in both areas is within the range of pH 3.8 to 4.4. This indicates that the regional phenomenon of acid precipitation is influenced by local urban effects. (Harris-Wisconsin)
W78-06025

HYDROGEN INPUT TO THE HUBBARD BROOK EXPERIMENTAL FOREST, NEW HAMPSHIRE, DURING LAST DECADE,
Cornell Univ., Ithaca, NY. Section of Ecology and Systematics.
G. E. Likens, F. H. Bormann, J. S. Eaton, R. S. Pierce, and N. M. Johnson.
Water, Air, and Soil Pollution, Vol 6, No 2-4, p 435-445, September-November 1976. 9 fig, 2 tab, 13 ref.

Descriptors: *Precipitation(Atmospheric), *Hubbard Brook Experimental Farm(NH), *Chemistry of precipitation, *Water pollution sources, *Hydrogen ion concentration, Sampling, Eutrophication, Anions, Sulfates, Cations, Acidity.

Precipitation chemistry has been monitored at the Hubbard Brook Experimental Forest New Hampshire since 1963. The site is downwind of eastern and midwestern industrial centers and as such offers a strategic location to monitor changes in regional precipitation chemistry. Precipitation samples have been collected on a storm or weekly basis. Sulfate and H ions dominate the precipitation. Sulfate is 2.5 times more important than the next most abundant anion NO-3, and H+ is 5.9 times more important than the next most abundant cation NH+4. Rain and snow at Hubbard Brook are highly acidic. The average annual weighted pH during the period 1964-1974 ranged between 4.03 and 4.21. The lowest pH value reported for a storm at Hubbard Brook was 3.0. There was a downward trent in annual pH values between 1964-65 to 23 micro eq per liter in 1973-74. H ion concentrations in precipitation have increased 1.4 times between 1964 and 1974. Based on a stoichiometric formation process in which the sea-salt anionic component is subtacted from the total anions in precipitation, SO-4 contribution to acidity dropped from 83% to 66%, and NO-3 increased from 15% to 30%. H ion concentrations showed significant correlation with increased input of nitrate to precipitation. (Harris-Wisconsin)
W78-06026

THE CHEMICAL COMPOSITION OF ATMOSPHERIC PRECIPITATION FROM SELECTED STATIONS IN MICHIGAN,
Michigan Univ., Ann Arbor. School of Natural Resources.
C. J. Richardson, and G. E. Merva.
Water, Air, and Soil Pollution, Vol 6, No 2-4, p 385-393, September-November 1976. 4 fig, 1 tab, 34 ref. NSF-RANN GI-348 98.

Descriptors: *Precipitation(Atmospheric), *Michigan, *Chemistry of precipitation, *Water pollution sources, Acidity, Rainfall, Hydrogen ion concentration, Cations, Nitrates, Sulfates, Chlorine, Phosphates, Calcium, Magnesium, Sodium, Sampling, Eutrophication.

Examination of pH values for rainfall from 60 stations in Michigan reveals that extremes are found throughout the state. The median acidity for the entire state is 6.3. The weighted annual pH is 5.03. On a regional basis northern lower Michigan, an area of low population density and industry, has the highest annual median pH (6.55). The heavily populated and industrialized southern portions of the state closely follow the entire state's frequency distribution and median pH value. The Upper Peninsula shows low pH values for localities near pulp and mining industries in the Western half of the peninsula. Analyses by individual stations reveal the importance of point source inputs and ground loading effects. Thus, Dimondale, located near a concrete tile plant, has a median pH value of 8.45, while Vassar located between Detroit and Toledo has pH median value of 4.80. A comparison of annual nutrient loading for NO3-, SO4--, Ca++, Mg++, K+. pH of rainwater between the Michigan and Eastern U.S. stations reveals that eastern U.S. stations reporting pH of less than 4.02 have similar loadings for NO3 but twice the SO4 input found for rural Michigan areas. (Harris-Wisconsin)
W78-06027

SEPARATE DETERMINATION OF ACRYLIC AND METHACRYLIC ACIDS IN WATER USING PAPER CHROMATOGRAPHY, (IN RUSSIAN),
Nauchno-Issledovatelskii Inst. Gigieny, Moscow (USSR).
R. S. Ekhina.
Gig Sanit 2, p 78-80, 1977.

Descriptors: *Pollutant identification, Methodology, Acrylic acids, *Chromatography, Acids, Waste water treatment.

A method for the separate determination of acrylic and methacrylic acids, toxic substances found in the waste waters of the acrylate industry, was observed. It is based on the transformation of the acids into complex esters and then into nonvolatile hydroxamic derivatives, giving a color reaction with trivalent Fe salts. Sensitivity of the method is 0.3 mg/l, and the relative error is 15%. It has been applied in the hygienic evaluation of the biological purification of waste waters from a chemical plant.--Copyright 1978, Biological Abstracts, Inc.
W78-06029

THE ABC'S OF DIATOM IDENTIFICATION USING LASER HOLOGRAPHY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, Jr., K. L. Dickson, and J. Slocomb.
Hydrobiologia, Vol. 54, No. 1, p 7-16, 1977. 8 fig, 1 tab, 26 ref. NSF/RANN/IT/GI-38357/PR/7312.

Descriptors: *Diatoms, *Laser holography, Pollutant identification, *Monitoring, Algae, Water quality control, Instrumentation, River basins, Lasers, Data collections, Ecosystems.

A biomonitoring system that employs coherent optical spatial filtering techniques (laser holography) to rapidly identify diatoms and to process species abundance information, is described. Currently in the development stage, the system can in the future be used in river basin monitoring. The system: (1) provides identification using type specimens furnished by a diatom taxonomist; and (2) is an operational experimental unit capable of identifying all individuals structurally similar to the type specimen. The system is not designed to describe new species or provide insights into diatom structure. Electro-optical and computer hardware/software are being developed for automation of the prototype. Diatom taxonomy is based primarily on recognition of physical patterns on the cleared cell frustule, and diatoms, being rigid and having complex character sets, are very suitable for pattern recognition using the technique described in this study. In this system, the filter, basically a holographic record of the two-dimensional periodic or aperiodic structure of the diatom type specimen, is used to sift complex wavelengths from the unknown diatoms. A match between filter and unidentified specimens produces a bright spot of light at a point beyond the filter. In the present optical system 35-mm black and white transparencies of diatoms were used as input specimens; as yet coupling a microscope to the system has not been accomplished. (Lynch-Wisconsin)
W78-06035

ALGAL ASSAY PROCEDURE BOTTLE TEST.
Pacific Northwest Water Lab., Corvallis, OR.
For primary bibliographic entry see Field 5C.
W78-06043

THE QUALITY OF LAKE OF THE OZARKS.
Environmental Protection Agency, Region VII, Kansas, MO.
For primary bibliographic entry see Field 5B.

W78-06050

MERCURY CONCENTRATIONS IN FISH IN LAKE OAHE, SOUTH DAKOTA, APRIL 16 TO SEPTEMBER 27, 1972.
Environmental Protection Agency, Denver, CO.
For primary bibliographic entry see Field 5C.
W78-06051

THE FLUOROMETRIC BEHAVIOR OF PULPING WASTE LIQUORS, A VALUABLE TOOL FOR LIGNIN AND PULPING RESEARCH,
Oregon State Univ., Corvallis. School of Forestry.
W. J. Bublitz, and T. Y. Meng.
Tappi, Vol 61, No 2, p 27-30, February, 1978. 6 fig, 3 tab, 5 ref.

Descriptors: *Pollutant identification, Pulp and paper industry, *Fluorometry, *Analytical techniques, *Hemlock trees, *Douglas fir trees, Lodgepole pine trees, Lignins, *Pulp wastes, Waste water treatment, Industrial wastes.

Fluorometric behavior was measured for the pulping waste liquors of Douglas fir, western hemlock, and lodgepole pine. The tests with pulping liquors indicated that fluorescence was a linear function of the lignin content of the waste liquors and correlated to other pulping parameters, such as yield and Kappa number. Douglas fir pulping liquor exhibited peak fluorescence at a wavelength of 430 nm but at a lower intensity than for Douglas fir of the same lignin concentration. Lignin in lodgepole pine liquors fluoresced at 485 nm with an excitation of 370 nm. Dilution of the pulping liquor by 1,000-10,000 times was necessary for accurate measurements of the lignin concentration. A reduction of solution pH from 12 to 6-7 produced a shift in the peak of fluorescent and excitation wavelengths for the pulping liquors of the three wood types were relatively equal, although the intensity of the wavelengths was found to vary. (Lisk-FIRL)
W78-06077

ELECTRON-BEAM OXIDATION TREATMENT OF A COMMERCIAL DYE BY USE OF A DUAL-TUBE BUBBLING COLUMN REACTOR,
Japan Atomic Energy Research Inst., Tasasaki. Tasasaki Radiation Chemistry Research Establishment.
For primary bibliographic entry see Field 5D.
W78-06079

POLLUTION INDICATORS AND OTHER MICROORGANISMS IN RIVER SEDIMENT,
Connecticut Univ., Storrs. Biological Sciences Group.
E. A. Matson, S. G. Hormor, and J. D. Buck.
Journal Water Pollution Control Federation, January 1978, p 13-19, 4 fig, 6 tab, 21 ref. OWRT A-052-CONN(17).

Descriptors: *Pollutant identification, Water pollution sources, Water quality, *Sediments, Rivers, Indicators, *Bioindicators, *Bacteria, *Yeasts, Microorganisms.

Data collected during a 3-year study of indicator and other bacteria and yeasts in the Shetucket River basin in northeastern Connecticut is presented. Analysis of the data shows high indicator densities in sediments and a high and variable sediment/water ratio for several groups of organisms; the potential for health hazard information in the sediment in the absence of such information from water analysis; and a synthesis of several concepts which stress the need for a more accurate sampling strategy than that currently employed. (Chilton-ORNL)
W78-06096

SEASONAL TRENDS OF NH4(+) AND NO3(-) NITROGEN ISOTOPE COMPOSITION IN RAIN COLLECTED AT JULICH, GERMANY,
Kerntorschungsanlage Juelich G.m.b.H. (West Germany). Inst. fuer Chemie.
H. D. Freyer.
Tellus, Vol 30, No 1, p 83-92, February 1978. 5 fig, 8 tab, 42 ref.

Descriptors: *Isotope studies, *Nitrogen, *Chemistry of precipitation, *Precipitation(Atmospheric), Sampling, Rainfall, Rain water, Data collections, Seasonal, Chemical analysis, Ammonia, Ammonium compounds, Nitrates, Nitrogen compounds, Fertilizers, Foreign countries, Farm wastes, Foreign research, Livestock, Urine, Pollutants, Water pollution, Water pollution sources, Meteorology, *West Germany, Julich(Germany).

Data were presented on nitrogen isotope composition in ammonium and nitrate from rain water collected over 2 years in an interior area at Julich, Germany. The seasonal trends in the data were discussed relative to natural and anthropogenic emissions of nitrogen compounds which additionally have been measured or estimated in their isotope composition, e.g., ammonia from animal urine, fuel combustion, fertilizer use and organic soil nitrogen, and natural and anthropogenic nitric oxides from automobile exhausts as well. The 15N content of Julich rain ammonium was found to be different from values of Hoering and Moore and from other rain samples collected in coastal areas. (Sims-ISWS)
W78-06113

COMPARATIVE CHEMISTRY OF A COOLING RESERVOIR AND ITS WATER SOURCE,
North Texas State Univ., Denton. Dept. of Biological Science.
For primary bibliographic entry see Field 5B.
W78-06114

EVALUATION OF LEACHATE CHARACTERISTICS AND PHYSICAL PROPERTIES OF COMPACTED MIXTURES OF FLY ASH AND WASTEWATER SLUDGE,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 5B.
W78-06118

HERBICIDE REPORT: CHEMISTRY AND ANALYSIS, ENVIRONMENTAL EFFECTS, AGRICULTURAL AND OTHER APPLIED USES.
Environmental Protection Agency, Washington, D.C. Hazardous Materials Advisory Committee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 006, Price codes: A10 in paper copy, A01 in microfiche. Report No EPA-SAB-74-001, May 1974. 196 p, 5 fig, 33 tab, 388 ref, append. 1HA410.

Descriptors: *Herbicides, *Environmental effects, *Chemical analysis, *Pesticide residues, *Aquatic weed control, Pesticides, Agriculture, Eutrophication, Gas chromatography, Classification, Bioaccumulation, Degradation(Decomposition), Cost-benefit analysis, Water pollution effects, Soil contamination, Air pollution, Water pollution sources, Rates of application.

Fifteen selected herbicides are evaluated for chemical structure, environmental effects, and application: Alachlor, Propachlor, Linuron, Diuron, Atrazine, Propazine, Tribluralin, Nitralin, 2,4-D, Chloramben, Butylate, Acrolein, copper sulfate, Endothall, and Xylene. Thirteen major groups based on chemical structure are recognized; synthesis, analysis, and properties of each are discussed. Environmental considerations include sources and movements of herbicides; residues in soil, water, and air; bioaccumulation of residues; effects on nontarget plants; and the costs and benefits of herbicide use. Herbicide uses are described, and alternative methods are evaluated. Herbicides make up about 50% of quantities of all pesticides used in the United States, and about 134 are currently registered. Of 500 million pounds of herbicides used annually in the U.S., 85.2% are applied to crops, 14.6% to rights-of-way and similar areas, and 0.2% in aquatic environments. Beneficial effects of herbicide use include increased crop yield and release of land from cropping, enhancement of recreation areas, and habitat improvement. Major herbicide pollution sources are drift during application, and volatilization and runoff after application. Residues do not appear to build up in air, water, or soil, and nearly all are at least partially metabolized by plants, animals, or soil-microbial systems. (Lynch-Wisconsin)
W78-06133

COOLING DISCONTINUOUS WATERS WITH A SINGLE REFRIGERATION UNIT,
Arizona Univ., Tucson. School of Renewable Natural Resources; and Arizona Cooperative Fishery Research Unit.
For primary bibliographic entry see Field 5G.
W78-06146

RELATION OF SAMPLE VARIATIONS TOPLATE ORIENTATION IN THE HESTER-DENDY PLATE SAMPLER,
North Dakota State Dept. of Health, Bismarck. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 7B.
W78-06147

ORGANOCHLORINE RESIDUES IN NEW JERSEY OSPREY EGGS,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
S. N. Wiemeyer, D. M. Swinford, P. R. Spitzer, and P. D. McLain.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 1, 1978, p 56-63. 3 tab, 23 ref.

Descriptors: *Polychlorinated biphenyls, *DDE, *Chlorinated hydrocarbon pesticides, Path of pollutants, Water pollution effects, *DDT, *DDE, *Dieldrin, Heptachlor, *Pesticide residues, *Ospreys, *Osprey eggs, Barnegat Bay, Mirex, Chlordane, Shell thickness.

Data are presented on the levels of organochlorine pesticides and polychlorinated biphenyls in the eggs of New Jersey ospreys, the changes in eggshell thickness. These data are related to similiar data for declining and stable osprey populations in other areas. DDE and PCB's were found in all eggs. The high residual levels of DDE and PCB's in the New Jersey osprey eggs appear to have been an important factor in the reduced rate of reproductive success. (Katz-EIS)
W78-06150

THE ACUTE AND CHRONIC EFFECTS OF CADMIUM ON THE ESTUARINE MYSID MYSIDOPSIS BAHIA,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5C.
W78-06152

THE FATE OF FENITROTHION IN AN AQUATIC ECOSYSTEM,
Ottawa Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-06161

ORGANOCHLORINE RESIDUES IN POTENTIAL FOOD ITEMS OF MARINE BALD EAGLES (HALIAEETUS LEUCOCEPHALUS), 1966 AND 1974,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.

S. N. Wiemeyer, A. A. Belisle, and F. J. Gramlich.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 1, p 64-72, 1978. 2 tab, 21 ref.

Descriptors: *Food chain, *Food habits, Foods, Maine, *Chlorinated hydrocarbon pesticides, DDE, DDD, *DDT, *Polychlorinated biphenyls, Yellow perch, Herring, Suckers, Atlantic salmon, Bullheads, Eels, Freshwater fish, Gulls, *Bald eagles, Alewife, Pickerel.

Potential bald eagles food items were collected from several areas in Maine in both 1966 and 1974 in a preliminary effort to determine the source of organochlorine pollutants found in the eagles and their eggs, to determine whether organochlorine levels were different in areas with dissimilar rates of eagle reproductive success, and to determine whether gross changes in residue levels had occurred through time. (Katz-EIS)
W78-06164

PHYSIOLOGICAL INDICES OF STRESS IN MYTILUS EDULIS,
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5C.
W78-06168

HEAVY METALS IN THE BURROWING BIVALVE SCROBICULARIA PLANA FROM THE TAMAR ESTUARY IN RELATION TO ENVIRONMENTAL LEVELS,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
For primary bibliographic entry see Field 5C.
W78-06169

FEEDING RATE OF MYTILUS EDULIS L. (BIVALVIA) FROM DIFFERENT PARTS OF DANISH WATERS IN WATER OF DIFFERENT TURBIDITY,
Copenhagen Univ. (Denmark). Zoological Lab.
For primary bibliographic entry see Field 2L.
W78-06170

DETERMINATION OF BIOCHEMICAL-OXYGEN-DEMAND PARAMETERS,
Geological Survey, Bay St. Louis, MS. Water Resources Div.; and Geological Survey, Lakewood, CO. Water Resources Div.
M. E. Jennings, and D. P. Bauer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 739, Price codes: A04 in paper copy, A01 in microfiche. Gulf Coast Hydroscience Center Computer Contribution, June 1976. 41 p, 4 fig, 11 ref.

Descriptors: *Biochemical oxygen demand, *Dissolved oxygen, *Mathematical models, *Aquatic microorganisms, *Organic wastes, Water quality, Waste dilution, Streamflow, Water pollution, Water pollution control, Aquatic environment, Pollutants, Water chemistry, Analytical techniques.

The computer program described in this manual determines biochemical-oxygen-demand (BOD) from the results of laboratory tests and determines two parameters of the first-order kinetic model for BOD. The parameters are k, the process rate constant, days; and Lo, the ultimate dissolved-oxygen demand, mg/liter. By use of the computer program, the parameters may be determined by three different methods: (1) The Thomas method, (2) the least-squares method, or (3) the nonlinear least-squares method. The rate constant parameter is determined in base-10 and base-e forms. Options for sample rea. ration, sample dilution, immediate BOD, and initial lag are contained in the program. (Woodard-USGS)
W78-06174

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1975.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06175

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1975.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06176

WATER RESOURCES DATA FOR MONTANA, WATER YEAR 1976.
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06177

GROUND-WATER RESOURCES OF EMMONS COUNTY, NORTH DAKOTA,
Geological Survey, Bismarck, ND. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06179

SELECTED HYDROLOGIC DATA, PAROWAN VALLEY AND CEDAR CITY VALLEY DRAINAGE BASINS, IRON COUNTY, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06180

WATER-QUALITY ASSESSMENT OF THE MIDDLE FORK ANDERSON RIVER WATERSHED, CRAWFORD AND PERRY COUNTIES, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
M. A. Ayers.
Open-file report 78-71, January 1978. 31 p, 11 fig, 5 tab, 20 ref.

Descriptors: *Water quality, *Surface waters, *Watersheds(Basins), *Indiana, *Water analysis, Sampling, Chemical analysis, Dissolved solids, Nutrients, Bacteria, Dissolved oxygen, Phytoplankton, Pesticides, Suspended solids, Sediments, Evaluation, *Middle Fork Anderson River(Ind), Crawford County, Perry County.

This report, on water quality for streams in Crawford and Perry Counties, Indiana, defines the variation in concentrations of nutrients, inorganic constituents, suspended sediment, bacteria, and phytoplankton in streams, and chlorinated hydrocarbons in bed materials in the Middle Fork Anderson River watershed; identifies areas and sources of water-quality problems; and determines the effects of existing flood-retarding structures on water quality. The data base for this water-quality assessment included five sets of samples collected from September 1975 through July 1976. Temperature, specific conductance, pH, and dissolved-oxygen concentration of water were measured, and stream discharge was estimated at 25 sites. Samples for laboratory analysis were collected at 9 of these sites in September 1975, at 8 of the sites in December 1975, and at 7 of the sites in March, June, and July 1976. Surface-water quality in the watershed is generally good except for problem-causing concentrations of bacteria, dissolved oxygen, and phosphorus at some sites along the main stem during low flow, and manganese at most sites year-round. (Woodard-USGS)
W78-06190

A WATER-QUALITY ASSESSMENT OF THE BUSSERON CREEK WATERSHED, SULLIVAN, VIGO, GREENE, AND CLAY COUNTIES, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06191

QUALITY OF RIVERS OF THE UNITED STATES, 1974 WATER YEAR--BASED ON THE NATIONAL STREAM QUALITY ACCOUNTING NETWORK (NASQAN),
Geological Survey, Reston, VA. Water Resources Div.
R. O. Hawkinson, J. F. Ficke, and L. G. Saindon.
Available from OFSS Br. of Dist. USGS Box 25425, Fed. Ctr. Denver, CO 80225 paper copy $7.00, microfiche $4.00. Open-file report 77-151, February 1977. 158 p, 16 fig, 9 tab, 21 ref.

Descriptors: *Water quality, *Rivers, *United States, *Streams, *Water temperature, Sediment transport, Inorganic compounds, Nutrients, Bacteria, Phytoplankton, Dissolved solids, Evaluation, *NASQAN system.

The National Stream Quality Accounting Network (NASQAN) was established by the U.S Geological Survey to determine and compare the quality at key locations on the Nation's major rivers. There are 345 stations in the network--data from the first 101 of these (those operating during the 1974 water year) are summarized in this report. Temperature data from NASQAN stations have been summarized for each station. At most stations the harmonic provides an estimate of daily temperatures with a standard error of estimate of 2.5 degrees C or less. According to 1974 water-year data summarized from NASQAN operations, water quality of the rivers of the United States is best (by most standards) in the Northeast, Southeast, and Northwest. Waters there generally are low in dissolved solids and major and minor chemical constitutents, generally are soft (except in Florida), and carry relatively small amounts of sediment. However, many of these waters carry moderate or high levels of major nutrients and have correspondingly high populations of attached and floating plants. High counts of indicator bacteria also show signs of local pollution at some sites. Rivers of most of the Midcontinent and Southwest are characterized by moderate to high levels of dissolved major and minor constituents, sediment, major nutrients, and biota (floating and attached aquatic plants and indicator bacteria. (Woodard-USGS)
W78-06192

PALEOGEOCHEMISTRY AND INTERSTITIAL WATER CHEMISTRY FROM SEDIMENTS OF FIVE MAINE LAKES,
Maine Univ. at Orono. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2H.
W78-06199

5B. Sources Of Pollution

A WATER QUALITY PLANNING MODEL WITH MULTIPLE TIME, POLLUTANT, AND SOURCE CAPABILITIES,
Meta Systems Inc., Cambridge, MA.
R. DeLucia, E. McBean, and J. Harrington.
Water Resources Research Vol 14, No 1, p 9-14, February 1978. 4 fig, 12 ref.

Descriptors: *Water pollution control, *Planning, *Capacity expansion, *Waste treatment, Pollutants, Constraints, Economies of scale, Optimization, Legislation, Biomass, Linearization, Mathematical models, Systems analysis, Equations.

The imposition of recent U.S. legislative requirements (Public Law(PL) 92-500) with the 1977 and 1983-1985 water quality goals requires that water

quality management plans must weigh both degree of treatment and capacity expansion questions. A planning model capable of reflecting the implications of the pollutant constraints and the scale economies of point source abatement implicit in the legislation is developed. The model captures within a mathematical programming format important characteristics of decisions associated with the time-related water pollution control goals of PL 92-500. The model's unique features are the utilization of a biomass potential parameter as a measure of water quality and a set of heuristic procedures involving linearization of the waste treatment capacity-removal curves. These features allow avoidance of nonconvexity problems associated with analogous models. The model also includes the usual BOD, DO, N, and P water quality measures; it was applied in a recent planning study for the Saint John Basin in Maine. (Bell-Cornell)
W78-05702

PROGRAMMER'S AND USER'S MANUAL FOR THE TRIBUTARY WATER QUALITY MODEL (FINAL REPORT ON PHASE 2),
Center for the Environment and Man, Inc., Hartford, CT.
J. T. Ball, L. E. Johnson, and G. M. Northrop.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 095, Price codes: A04 in paper copy, A01 in microfiche. Study of the Impact of Economic Development and Land Utilization Policies on the Quality of the Environment, Initial Application to England. Report No NSF-RA-E-75-158, NSF, Washington, D.C., October 1975. 66 p, 15 fig, 3 tab, append.

Descriptors: *Water quality, *Mathematical models, *Land use, Planning, Regional analysis, Industries, Economic development, Pollution, *Computer programs, Manuals, Environmental impacts, Equations, Dissolved oxygen, Biochemical oxygen demand, Temperature, Flow rate, Fecal coliforms, Dissolved solids, Systems analysis.

This study examines alternative land use plans and environmental control policies that affect regional economic development, population growth, and environmental quality. As part of its water quality analyses phase, a one-dimensional tributary water quality model is developed. The objective of the model is to develop data on tributary water quality parameters as they enter the main stem of a larger stream. The requirements for this study call for a model capable of outputting six characteristics at selected points along a stream: flow rate; temperature; dissolved oxygen deficit; biochemical oxygen demand remaining to be exerted; total dissolved solids; and total fecal coliforms. The model must be able to accommodate secondary inputs of flow, both from natural streams (subtributaries) and industrial/municipal outfalls. The model must also be able to accommodate withdrawals of flow and point changes in characteristics. The model is applied to eleven tributaries--seven in Connecticut and four in Massachusetts. This version of the Programmer's and User's Manual shows examples of test data results for the Hockanum River. The model includes an optional on-line graphical printout to all parameters. This feature is useful in presenting results to decision makers. (Bell-Cornell)
W78-05717

A WATER QUALITY OPTIMIZATION MODEL FOR NONSERIAL RIVER SYSTEMS,
Calgary Univ. (Alberta).
M. B. Bayer.
In: Mathematical Models for Environmental Problems. Proceedings of the International Conference held at the University of Southampton, England, September 8-12, 1975. C.A. Brebbia (Ed.), Southampton University. John Wiley & Sons, N.Y., N.Y., p 253-267. 1976. 3 tab, 12 ref.

Descriptors: *Water quality control, *Optimization, *River systems, *Standards, *Evaluation, *Water policy, Dissolved oxygen, Biochemical oxygen demand, Water temperature, Reach(Streams), Thermal pollution, Constraints, River basins, Construction costs, Equations, Mathematical models, Systems analysis, Simulation analysis, *Nonlinear programming, Biodegradable wastes, Transfer functions.

Described is a modeling method for evaluating policies for achieving specified water quality standards in a nonserial river system. The river system is assumed to be a closed economic system to avoid the problem of accounting for the external diseconomies of internal pollution abatement decisions. The system is assumed to be under the management of a single agency which has the legal authority to specify and codify river water quality standards. These standards are designated as lower limits on DO concentration, upper limits on BOD concentration, and upper limits on water temperature in the various reaches of the river system. It is the agency's purpose to control the amount of biodegradable materials and waste heat introduced into the receiving waters to meet the standards. Only biodegradable and thermal wastes are considered herein. The water quality model is formulated as a set of interdependent mathematical programming problems with nonlinear objective functions and linear constraints. The model is developed assuming that the following are known for each tributary branch and the mainstream: (1) minimum allowable DO and maximum allowable BOD concentrations; (2) maximum allowable water temperature; (3) equilibrium air temperatures in the basin; (4) rate constants for the physical phenomena in the river system; (5) minimum mean period mainstream and tributary flows; and (6) construction costs for pollution abatement structures throughout the operating ranges for these structures. (See also W78-05720) (Bell-Cornell)
W78-05725

THE PRIMARY PRODUCTION OF PHYTOPLANKTON IN EXPERIMENTS ON BIOMONITORING AT THE UCHINSKOYE RESERVOIR, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Hydrobiology.
For primary bibliographic entry see Field 5C.
W78-05733

COMPUTER MODELLING OF GROUNDWATER 13C AND 14C ISOTOPE COMPOSITIONS,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
For primary bibliographic entry see Field 2F.
W78-05767

DRIFT RESPONSE OF MONOMOLECULAR SLICKS TO WAVE AND WIND ACTION,
Hamburg Univ. (West Germany).
For primary bibliographic entry see Field 2L.
W78-05773

DILUTION GAUGING ON THE RECESSION LIMB: 1. CONSTANT RATE INJECTION METHOD,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 8B.
W78-05774

THE SPEED AND DIRECTION OF MOVEMENT OF STORM RAINFALL PATTERNS WITH REFERENCE TO URBAN STORM SEWER DESIGN,
British Meteorological Office, Bracknell (England).
R. J. Shearman.
Hydrological Sciences Bulletin, Vol 22, No 3, p 421-431, September 1977. 7 fig, 9 ref.

Descriptors: *Rainfall, *Storms, Movement, *Distribution patterns, Networks, Gages, Precipitation gages, Rain gages, Precipitation(Atmospheric), Winds, Velocity, Frequency analysis, Urban runoff, Urban hydrology, Storm drains, Design, *England.

A pilot investigation of the direction and speed of movement of storm rainfall patterns in an area near London was described briefly. Within the limited scope of the pilot study, which used only 15 of the 53 raingages in the Surrey and Greater London Council network, the results suggested that there is no preferred direction of storm movement. There is a preferred range of medium level (700 mb) wind directions from 200 deg to 290 deg, but there is no evidence that the majority of storms move with the direction and speed of the medium level wind. Aproximately 60% of the storms analyzed in the study moved with speeds greater than about 15 m/s. Thus, many storms move with greater speeds than those of general interest to the urban drainage engineer. The results did not suggest that storm paths departed from the 700 mb wind field in any organized manner. For example, there was no obvious dependence on storm intensity. However, a large number of storms were not tracked successfully and were eliminated due to the reduced raingage network and the problem of multi-cellular storms. Thus, the results are based on approximately 230 storms, a relatively small sample compared with the 670 storms originally selected. Suggestions were made for future work in the form of a more comprehensive investigation. (Sims-ISWS)
W78-05776

IMPACT OF LAND USE ON GROUND WATER QUALITY IN THE GRAND TRAVERSE BAY REGION OF MICHIGAN,
Duke Univ., Durham, NC. School of Forestry and Environmental Studies.
For primary bibliographic entry see Field 5A.
W78-05778

FALLOUT CESIUM-137 IN CULTIVATED AND NONCULTIVATED NORTH CENTRAL UNITED STATES WATERSHEDS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
J. C. Ritchie, and J. R. McHenry.
Journal of Environmental Quality, Vol 7, No 1, p 40-44, January-March 1978. 1 fig, 3 tab, 27 ref. ERDA AT(49-7) 3029.

Descriptors: *Cesium, *Sediments, *Soils, *Watersheds(Basins), Data collections, Regression analysis, Erosion, Soil erosion, Reservoirs, Rainfall, Precipitation(Atmospheric), Soils, Farm management, Cultivated lands, Pollutants, Path of pollutants, Nonpoint pollution.

The cesium (137Cs) concentrations were measured in the soils and sediments of 14 watersheds, 7 cultivated and 7 noncultivated, in the North Central United States. The 137Cs concentration in watershed soils ranged from 56 to 149 nCi/sq m, with cultivated watersheds averaging 75 nCi/sq m, and noncultivated watersheds averaging 104 nCi/sq m. The 137Cs concentration in the reservoir sediments ranged from 74 to 1,280 nCi/sq m, with a mean of 676 nCi/sq m for the cultivated watersheds and 365 nCi/sq m for the noncultivated watersheds. The 137Cs concentrations per unit area in sediments were 0.8 to 18.7 times greater than those found in the contributing watershed soils. This indicated that some 137Cs is moving within the watersheds and that the reservoirs are acting as 'traps' or 'sinks.' The factors accounting for the variation in 137Cs concentration in the soils and sediments of the watersheds are (1) the erosion potential of the watershed, (2) the sites for adsorption of 137Cs, and (3) the input of radioactivity into the watershed. (Sims-ISWS)
W78-05779

EFFECTS OF SOIL, COVER CROP, AND NUTRIENT SOURCE ON AMOUNTS AND FORMS OF PHOSPHORUS MOVEMENT UNDER SIMULATED RAINFALL CONDITIONS,
Ohio Agricultural Research and Development Center. Wooster.
G. Y. Reddy, E. O. McLean, G. D. Hoyt, and T. J. Logan.
Journal of Environmental Quality, Vol 7, No 1, p 50-54, January-March 1978. 1 fig, 4 tab, 20 ref.

Descriptors: *Phosphorus, *Runoff, *Sediments, *Laboratory tests, Erosion, Soils, Soil erosion, Simulated rainfall, Fertilizers, Nutrients, Manure, Leachate, Water quality, Water pollution, Water pollution sources, Chemical, Chemical analysis, Crops, Agriculture, *Path of pollutants.

Three soils (Toledo silty clay, Rossmoyne silt loam, and Wauseon sandy loam) in greenhouse microplots were treated with chemical, chemical + straw, and manure sources of N, P, and K, were cropped or left bare, and were subjected to simulated rainfall. Phosphorus moving in runoff sediments, runoff solution, and leachate was measured. Most P moved as a component of sediments. Cropping decreased sediment and solution losses, while manure generally increased losses in both. Most P moving in runoff solution was inorganic. However, except where percolation swept inorganic P downward without reaction with the soil, most P moving in leachate was organic. Fractionations of soil P revealed that P treatments increased the HN4Cl- and NH4F-extractable fractions markedly, hadd less effect on the NaOH-extractable fraction, and had still less effect on the H2SO4-extractable and organic fractions. All phosphorus sources markedly increased the equilibrium P concentrations (EPC) of all soils. Manure increased EPC more than the other sources in the Rossmoyne and Wauseon soils. The tendency is for more sediment P to be lost from manure and for manure-treated soil to mobilize P into solution, make erosion control especially important if much manure is to be applied to soils and if eutrophication of surface waters is to be minimized. (Sims-ISWS)
W78-05780

AQUEOUS- AND SEDIMENT-PHASE PHOSPHORUS YIELDS FROM FIVE SOUTHERN PINE WATERSHEDS,
Southern Forest Experiment Station, Oxford, MS.
P. D. Duffy, J. D. Schreiber, D. C. McClurkin, and L. L. McDowell.
Journal of Environmental Quality, Vol 7, No 1, p 45-50, January-March 1978. 4 fig, 7 tab, 24 ref.

Descriptors: *Phosphorus, *Storm runoff, *Sediments, *Forests, *Mississippi, Pine trees, Watersheds(Basins), Erosion, Soil erosion, Soils, Sampling, Chemical analysis, Water quality, Sediment transport, Nutrients, Water pollution, Pollutants, Path of pollutants, Runoff, Drainage.

Stormflow from five reforested watersheds (1.5 to 2.8 ha) in northern Mississippi was analyzed during the 1974 water year (October 1973 to September 1974) for phosphorus (P) in solution and in association with suspended sediments. Samples were collected for each storm with Coshocton wheel samplers set below 0.91 -m H-flumes. For the year, mean concentration of total P in solution was 0.027 mg/liter for the five watersheds. Of this concentration, 45% was hydrolyzable P, 33% ortho-P, and 22% organic P. Sediment total P concentrations ranged from 274 to 1,067 micrograms/gram and were 2.0 to 8.9 times that in the watershed soils. Increased concentration of P in suspended sediment relative to soil was attributed to selective erosion of fine sediments and/or deposition of coarse sediments in transport. For the five watersheds, solution total P yield during the water year averaged 88 g/ha; whereas sediment total P yield averaged 210 g/ha and accounted for 64 to 76% of the sediment plus solution P yield. (Sims-ISWS)
W78-05781

TRANSPORT OF ATRAZINE AND SIMAZINE IN RUNOFF FROM CONVENTIONAL AND NO-TILLAGE CORN,
Ohio Agricultural Research and Development Center, Wooster.
G. B. Triplett, Jr., B. J. Conner, and W. M. Edwards.
Journal of Environmental Quality, Vol 7, No 1, p 77-84, January-March 1978. 1 fig, 7 tab, 25 ref.

Descriptors: *Herbicides, *Runoff, *Weed control, *Farm management, Storm runoff, Rainfall, Precipitation(Atmospheric), Corn(Field), Crops, On-site investigations, Sampling, Regression analysis, Correlation analysis, Data processing, Pollutants, *Path of pollutants, Water pollution, *Atrazine, *Simazine, No-tillage farms, Herbicide transport.

On a 0.4- to 3.5-ha watersheds, highest concentrations of atrazine (0.48 ppm) and simazine (1.2 ppm) were present in runoff occurring soon after application and declined rapidly for later events. Quantity of herbicides transported increased with the amount of runoff and was inversely related to the length of time between application and the runoff event. A maximum of 6% of the applied herbicide was transported from the field even under the most favorable conditions, and the average for all watersheds was less than 2%. Less runoff and herbicide loss occurred from areas planted to no-tillage than to conventional corn. In a multiple regression analysis of the factors, the natural logarithm (ln) of days after application and a tillage X application rate interaction were useful in predicting the natural logarithm of herbicide concentration in runoff. Factors from the multiple regression analysis used in this study were important in predicting concentration of atrazine and other pesticides when applied to data published by other workers. (Sims-ISWS)
W78-05782

EFFLUENTS FROM CATFISH PONDS DURING FISH HARVEST,
Auburn Univ., AL. Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5A.
W78-05783

EFFECTS OF DEICING SALTS ON WOODY VEGETATION ALONG MINNESOTA ROADS,
Minnesota Univ., St. Paul. Coll. of Forestry.
E. Sucoff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 169, Price codes: A04 in paper copy, A01 in microfiche. Technical Bulletin 303-Forestry Series 20, Final report of Investigation No. 636, 1975. 49 p, 15 fig, 22 tab, 91 ref, 3 append.

Descriptors: *Salts, *Highways, Damages, *Vegetation, *Minnesota, Trees, Shrubs, Salt tolerance, Sodium chloride, Ice, Melt water, Runoff, Water pollution, Pollutants, Effects, Vegetation effects, Water pollution effects, Soil contamination effects, Path of pollutants, Salt spray, Soil salts, Deicing salts, Plant damage.

Information was collected on amounts of deicing salts used and methods of application. Planting practices and investment also were surveyed. Techniques were presented for the recognition of soil-salt and spray-salt damage using visual symptoms and chemical analysis of leaves and soils. Proof was obtained that salt causes much of the twig dieback in hardwoods and needle browning in pines observed along certain Minnesota roadways. The locations were defined as where salt-spray and soil-salt damage are likely to be high, moderate, or low. Species were rated for their sensitivity to soil-salts and winter spray-salts. A brief history of salt damage in Minnesota was presented, and the seriousness of current damage was evaluated in terms of mortality, reduced growth and disfigurement, and increased maintenance costs. Seven ways to reduce salt damage were presented, including a planting guide to match species to site. Future prospects were estimated for salt damage in Minnesota. A permanent plot system was described that will monitor build up in plant and soil sodium and chloride as well as changes in the vegetation caused by salt damage. (Sims-ISWS)
W78-05786

EFFECTS OF DEICING SALTS AND LEAD UPON TREES, SHRUBS AND SOILS IN CONNECTICUT,
Connecticut Dept. of Transportation, Wethersfield. Bureau of Planning and Research.
E. F. Button, E. J. Rubins, M. A. Woodward, and G. F. Griffin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 294, Price codes: A09 in paper copy, A01 in microfiche. Report FHWA-CT-76-9, January 1977. 163 p, 4 fig, 20 tab, 18 ref, 5 append.

Descriptors: *Damages, *Highways, *Salts, *Lead, *Connecticut, Vegetation, Vegetation effects, Trees, Shrubs, Salt tolerance, Sodium chloride, Water pollution, Water pollution effects, Soil properties, Soil chemistry, Soil contamination effects, Pollutants, Effects, Path of pollutants, Deicing salts, Salt concentrations, Plant damage.

The effects of deicing salts and particulate lead were studied on 28 species of trees and shrubs planted in 1968 and 1971 adjacent to a heavily travelled interstate roadway in central Connecticut. The soil on the same test site also was investigated for the accumulation of undesirable elements and their effects on its chemical and physical properties. Field observations, chemical analyses of plant tissues, tissue indices, and soils investigations all indicated that areas within 30 ft of the highway are unfavorable to the normal growth of many trees and shrubs. Consequently, trees and shrubs growing between 30 and 80 ft of the pavement were rated on their relative tolerance to roadside condition. The data supported the thesis that on well-drained sites under Connecticut conditions, deicing salts are being removed annually from the root-zone soil about as fast as they are being added. The data also suggested that trapping of lead particulates by vegetation bordering highways apparently results in an increase of lead in the underlying surface soils. Foliage may be effective in protecting areas immediately beyond the vegetative border from lead (Pb) fallout. (Sims-ISWS)
W78-05787

ORGANIC MATTER IN THE SUSPENDED LOAD OF THE RIVERS AND IRRIGATION SYSTEMS OF SOVIET CENTRAL ASIA,
I. A. Klyukanova.
Soviet Hydrology, Selected Papers, Vol 15, No 1, p 68-71, 1976. 4 tab, 14 ref. Translated from News of the USSR Academy of Sciences. Geographic Series (Izvestiya Akademii Nauk SSR. Seria Geograficheskaia), No 1, 1976, p 102-107.

Descriptors: *Organic matter, *Suspended load, *Rivers, *Asia, Canals, Sediment discharge, Data collections, Irrigation ditches, Surveys, On-site investigations, Foreign research, Foreign countries, Water pollution, *USSR.

The general patterns of variation in the content of organic matter in the strongly calcareous suspended load of the rivers and irrigation systems of Soviet Central Asia were investigated. The variation in the content of organic matter along the length of a river was given as a function of river load, and the annual discharge of organic substances by the major rivers of this region was computed. The suspensates were sampled in 1963-1973

in almost all the major rivers of Soviet Central Asia during the flood peak, and in the largest irrigation systems. Data on the absolute content of organic matter, obtained by multiplying the suspended particle concentration in the water, sediment discharge, and its volume by percentage content of organic matter, were presented. Study of the changes in the chemical composition of the suspended load of rivers (including organic matter) and irrigation-water suspensates has become one of the pressing problems in the geochemistry of suspensates. Successful solution of this problem probably will make it possible to use data on the changed chemical composition of suspended and irrigation sediments in a sound forecast of the probable changes in the agrochemical, physicochemical, and other properties of irrigated lands. (Humphreys-ISWS)
W78-05799

THE MIGRATION OF 238U, 226RA, 232TH AND 40K INTO FLOODPLAIN SOILS OF SUPERAQUATIC LANDSCAPES OF THE BITYUG RIVER, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of General Soil Science.
M. T. Yastrebov.
Vestn Mosk Univ Biol Pochvoved 31(2), p 83-86, 1976.

Descriptors: Flood plain soils, Landscapes, Migration, *Potassium-40, *Radium-226, Rivers, Soils, *Thorium-232, *Uranium-238, USSR, *Bityug River(USSR), *Chermozem, Humus, Gleys, Radioisotopes, Path of pollutants.

Meadow-swamp soddy-meadow and chernozemic-meadow soils of the superaquatic calcic-magnesium sodic landscapes in the floodplain Bityug River (USSR) contain 1.8-4.1 times more 238U than the typical chernozems of the correlated trans-eluvial calcic landscapes. 238U is accumulated in humus and gley horizons of flood plain soils. A more narrow ratio 232Th: 238U in the floodplain soils (1.1-2.5), than in the typical chernozems (2.3-4.8) indicate the mirgation of 238U into the floodplain soils. Migration of the 226Ra, 232Th and 40K into the investigated floodplain soils was not established.--Copyright 1977 Biological Abstracts, Inc.
W78-05822

BIOLOGICAL ACTIVITY OF SODDY-PODZOLIC SOILS UNFLOODED AND FLOODED BY THE WATER OF MOZHAISK RESERVOIR, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Physics; and Moscow State Univ. (USSR). Dept. of Soil Melioration.
For primary bibliographic entry see Field 2G.
W78-05827

NO METAL UPTAKE BY CORN OR GRASS.
For primary bibliographic entry see Field 5E.
W78-05853

EFFECTS OF INCUBATION AND LIMING ON YIELD AND HEAVY METAL UPTAKE BY RYE FROM SEWAGE-SLUDGED SOIL,
Agricultural Research Service, Beltsville, MD.
For primary bibliographic entry see Field 5E.
W78-05863

CHEMICAL INTERACTION IN PARTICAL SEPARATION,
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
For primary bibliographic entry see Field 5D.
W78-05865

THE USE OF FAECAL BACTERIA AS A TRACER FOR SEWAGE SLUDGE DISPOSAL IN THE SEA,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
P. A. Ayres.
Marine Pollution Bulletin, Vol 8, No 12, p 283-285, December, 1977. 2 fig, 4 ref.

Descriptors: *Bioindicators, *Path of pollutants, *Coliforms, *Sewage disposal, *Sewage bacteria, *Tracking techniques, *E coli, Analytical techniques, Sludge disposal, Sampling, Membrane processes, Water pollution control, Monitoring, On-site data collections, Waste water disposal, *Liverpool Bay(England), Bays.

The movement of sewage sludge discharged into Liverpool Bay in England was followed using bacteria indigenous to sewage as a tracer. Enumeration of E. coli and other enterobacteria associated with fecal waste was accomplished within two days for samples of bottom sediment collected from 62 sites in Liverpool Bay. Initial concentrations of coliforms in the sediment samples proved higher than E. coli concentrations, indicating greater survival of coliform bacteria over a large area. Movement of the bacteria demonstrated a definite easterly direction towards the River Mersey and rising tide; little northerly or southerly movement was observed. Previous studies with radioactive tracers had yielded similar results and indicated rapid dispersion with east-west settlement over an area 8-km wide by 30-km long. Fecal bacteria was found to collect in muddy sediments and had a short viability in seawater. (Lisk-FIRL)
W78-05876

A FAECAL STEROL SURVEY IN THE CLYDE ESTUARY,
Bristol Univ. (England). Dept. of Chemistry.
R. M. Goodfellow, J. Cardoso, G. Eglinton, J. P. Dawson, and G. A. Best.
Marine Pollution Bulletin, Vol 8, No 12, p 272-276, December, 1977. 2 fig, 5 tab, 21 ref.

Descriptors: *Path of pollutants, *Pollutant identification, *Alcohols, *Sewage disposal, *Estuaries, *Europe, Gas chromatography, Surveys, Analytical techniques, Measurement, Sewerage, Waste water disposal.

Various tracer techniques have been used to map the movement of sewage effluents discharged from ocean outfalls. In this study, gas chromatography was used to measure levels of coprostanol in water and sediments collected in the Clyde estuary and Firth of Clyde in England. Bottom sediments contained 0.1-14.0 ppm of coprostanol (5beta-cholestan-3beta-ol), as well as the corresponding 24-methyl- and 24-ethyl-5beta-stanols. The concentrations of coprostanol in seawater closely parallelled fecal coliform counts obtained for the seawater samples. Coprostanol levels were also directly related to the discharge locations and quantities of sewage input to the estuary by sewage outfalls and dumping operations. The data indicated that fecal steroid levels in sewage were rapidly diluted after discharge, although they could be detected in surface waters over 20 km from the sewage outfalls. The results suggested that coprostanol data might be used in addition to fecal coliform enumeration for monitoring the path of pollutants, especially for detecting domestic wastes in industrial outfalls where the concentration of sewage bacteria is generally low. (Snyder-FIRL)
W78-05879

DISTRIBUTION OF VIRAL AND BACTERIAL PATHOGENS IN A COASTAL CANAL COMMUNITY,
Baylor Coll. of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
C. P. Gerba, S. M. Goyal, E. M. Smith, and J. L. Melnick.
Marine Pollution Bulletin, Vol. 8, No. 12, p 279-282, December, 1977. 1 fig, 3 tab, 18 ref.

Descriptors: *Path of pollutants, *Pathogenic bacteria, *Viruses, *Canals, *Pollutant identification, Distribution patterns, Sewage treatment, Biological treatment, Treatment facilities, Activated sludge, Municipal wastes, Waste water disposal, Waste water treatment.

In canal communities, each house has canal frontage allowing direct water access. The occurrence and distribution of bacterial and viral pathogens were examined in a canal community on the Texas Gulf coast where secondary-treated sewage effluent was discharged. Turbidity and salinity, as well as bacteria and viruses, were measured. Sewage from the community is treated in a small activated sludge plant which discharges an unchlorinated effluent. Recommended limits of 1000 total coliforms/100 ml and 200 fecal coliforms/100 ml for recreational water were exceeded in two of the three monthly samples. Salmonella, poliovirus, and Echovirus types 1, 2, and 3 were also isolated. Assuming an average virus concentration efficiency of 50%, the recommended standard for recreational water of one infectious unit of virus per 10 gallons was exceeded in all water samples. (Snyder-FIRL)
W78-05880

INFLUENCE OF ARTIFICIAL DRAINAGE ON PENETRATION OF COLIFORM BACTERIA FROM SEPTIC TANK EFFLUENTS INTO WET TILE DRAINED SOILS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
R. B. Reneau, Jr.
Journal of Environmental Quality, Vol. 7, No. 1, p 23-30, January-March, 1978. 4 fig, 6 tab, 14 ref.

Descriptors: *Path of pollutants, *Coliforms, *Loam, *Monitoring, *Water table, *Septic tanks, Sampling, Domestic wastes, Flow, Test wells, Tile drains, Tile drainage, Waste water treatment, Virginia, Analytical techniques.

The movement of fecal and total coliform bacteria through tile drained soil systems from domestic septic tanks was monitored with on-site analytical techniques in Windsor, Virginia. The residential study area was characterized by poorly drained Aeric and Typic Ochraquults soil that had been previously tile drained for agricultural purposes. Sampling monitors were oriented in the direction of the groundwater flow; water table control wells and tile outfalls were established at various distances from the three sites. Log normalized fecal coliform densities for high water tables reached a mean high of 160,000/100 ml in the third site at 152 cm from the septic source. Fecal counts for three sites at distances of 1,310, 1,341, and 2,172 cm from the sewage sources were reduced to a minimum of less than 3.0/100 ml. The highest mean total coliform density recorded at site three of 730,000/100 ml at 152 cm was reduced to a density of 38/100 ml at the maximum distance from the source. A high of greater than 240,000/100 ml for total coliform density and a low of less than 3.0/100 ml for fecal coliform density were observed in the tile outfalls for high water tables. Coliform counts increased during the summer low water tables. (Lisk-FIRL)
W78-05881

NEARSHORE SEDIMENT POLLUTION IN ISRAEL BY TRACE METALS DERIVED FROM SEWAGE EFFLUENT,
Hebrew Univ. of Jerusalem, Rehovot (Israel). Dept. of Soil and Water Science.
A. J. Amiel, and J. Navrot.
Marine Pollution Bulletin, Vol. 9, No. 1, p 10-14, 1978. 5 fig, 9 ref.

Descriptors: *Sediments, *Sea water, *Trace elements, *Copper, *Outfall sewers, Silver, Cobalt,

Chromium, Mercury, Nickel, Lead, Zinc, Cadmium, Bacteria, Marine fish, Waste water disposal, Municipal wastes, Waste dilution, *Israel.

Marine sediment from the Israeli coast in the vicinity of a sewage outfall was analyzed for silver, copper, chromium, cobalt, mercury, nickel, lead, and zinc. Both total and extractable trace metal measurements were recorded for sediment core samples. Trace metal concentrations were found to be a function of distance from the sewage outfall, with the highest accumulations recorded near the pipeline outlet. Significant trace metal concentrations were found within 400 meters from the shoreline and sewage pipe. Beyond the 400 meter distance, dilution reduced the trace metal concentrations. Dilution of bacteria was limited near the outfall and increased progressively with distance from the pipe. Trace metal concentrations in sediment collected at a significant distance from the outfall were similar to concentrations in non-polluted areas. Maximum trace metal levels were recorded during the summer months and in the upper layers of the sediment. A previous study of the outfall area indicated concentrations of cadmium and copper at a level considered potentially dangerous to aquatic organisms. (Lisk-FIRL)
W78-05887

TRACE METAL DISTRIBUTIONS AMONG THE HUMIC ACID, THE FULVIC ACID, AND PRECIPITABLE FRACTIONS EXTRACTED WITH NAOH FROM SEWAGE SLUDGES,
California Univ., Riverside. Dept. of Soil and Environmental Science.
For primary bibliographic entry see Field 5A.
W78-05888

THE USE AND INTEGRATION OF GROUND AND SURFACE WATER MODELS IN THE 208 PLANNING PROCESS,
Battelle Pacific Northwest Labs., Richland, WA.
J. R. Raymond.
AIChE Symposium Series, Vol. 73, No. 167, p 319-327, 1977. 10 fig, 13 ref.

Descriptors: *Computer models, *Hydraulic models, *Surface-groundwater relationships, *Long-term planning, *Analytical techniques, Hydrology, Groundwater, Surface waters, Legislation, Water supply, Waste treatment, Waste water disposal.

Section 208 of the Federal Water Pollutin Control Act Amendments of 1972 requires waste treatment management planning for areas with substantial water quality problems. The impact, interrelationships, and treatment alternatives must be identified and assessed for complex waste sources which may affect water quality. Waste treatment needs must be projected over a period of 20 years. Numerical hydrologic models and associated models for pollutant transport are important planning tools, allowing complex interrelationships between surface and groundwater quality, water supply, waste discharge, waste water treatment, and treatment alternatives to be assessed. The hydralic and transport theories are well developed; equations exist which can be solved by existing computers to describe the systems. The development of a model to provide accurate assessments requires considerable hard data and knowledge of system parameters and boundaries. Because of the cost, time, and technology required, numerical modelling should be limited to complex problems where simpler methods are insufficient. (Snyder-FIRL)
W78-05895

STUDY OF THE CONTAMINATION OF MARINE CULTURES, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Oceanographie Medicale, Nice (France).
J. Aubert, G. Flatau, D. Puel, V. Breittmayer, and R. Clement.
Rev Int Oceanogr Med 45/46, p 77-98, 1977.

Descriptors: Chemical wastes, *Microbiological studies, *Toxicity, Water quality, *Marine pollution, *Path of pollutants, *Monitoring.

Chemical and microbiological pollution resulting from agricultural, industrial and urban sources were monitored in water and in organisms of 6 marine experimental aquaculture centers and of a marine zoo. Pollutant concentrations were lower than the admitted levels. Microbiological quality of organisms was apparently related to the biological quality of water.--Copyright 1978, Biological Abstracts, Inc.
W78-05897

UNDERGROUND INJECTION OF LIQUID WASTE CAN BE ENVIRONMENTALLY SOUND,
Texas Water Quality Board, Austin.
For primary bibliographic entry see Field 5E.
W78-05899

BEHAVIOR OF ANIONIC SURFACTANTS IN A SOIL-SEWAGE EFFLUENT SYSTEM,
Agricultural Research Organization, Bet Dagan (Israel). Inst. of Soils and Water.
A. J. Acher, and B. Yaron.
Journal of Environmental Quality, Vol. 6, No. 4, p 418-420, October-December, 1977. 5 fig, 2 tab, 11 ref.

Descriptors: *Surfactants, *Soil chemistry, *Sewage effluents, *Adsorption, *Soil contamination, Pollutant identification, Soils, Microbial degradation, Municipal wastes, Waste water disposal, Waste water treatment.

The absorption and desorption of anionic surfactants by soil during the application of water and sewage effluents was investigated. Sodium lauryl sulfate (NaLS), dodecyl benzene sulfonate sodium salt (DDBS), and linear alkyl aryl sulfonate (LAS) were applied in 1% aqueous solutions to a sandy regosol from Mivtachim, Israel and a clay grumusol from Tel Adashim, Israel. The soil was mixed with a combination of the anionic surfactant solution and sewage effluent from Nazareth or Haifa, Israel. The concentration of anionic surfactants was measured with the methylene blue active substances (MBAS) method. The affinity of the soil was lowest for DDBS and higher for NaLS. Microbial attack during adsorption from sewage effluent raised the soil's apparent adsorption capacity. The adsorption isotherms of the ionic surfactants were linear and the soil type controlled the rate of accumulation. The soil-adsorbed NaLS was completely fixed and could not be desorbed. The desorption rate of DDBS and LAS from soil was controlled by the initial concentration. (Snyder-FIRL)
W78-05900

IMPROVING SUBSURFACE DISPOSAL SYSTEM PERFORMANCE,
Agricultural Research Center, Beltsville, MD.
For primary bibliographic entry see Field 5E.
W78-05901

NITRATE LEACHING DURING LONG-TERM SPRAY IRRIGATION FOR TREATMENT OF SECONDARY SEWAGE EFFLUENT ON WOODLAND SITES,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
J. E. Kook, and L. T. Kardos.
Journal of Environmental Quality, Vol. 7, No. 1, p 30-34, January-March, 1978. 5 fig, 3 tab, 16 ref.

Descriptors: *Return flow, *Sewage wastes, *Nitrates, *Leaching, *Soil water, Forests, Hardwood, Surface irrigation, Rates of application, Recirculated water, Waste water treatment, Municipal wastes.

Studies were conducted at two forested areas irrigated with 5 cm of waste water to evaluate long-term effects of sewage effluent land applications on nitrate leaching. A hardwood forest received an average annual effluent loading of 293 kg/acre over a nine-year period. The study indicated that 83% of the total nitrate, more than 2,000 kg/acre, had leached from the hardwood site in six of the nine years. Analyses of the soil water at a depth of 120 cm showed an average nitrate concentration of 15 mg/liter, with a high of 30 mg/liter recorded during the latter part of 1969 and early 1970. Little nitrate reduction was achieved by dividing effluent applications into 2.5 cm twice weekly or reducing irrigation to 2.5 cm weekly. Nitrate concentrations at the 120-cm depth remained above the potable water nitrate limit of 10 mg/liter. A white spruce forest planted in well-drained clay loam was irrigated weekly with 5 cm of effluent over 9 months of the year beginning in 1963. Analyses of the soil water nitrate content at a depth of 120 cm showed an average concentration of less than 10 mg/liter. A total of 36% of the nitrate had leached from the site between the sixth and ninth years of the study. An increase in the rate of effluent irrigation to 7.5 cm/week resulted in a 75% leaching rate, with nitrate concentrations exceeding 10 mg/liter at the 120 cm depth. (Lisk-FIRL)
W78-05903

DISCHARGE OF NITROGEN, PHOSPHORUS AND ORGANIC MATTER INTO THE GULF OF BOTHNIA,
National Swedish Environment Protection Board, Uppsala. Limnological Survey.
T. Ahl, A. Haverinen, L. Thorell, and J. Wartiovaara.
Ambio, Vol 6, No 5, p 273-275, 1977. 4 fig, 1 tab, 12 ref.

Descriptors: Path of pollutants, Water pollution sources, *Nitrogen, *Phosphorus, *Biochemical oxygen demand, *Oceans, *Rivers, Drainage area, Watersheds(Basins), Municipal wastes, Industrial wastes, Waste water treatment, *Gulf of Bothnia(Finland).

Sources and quantities of nitrogen, phosphorous, and organic matter discharged into the Gulf of Bothnia, feeder to the Baltic Sea, from Sweden and Finland were calculated. Major sources of nitrogen, phosphorus, and organic matter were determined to be rivers, municipal waste waters, and industrial waste waters. A total of more than 81,000 tons/yr of nitrogen in the form of ammonia, nitrite, nitrate, and organic matter was discharged into the gulf, 90% from rivers. The total quantity of inorganic nitrogen discharged was 22,000 tons and organic was 59,000 tons. A total of 6,200 tons/yr of phosphorus was released with under 5,000 tons from rivers, more than 600 tons from municipal waste waters, and more than 700 tons from industrial wastes. About 56% of the total phosphorus was organic, with the remainder being inorganic phosphate. An estimated 600,000 tons/year of 7-day BOD was discharged, with 54% contributed by industrial waste waters and 43% from rivers. The 7-day BOD loading on the Gulf of Bothnia was calculated at 5.16 g/sq m/yr. Bothnian Bay loading was estimated at 6.58 g/sq m/yr, and 4.51 g BOD/sq m/yr in the Bothian Sea. (Lisk-FIRL)
W78-05905

THE PROBLEM OF POLLUTION IN THE MONTPELLIER REGION, (IN FRENCH),
L. Berner.
Bull Soc Linn Provence 28, p 23-32, 1975.

Descriptors: *Bioindicators, Water pollution effects, *Lez River(France), Path of pollutants, Environmental effects.

Animal and plant indicators show that the development of pollution of the Lez river, in the Montpellier region, from its source (where it is potable) to

its mouth (where it is heavily polluted) corresponds to the degradation of the environment of the region.--Copyright 1978, Biological Abstracts, Inc.
W78-05906

COASTAL WATER RESEARCH PROJECT. ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1977.
Southern California Coastal Water Research Project, El Segundo.
Annual Report for the Year Ended 30 June 1977. 257 p, 3 append.

Descriptors: *Baseline studies, *Environmental effects, *Resources development, *Water resources, California, Waste water disposal, DDT, Polychlorinated biphenyls, Heavy metals, Toxicity, Outfall sewers, Sediments, Diseases, Bottom sediments, Pacific Ocean, *Outer Continental Shelf, *Southern California Bight, Petroleum development, Chlorinated hydrocarbons, Fin erosion, Dichlorobenzene.

Twenty-eight professional papers make up this annual report. Each paper prepared by individual scientists, covers research that was outlined in the Research Plan for 1977 and describes when, where, and how the scientific work was done as well as what was discovered. The following topics are covered: Recent data on possible pollutants contributed to southern California's open coastal waters by various sources, especially including details about municipal wastewaters; new information about how the discharged material is distributed by water motions; new findings about animal and plant populations; studies of the levels of pollutant materials in animals; the levels at which metals and chlorinated hydrocarbon pollutants become toxic to marine life as determined by tests; and evidence of actual effects on animals in the ocean. (See W78-05912 thru W78-05930) (Sinha - OEIS)
W78-05911

CHARACTERISTICS OF MUNICIPAL WASTEWATER DISCHARGES, 1976,
Southern California Coastal Water Research Project, El Segundo.
H. A. Schafer.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 19-23, 1977. 4 tab.

Descriptors: *California, *Water pollution sources, *Heavy metals, *Baseline studies, Environmental effects, *Resources development, *Water resources, Municipal wastes, Waste water, DDT, Polychlorinated biphenyls, Outer Continental Shelf, *Petroleum development, Chlorinated hydrocarbons.

Municipal wastewater discharges are the principal source of most pollutants entering the southern California waters as a result of human activity. The data for 1976 are summarized in three tables. The summary indicates that, although the flow of municipal wastewater has increased by approximately 10% in the last 5 years, the mass emission of several of the waste constituents have been reduced. Most notable is the significant decline in the discharge of DDT and PCB chlorinated hydrocarbons. Notable changes between 1975 and 1976 include the following: The Hyperion 7-mile outfall selenium mass emission rate is twice the amount of any previous year. Silver showed a 17% increase between 1974 and 1975, but the 1976 mass emission rate was lower than for any year since 1971. Arsenic, cadmium, copper, lead and zinc values showed some increase. (See also W78-05911) (Sinha - OEIS)
W78-05912

METALS IN POWER PLANT COOLING WATER DISCHARGES,
Southern California Coastal Water Research Project, El Segundo.
D. R. Young, T-K. Jan, and M. D. Moore.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 25-31, 1977. 2 ref.

Descriptors: *Baseline studies, *Environmental effects, *Resources development, *Water resources, *Cooling water, *Powerplants, *Metals, Water pollution sources, Heavy metals, Electric powerplants, California, Outer Continental Shelf, Petroleum development, Southern California Bight.

Cooling water from coastal power plants is the largest type of discharge to the Southern California Bight. The average annual flow from the fifteen major electrical generating stations in southern California during 1970-71 was 7.7 x 10 to the 12th power liters/year, approximately seven times the corresponding rate for municipal wastewater discharged via submarine outfalls. There has been growing concern that these very large thermal discharges could be raising the levels of certain toxic trace metals, such as copper, in the nearshore waters. An investigation into the levels of six trace metals in both seawater influent and effluent of eight major generating statons located along the Ventura, Los Angeles, and Orange County coastlines was conducted. Findings to date indicate that, although increased levels of some metals are found in certain nearshore regions (particularly harbors), the power plants studied do not appear to be an important source (See also W78-00511) (Sinha - OEIS)
W78-05913

HALOGENATED HYDROCARBONS IN WASTEWATERS: KNOWNS AND UNKNOWNS,
Southern California Coastal Water Research Project, El Segundo.
T. C. Heesen, and D. R. Young.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June, p 33-38, 1977. 2 fig, 3 tab, 3 ref.

Descriptors: *Baseline studies, *Environmental effects, *Resources development, *Halogenated pesticides, Water pollution sources, Pollutant identification, Polychlorinated biphenyls, DDT, Outer Continental Shelf, Southern California Bight, Low-molecular-weight halogenated hydrocarbons(LMHH).

The data are in agreement with a conclusion reported last year--that the sum of the measureable DDT and PCB residues (which make up most of the effluent monitoring total identifiable chlorinated hydrocarbon values) are generally an order of magnitude below the level of total chlorinated benzenes in these municipal wastewaters. Recent pilot studies of the Hyperion 5-mile effluent (whose 350-mgd flow accounts for about one-third of the municipal wastewater discharged to the Bight) suggest that the level of low-molecular-weight halogenated hydrocarbons (LMHH) is one order of magnitude above that of the chlorinated benzenes, and two orders of magnitude above that of the DDT/PCB residues generally reported to regulatory agencies as total identifiable chlorinated hydrocarbons. (See also W78-05911) (Sinha - OEIS)
W78-05914

IN SITU MEASUREMENTS OF INITIAL DILUTION,
Southern California Coastal Water Research Project, El Segundo.
T. J. Hendricks.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 41-51, 1977. 4 fig, 2 ref.

Descriptors: *Baseline studies, *Environmental effects, *Resources development, *Water pollution sources, *Path of pollutants, *Waste water(Pollution), Outfall sewers, California, Outer Continental Shelf, Southern California Bight, Dilution, In-situ measurements.

Initial dilution processes at the four major ocean outfalls in the southern California area were studied to (1) compare various methods of predicting initial dilution, measure the actual dilutions produced by existing outfall systems, and compare the predicted and actual performances; (2) examine the behavior of buoyant plumes and surface wastefields in the sea; and (3) determine the suitability of various tracers for field studies of plume and wastefield behavior. Results to date indicate that the 'minimum initial dilutions' ranged from a low of 100:1 to a high of 290:1 for the well-stratified conditions existing during October 1976. Measurements at the four major outfalls during a period of strong stratification indicate that initial dilutions of effluents are significantly higher than predicted by numerical models, which neglect the influence of ambient ocean currents. Ammonia and Rhodamine WT dye dilutions were essentially equivalent, in relatively good agreement with limited bacterial comparisons, but significantly greater than estimates based on turbidity. (See also W78-05911) (Sinha-OEIS)
W78-05915

COASTAL CURRENTS,
Southern California Coastal Water Research Project, El Segundo.
T. J. Hendricks.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 53-62, 1977. 5 fig, 3 ref.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water pollution sources, *Currents(Water Waste water(Pollution), Outfall sewers, California, *Outer Continental Shelf, *Southern California Bight, Pollutant transport, Subthermocline water.

During 1976, current meter and drogue studies were carried out in the San Diego area. The objectives of this work were (1) to determine the mean speed and direction of subthermocline currents over a period of a year, (2) to examine the long-term variability in these currents, (3) to determine the length of the segment of coast that can be described by the currents recorded at a single location, and (4) to explore possible correlations between these currents and winds and tides. During the year, short-duration measurements of currents were made at several depths in the water column near four southern California municipal wastewater outfalls as part of the continuing studies of initial dilution of wastewater discharges. The mean notion of the subthermocline currents in the area of the Point Loma outfall over a 290-day period was upcoast at a speed of 3 cm/sec. This net upcoast motion is in agreement with the distribution of effluent-related sediments in this area and, in fact, with the distribution of sediments off the Whites Point outfall as well. If this mean flow continued along the entire coast between Mexico and Point Conception, it would correspond to a transit time for that region of about 150 days. (See also W78-05911) (Sinha-OEIS)
W78-05916

POLLUTANTS IN SEDIMENTS OFF PALOS VERDES,
Southern California Coastal Water Research Project, El Segundo.
G. P. Hershelman, T-K. Jan, and H. A. Schafer.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 63-68, 1977. 3 fig, 6 ref.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water pollution

sources, *Sediments, *Heavy metals, DDT, Polychlorinated biphenyls, Water pollution, Paths of pollutants, Outfall sewers, *Outer Continental Shelf, Southern California Bight.

Concentrations of eight metals, DDT, and PCB in the surface sediments at 44 stations off Palos Verdes Peninsula were determined and are reported. To evaluate the degree to which submarine discharges have altered conditions around outfalls, it is necessary to determine corresponding baseline values. In spite of the differences between sampling sites, the ranges of the baseline concentrations are generally quite similar. The highest values for most of the metals are about an order of magnitude lower than concentrations in outfall sediments in the area extending 5 km to the northwest of the JWPCP outfalls. (See also W78-05911) (Sinha-OEIS)
W78-05917

PRECISION OF CHLORINATED HYDROCARBON MEASUREMENTS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5A.
W78-05918

SATELLITE IMAGERY STUDIES,
Southern California Coastal Water Research Project, El Segundo.
T. J. Hendricks.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 75-78, 1977. 2 fig, 1 ref.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water pollution sources, Remote sensing, Satellites(Artificial), Water circulation, California, *Outer Continental Shelf, *Southern California Bight, Pollutant transport, Satellite imagery.

The possibility of using remote sensing, particularly satellite imaging, to obtain information on the surface water circulation within the Southern California Bight is explored. As imagery is collected and analyzed, the sequential development and movement of the thermal patterns can be observed and the validity of these inferences can be tested. From this imagery, a conceptual model of the circulation of the surface water within the Bight might be developed and perhaps insight can be gained into the sources of the long-period fluctuations observed in nearshore shelf current meter records. (See also W78-05911) (Sinha-OEIS)
W78-05919

CHLORINATED BENZENES IN PALOS VERDES FLATFISH,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-05920

METALS IN SEAFOODS NEAR OUTFALLS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-05921

METALS IN MUSSELS FROM HARBORS AND OUTFALL AREAS,
Southern California Coastal Water Research Project, El Segundo.
D. R. Young, and G. V. Alexander.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 159-165, 1977. 1 fig, 2 tab, 6 ref.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water pollution sources, *Water pollution effects, *Heavy metals, Bioindicators, Outfall sewers, Mussels, Paints, California, Outer Continental Shelf, Southern California Bight, Trace metals, Mytilus edulis

Abnormally high levels of a number of potentially toxic trace metals in tissues of bay mussels (Mytilus edulis) collected from areas of either vessel activities or municipal wastewater discharges are reported. Ship and boat protective paints constitute a potentially significant source of certain trace metals to coastal marine waters. For example, copper, mercury, and tin have been used extensively as toxicants in antifouling paints, and chromium, lead and zinc are important components of bottom primers. Cadmium also occurs in certain paint pigments, and zinc is utilized in the sacrificial anodes that are attached to vessel bottoms to prevent corrosion of metal parts. The results of this study indicate that the use and maintenance of recreational, commercial, and naval vessels, as well as the submarine discharge of municipal wastewater, are sources of trace metal additions to intertidal organisms of the Southern California Bight. (See also W78-05911) (Sinha - OEIS)
W78-05922

A SAFE LEVEL OF HEXAVALENT CHROMIUM FOR A MARINE POLYCHAETE,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-05923

EFFECTS OF HEXAVALENT CHROMIUM ON SEA URCHIN EMBRYOS AND BRITTLE STARS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-05924

TOXICITY OF A CHLORINATED BENZENE TO SEA URCHIN EMBRYOS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-05925

MARINE BIRD DEATHS AT LOS ANGELES ZOO,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-05926

ANIMALS THAT ARE INDICATORS OF MARINE POLLUTION,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-05927

HISTOLOGY OF LIVER TISSUE FROM DOVER SOLE,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-05928

FIN EROSION DISEASE AND LIVER CHEMISTRY: LOS ANGELES AND SEATTLE,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-05929

FIN REGENERATION IN DOVER SOLE,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5C.
W78-05930

HYDROGEOLOGY OF THE LAKE METIGOSHE BASIN NORTH DAKOTA AND MANITOBA,
North Dakota Univ., Grand Forks. Dept. of Geology, and Geological Survey, Grand Forks, ND.
S. R. Moran
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 638. Price codes: A04 in paper copy, A01 in microfiche. North Dakota Water Resources Research Institute, Fargo, Completion Report, Part I, Research Report WI-221-043-77, May 1977. 59 p, 10 fig, 3 tab, 19 ref, 2 append. OWRT A-034-NDAK(1). 14-31-0001-5034.

Descriptors: Baseflow, Groundwater, Recharge, *Nutrients, Lake basins, Seepage, Lakes, Water quality, Groundwater movement, Hydrogeology, *Canada, Watershed management, Recreation wastes, *Water pollution sources, Water pollution effects, *North Dakota, Manitoba, *Lake Metigoshe Watershed(ND-Manitoba), Turtle Mountains.

Lake Metigoshe has been extensively developed as one of the most important recreational lakes in Central North Dakota. With such heavy use, the nutrient level of the lake has risen to a level where growth of planktonic algae and rooted plants have detrimentally affected recreational use of the lake. This study is part of a multi-disciplinary effort to discover the sources from which and the mechanisms by which excess nutrients were entering the lake. On the basis of the data obtained in this study it is not possible to determine the origin of the nutrients that Downing (1975) found entering the lake through the groundwater.
W78-05933

PHOSPHORUS DYNAMICS IN SOILS IRRIGATED WITH MUNICIPAL WASTEWATER,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W78-05937

CRITERIA FOR THE USE OF VERTICAL AVERAGING IN GREAT LAKES DISPERSION MODELS,
Cleveland State Univ., OH. Dept. of Chemical Engineering.
F. M. Galloway, Jr, and S. J. Vakil.
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 20-28, October 1977. 9 fig, 2 tab, 13 ref. OWRT A-036-OHIO(3).

Descriptors: *Dispersion, *Lake Erie, *Lake Ontario, *Great Lakes, *Model studies, Mathematical models, Lakes, Circulation, Water circulation, Mixing, Diffusion, Pollutants, *Path of pollutants, Water pollution, Flow, Currents(Water), Velocity, Limnology, *Dispersion models.

Two basic questions that arise in the development of Great Lakes dispersion models are (1) when can vertical averaging be used to reduce the dimensionality of the problem, and (2) what value(s) should be used for the horizontal dispersion coefficient(s). A strategy was presented for estimating answers to both questions. Application of the strategy was illustrated using dispersion modeling in the Western Basin of Lake Erie as an example. Predicted values for the horizontal effective dispersion coefficient also were compared with some previous measurements of horizontal dispersion in Lake Ontario. (Sims-ISWS)
W78-05947

EFFECTS OF POLLUTANTS ON NATALITY OF MUSCULIUM SECURIS (BIVALVIA:PISIDIIDAE),
Guelph Univ., (Ontario). Dept. of Zoology.

For primary bibliographic entry see Field 5C.
W78-05956

THE CYCLE OF HEAVY METALS IN LAKES, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switzerland). Seenforschungslab.
P. Baccini.
Schweiz Z Hydrol 38(2), p 121-158, 1976.

Descriptors: *Heavy metals, *Lake sediments, Mesotrophy, Biomass, Lakes, *Model studies, Sedimentation, Switzerland, *Lake Lucerne(Switz), *Path of pollutants.

In mesotrophic Lake Lucerne (Bay of Horw) (Switzerland) and in eutrophic Lake Alpnach concentration and sedimentation of Fe, Cu, Zn, Cd and Pb were investigated as a function of time and depth, and compared with a series of physical and chemical parameters. A metal balance was made for the Lake Alpnach. A model for the distribution of the metals between biomass, allochthonous material and dissolved phase was employed. Phenomenology and the model indicate that the sedimentation of the metals is dominated by allochthonous particles, the biogenic particularization is partially reversed by lake internal decomposition processes and the trace metals reaching the sediment ar partially redissolved.--Copyright 1978, Biological Abstracts, Inc.
W78-05962

PHOSPHORUS LOADING AND RESPONSE IN LAKE VANERN NEARSHORE AREAS,
National Swedish Environmental Protection Board, Uppsala.
For primary bibliographic entry see Field 5C.
W78-05966

BACTERIAL CONTAMINATION OF LAKE POWELL WATERS: AN ASSESSMENT OF THE PROBLEM,
New Mexico Univ., Albuquerzque. Dept. of Biology.
D. E. Kidd.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 682, Price codes: A03 in paper copy, A01 in microfiche. Report NSF-RA-E-75-184, Lake Powell Research Project Bulletin Number 16, December 1975. 32 p, 2 fig, 17 tab, 11 ref. NSF AEN 72-03462 A03.

Descriptors: *Lake Powell(Ariz-Utah), *Coliforms, *Water pollution, *Bacteria, *Water quality standards, *Public health, Reservoirs, Recreation, Swimming, Potable water, Mathematical models, Shigella, Salmonella, Streptococcus, Lake Powell Research Project, Diseases, Hazards, Utah, Arizona, Colorado River.

Analysis of water samples taken from Lake Powell in Utah and Arizona from 1972-74 for coliform bacteria and fecal streptococci indicates that water in the reservoir is unsafe to drink, but generally safe for recreational use. But fecal material is present in the water, and contamination will increase with additional recreational activity in the future. Samples from nine main channel sites all contained total coliforms in excess of the drinking water standard of a monthly average of one per 100 ml of surface water. The samples also showed that only 6% of the observations exceeded the safety standard for body contact recreation of 50-3000/100ml. At the alternate criterion of 1000/100 ml, 20% of the observations exceeded the standard. Fecal coliforms, estimated on the basis of 20% of total coliforms, were above the 200/100 ml minimum level for safe body contact in 27% of the observations. Fecal streptococci were detected at six of the sites, and probable Salmonella contamination at four sites. During the summer of 1974 increased sampling was conducted. In June and July 84-96% of the counts exceeded 1000 total coliforms/100 ml, and 58-61% exceeded 3000/100 ml. Both standards indicated that many sites were unfit for human body contact. A linear regressin management model is presented for estimating safe and hazardous water regression management model is presented for estimating safe and hazardous water conditions. (Lynch-Wisconsin)
W78-05972

EUTROPHICATION IN VERMONT,
Vermont Dept. of Water Resources, Montpelier. Water Quality Div.
For primary bibliographic entry see Field 5C.
W78-05977

APPROACHES TO THE STUDY OF MICROBIAL TRANSFORMATIONS OF METALS,
National Bureau of Standards, Washington, DC.
F. E. Brinckman, W. P. Iverson, and W. Blair.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 527, Price codes: A02 in paper copy, A01 in microfiche. In: Proceedings of the 3rd International Biodegradation Symposium, Kingston, RI, Aug 17-23, 1975, p 919-936, 1976. 14 fig, 3 tab, 27 ref. Final rept. to ONR, Wash., D.C. and NSRDL, Annapolis, Md. 3130118.

Descriptors: *Heavy metals, *Trace elements, *Speciation, *Spectrophotometry, *Water pollution effects, *Microbial transformation, Volatility, Graphite furnaces, Mercury, Microorganisms, Toxicity, Toxins, Pollutant identification, Food chains, Bioaccumulation, Methylmercury.

General approaches to the study of microbial transformations of trace metals are surveyed, and a research method is described based primarily on the detection and speciation of volatile forms of these metals. Simple quantitative means for surveying the potential of microorganisms for volatilizing metals are described. Transport agents were identified principally through use of flameless atomic spectrophotometry coupled with gas chromatography, which permits characterization of volatile metals and organometallic compounds in the nanogram range so that transformation at environmental levels may be monitored. Abiotic transfer of methyl groups from biologically methylated metals to mercury (II) is useful for speciation of volatile metal forms suspected of being methylated. Bacteria, fungi, algae, and protozoa all transform minerals, but certain groups contribute more than others to the geological distribution of mineral matter. Gradually increasing amounts of heavy metals from anthropogenic sources have been discharged to the aquatic environment, and food chain cycling in the vicinity of locally heavy concentrations have produced such disastrous effects as methylmercury poisoning at Minimata and Niigata, Japan. (Lynch-Wisconsin)
W78-05978

UTAH LAKE-JORDAN RIVER BASIN MODELING PROJECT. VOLUME I. SUMMARY REPORT. VOLUME II. APPENDIX.
Environmental Dynamics Inc., Los Angeles, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 609, Price codes: A05 in paper copy, A01 in microfiche and PB-255 575, A05 in paper copy, A01 in microfiche. Two technical reports prepared for EPA, Washington, D.C., Office of Water Quality. (Vol I Summary Rept): Oct 1973. 48 p, 23 fig, 1 tab; (Vol II App): June 1975. 87 p, 4 fig, 17 tab. EPA-68-01-0775.

Descriptors: *Utah Lake(UT), *Jordan River(UT), *Mathematical models, *Simulation analysis, *QUAL model, *Deep Reservoir Model, *Waste assimilative capacity, River basins, Basins, Lakes, Rivers, *Utah, Planning, Analytical techniques, Reservoirs, Computer programs, Deer Creek Reservoir(UT), Water management(Applied).

Expanded versions of the stream simulation model, QUAL, and the Deep Reservoir Model were applied to the Utah Lake-Jordan River Basin in Utah to study waste assimilation capacity for planning purposes and to verify the models. Limited routing capabilities of the original models, ranging from streamflow and water temperature only, to these plus dissolved oxygen, basic oxygen demand (BOD), and conservative minerals, were amplified to route a wide range of water quality indexes. All programming was done in FORTRAN IV. A one-dimensional mass balance analysis was used to route constituents in the new models, called QUAL II and Modified Deep Reservoir Model. For application of QUAL II, the flow regimes of the Utah Lake-Jordan River Basin were segmented into seven subsystems. While flow records were excellent, water quality data for tributaries were seriously deficient; simulation results must therefore be interpreted with caution. Simulated parameters for the Upper Provo River subsystem coinciding directly with historical data included dissolved oxygen, hex-valent chromium, boron, TDS, nitrite, nitrate, phosphorus, and ambient coliforms. The BOD profile was very similar, while ammonia and temperature varied somewhat in some reaches. Other subsystems displayed comparable results, with the exception of Utah Lake, the simulation of which proved inaccurate. The Modified Deep Reservoir Model was applied to Deer Creek Reservoir, but historical data was severely limited. (Lynch-Wisconsin)
W78-05983

PROCEDURES FOR ESTIMATING DRY WEATHER POLLUTANT DEPOSITION IN SEWERAGE SYSTEMS,
Energy and Environmental Analysis, Inc., Boston, MA.
W. C. Pisano, and C. S. Queiroz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 695, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-600/2-77-120, July, 1977. 92 p, 18 fig, 22 tab, 11 ref, 3 append. R804579.

Descriptors: *Combined sewers, *Mathematical models, *Regression analysis, *Water pollution, *Forecasting, Water quality, Economics, Maintenance, On-site investigations, Measurement, Pollutant identification, Waste water treatment, *Flushing, *Dry weather sewage bed, Field measurements.

A set of generalized procedures for estimating pollutant loadings associated with dry weather sewage solids deposition in combined sewer systems as presented. The predictive equations relate the total daily mass of pollutant deposition accumulations within a collection system to physical characteristics of collections systems (e.g., per capita waste rate, service area, total pipe length, average pipe slope, average diameter, etc.) A complex distributed-parameter dry weather sewage deposition model was applied to 75 separate and combined sewer collection systems in eastern Massachusetts to generate estimates of solids deposited in the systems (lb/day). These estimated loads were then regressed with selected variables representing the physical characteristics of the collection resulting in 4 predictive single term power functions with at most 4 independent variables. A high degree of fit of the nonlinear functions to the data set was achieved, with the R2 values ranging from 0.85 to 0.95. Several alternative predictive models which reflect anticipated differences in the availability of data and user resources are presented. Pollutant parameters include suspended solids, volatile suspended solids, biochemical oxygen demand, chemical oxygen demand, total organic nitrogen, and total phosphorus. Sewer system age and degree of maintenance were considered. Factors are presented for estimating the increase in collection system deposition resulting from improper maintenance. A user's guide is included. (Seip-IPA)
W78-05984

EFFECT OF LAND DISPOSAL APPLICATIONS OF MUNICIPAL WASTES ON CROP YIELDS AND HEAVY METAL UPTAKE,
National Fertilizer Development Center, Muscle Shoals, AL.
P. M. Giordano, and D. A. Mays.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 649, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA - 600/2-77-014, April, 1977. 73 p, 2 fig, 35 tab, 19 ref. append. EPA-IAG-D4-0415.

Descriptors: *Rates of application, *Heavy metals, *Absorption, *Soil treatment, *Fertilizers, Sewage disposal, Sludge disposal, Municipal wastes, Leaching, Movement, *Heavy metal uptake, *Heavy metal movement, *Land application.

Heavy metal uptake in soils and plants resulting from land application of municipal compost and sewage sludge was investigated over a 7-year period. Special emphasis was placed on uptake and cumulative and residual availability of Cd, Zn, Ni, Pb, and Cu to vegetable crops grown in the field. Multiple applications of composted garbage refuse totaling 900 metric tons/hectare have resulted in satisfactory crop growth with only a moderate increase of some heavy metals in plant tissues. In contrast, lower application rates of several domestic sewages resulted in significant uptake of certain metals, especially in more sensitive species such as leafy vegetables and string beans. Although heavy metals accumulate with repeated treatment, plant abailability seems to be related to product matrix rather than to total content. Uptake rates from inorganic and organic sources were compared. Heavy metal movement in soil profiles from municipal waste applications were investigated under simulated and natural rainfall conditions. Mobility of heavy metals is slightly greater from inorganic than from organic sources but is minimal under even severe leaching situations; groundwater contamination from heavy application is unlikely except in very acid soils where mobility would be greater. The economic return of municipal waste application, when compared to chemical fertilizer application, is minimal. (Seip-IPA)
W78-05985

ENVIRONMENTAL INFLUENCES ON THE ACCUMULATION OF LEAD, CADMIUM, MERCURY, ANTIMONY, ARSENIC, SELENIUM, BROMINE AND TIN IN UNICELLULAR ALGAE CULTIVATED IN THAILAND AND IN GERMANY,
Gesellschaft fuer Strahlen- und Unweltforschung m.b.H., Neuherbergbei Munich (West Germany).
For primary bibliographic entry see Field 5C.
W78-05998

NITROGEN - AN ESSENTIAL LIFE FACTOR AND A GROWING ENVIRONMENTAL HAZARD, REPORT FROM NOBEL SYMPOSIUM NO. 38.
AMBIO, Vol. 6, No. 2-3, p 96-105, 1977. 4 fig, 48 ref. Edited by B. Bolin and E. Arrhenius.

Descriptors: *Nitrogen, *Hazards, *Environmental effects, Nitrates, Nitrites, Ammonium compounds, Nitrogen compounds, Nitrogen cycle, Nitrogen fixation, Runoff, Leaching, Oxidation-reduction potential, Agricultural runoff, Toxicity, Economics, Eutrophication.

A review of the basic relationships of nitrogen to the life cycle shows that it is one of the elements essential for building cells of which all living organisms are composed. It occurs in food, in natural products, in the products of ammonia based industry, in soil, in bodies of water and in the atmosphere. The relative amounts of nitrogen in the various global compartments vary widely but are found in ratios of approximately 1:30:30:600 for microorganisms:plant biomass:soil inorganic nitrogen:soil organic matter. In a mature terrestrial ecosystem the nitrogen cycle is balanced and almost closed. The main processes whereby nitrogen enters this system are biological nitrogen fixation and deposition from the atmosphere. The processes by which nitrogen leaves the system are: leaching; denitrification, erosion, surface runoff and ammonia volatization. Human activities that interfere most with the nitrogen cycle are agriculture, combustion and waste treatment. The main effects obtained are contamination of water bodies with nitrogen compounds leading to eutrophication and health hazards, pollution of air, acidification of soil and water, and diminishing of the stratospheric ozone. Some of the measures that would alleviate the undesirable effects of human intervention in the nitrogen cycle include: increased use of solar, water and wind energy; promotion of local energy production units; development of more efficient combustion engines; promotion of public transport; development of small scale waste-recycling units; and development of the waste disposal system that does not use water as vehicle. (Harris-Wisconsin)
W78-05999

ALKALINE POTASSIUM PERMANGANATE DEGRADATION OF INSOLUBLE ORGANIC RESIDUES (KEROGEN) ISOLATED FROM RECENTLY-DEPOSITED ALGAL MATS,
California Univ., Berkeley. Dept. of Chemistry.
R. P. Philp, and E. Yang.
Energy Sources, Vol. 3, No. 2, p 149-161, 1977. 4 fig, 2 tab, 13 ref. NASA NGL-05-003-003.

Descriptors: *Degradation(Decomposition), *Potassium permanganate, *Algal mats, *Kerogens, *Organic compounds, Oil shales, Algae, Cyanophyta, Oxidation, Methodology, Analytical techniques, Microcoleus chthonoplastes, Lyngbya aestuarii, *Laguna Mormona(Mexico), Extraction.

Although kerogen is the most abundant form of organic carbon and is very important in hydrocarbon formation, relatively little is known of its origin, formation, or structure. In this study, insoluble organic matter was isolated from an algal mat from Laguna Mormona, Baja California (Mexico), and the kerogen-like residue extracted and then degraded by stepwise alkaline potassium permanganate oxidation. The findings support the theory that kerogen-like precursors are present in recently-deposited algal mats, and it is proposed that with increasing time additional lipid materials can become bound to this residue. Cross-linking and defunctionalization may also occur, finally producing the algal type of kerogens found in many ancient oil shales and sediments. The algal mat used in the experiments was formed primarily by the filamentous cyanophytes Microcoleus chthonoplastes and Lyngbya aestuarii. The mat was digested with 6N HCl and 48% HF to remove carbonates and silicates. The residue was extracted over two weeks, and divided into two portions; one portion was saponified. Major oxidation products from the subsequent degradation included alpha, omega-dicarboxylic acids, normal mono-carboxylic acids, isoprenoid acids, and mono-methyl branched acids. Problems involved with destructive degradation techniques for structural determination of kerogen are discussed. (Lynch-Wisconsin)
W78-06000

A METHOD OF MEASURING AIRBORNE ACIDITY: ITS APPLICATION FOR THE DETERMINING OF ACID CONTENT ON LONG-DISTANCE TRANSPORTED PARTICLES AND IN DRAINAGE WATER FROM SPRUCES,
Swedish Water and Air Pollution Research Lab., Goteborg.
For primary bibliographic entry see Field 5A.
W78-06003

NITROGEN CYCLES IN A POLLUTED SEA AREA,
Tokyo Univ. (Japan). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5C.
W78-06004

UPTAKE OF DISSOLVED AMMONIUM AND NITRATE ION BY THE FRY OF COMMON CARP, CRUCIAN CARP AND LOACH FROM SURROUNDING WATER, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
For primary bibliographic entry see Field 5C.
W78-06006

THE EFFECT OF CHEMICAL SUBSTANCES AND THEIR COMBINATIONS ON WATER MICROFLORA, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
For primary bibliographic entry see Field 5C.
W78-06014

NITRIFICATION IN RUNNING WATERS: CASE STUDY GLATT, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
W. Gujer.
Schweiz Z Hydrol 38(2), p 171-190, 1976.

Descriptors: *Nitrification, Rivers, Model studies, Path of pollutants, Waste water treatment, *Ammonium, *Switzerland, Water pollution control.

Todays ammonium concentrations in large Swiss rivers are well within the admissible tolerance threshold, but smaller rivers flowing through densely populated areas are likely to be overloaded with ammonium. A proposed nitrification model for rivers permits an evaluation of the influence of water pollution control measures on the ammonium load in the rivers. On the basis of a cast study, the use of this nitrification model for the Glatt river is discussed. Mean annual values are insufficient for planning water pollution control measures, different values based on seasonal variations are necessary. Nitrification in Swiss rivers is low when compared to possible ammonium inputs. At a mean time of flow of 24 h, the Glatt river nitrifies only about 40% of its ammonium input. If wastewater cannot be sufficiently diluted, it has to be nitrified in wastewater treatment plants. Lakes generally decouple ammonium loadings present in the inlet and in the outlet.--Copyright 1978, Biological Abstracts, Inc.
W78-06015

INVESTIGATION OF THE SUSPENDED SOLIDS FROM LAKE CONSTANCE AFFLUENTS, (IN GERMAN),
Staatliches Inst. fuer Seenforschung und Seenbewirtschaftung, Langenargen (West Germany).
G. Wagner.
Schweiz Z Hydrol 38(2), p 191-206, 1976.

Descriptors: *Suspended solids, *Lake Constance(Switz), Lakes, *Path of pollutants, *Phosphates, Switzerland, Water pollution sources.

From 1970-1973 suspended solids taken out of the most important effluents of Lake Constance (Switzerland) were isolated during different water discharges in the rivers. The concentrations of some elements within the dried substances were determined. The concentrations of C, N, P, Ni, Cr, Cd and Zn proved to be strongly influenced by civilization, on the other hand those of Co, Fe and Mn only a little or not. The suspended matter from the Bregenzer Ach and the Neuer Rhein was hardly polluted and that from the Schussen most

polluted by elements coming from local waste waters. The loads in every river were calculated by the relations between water discharge, concentration of suspended solids and concentration of the elements within the substance. THe greatest loads were transported by the largest rivers. Maximum loads were noticed during high water periods. Results of tests with material not being dried, mixed in hypolimnic waters of Lake Constance, showed that only the material from the Bregenzer Ach and the Neuer Rhein adsorp phosphate out of the water. These substances participated in the transport of originally soluted phosphate. The suspended solids of all the other rivers gave phosphate to the water.--Copyright 1978, Biological Abstracts, Inc.
W78-06016

LONG RANGE TRANSPORT OF AIR POLLUTANTS IN EUROPE AND ACID PRECIPITATION IN NORWAY,
Norwegian Meteorological Inst., Oslo; and Norsk Inst. for Luftforskning, Kjeller.
For primary bibliographic entry see Field 5A.
W78-06018

MIGRATION OF TRACE METALS IN INTERFACES OF SEAWATER AND POLLUTED SURFICIAL SEDIMENTS,
University of Southern California, Los Angeles. Environmental Engineering Program.
J. C. S. Lu, and K. Y. Chen.
Environmental Science and Technology, Vol. 11, No. 2, p 174-182, February 1977. 9 fig, 3 tab, 45 ref.

Descriptors: *Sediment-water interfaces, *Migration, *Trace elements, *Metals, *Path of pollutants, *Oxidation-reduction potential, Sediments, Water pollution, Pollutants, Model studies, Interstices, Los Angeles harbor(CA), California.

A study of the migration of trace metals between water and sediments on three typically-polluted nearshore surficial sediments (clay, sand, and silt) from Los Angeles harbor, California, showed that the direction of migration was regulated by oxidation-reduction condition rather than by sediment type. Three general trends involving different trace metals were observed and confirmed with an equilibrium model: (1) the released amount increased as the oxidation-reduction condition became progressively reducing (iron and manganese); (2) the released amount increased as the environment became more oxidizing (cadmium, copper, nickel, lead, and zinc); and (3) there was no significant change of concentration in interfacial water (mercury and chromium). In general, trace metal concentrations in interfacial water were in the sub-ppb range. Possible mechanisms for migration are chemical transformation, bio-oxidation, sorption, dissolution, precipitation, complexation, and diffusion. The first four probably take place at the sediment particle surface and finally form the solubility-controlling solids of trace metals, while the last three probably occur in the bulk solution, and can further regulate the concentration levels and speciation of the trace metals in the interfacial waters. Despite the complexity of the metal chemistry in the sediment-water interface, the behavior of metal species can be reasonably well-predicted if environmental conditions are known. (Lynch-Wisconsin)
W78-06022

A SEARCH FOR CYTOPATHOGENIC VIRUSES IN SURFACE AND COASTAL SEA WATER IN THE PROVINCE OF PISA (ITALY), (IN ITALIAN),
Pisa Univ. (Italy). Ist. di Igine.
A. Ruschi, and D. Matteucci.
Riv Ital Ig 35(4-6), p 103-109, 1975.

Descriptors: *Cytopathogenic viruses, *Bacteria, *Viruses, Sea water, *Pisa(Italy), Adenovirus, Arno River(Italy), Coxsackievirus, Echovirus, Morto River(Italy), Picornaviruses, Poliovirus, Rivers, Serchio River(Italy).

River and sea waters of Pisa Province were examined for cytopathogenic viruses using various cell lines and primary cultures. The percentages of positive samples were: 26% from the Serchio river, 46% from Morto river, 60% from Arno river and 65% of sea-water samples taken near a sewage outlet. The viruses isolated were coxsackie B, echo, adeno, polio and coxsackie A. All polioviruses isolated were of vaccine origin.--Copyright 1978, Biological Abstracts, Inc.
W78-06023

HYDROGEN ION SPECIATION IN THE ACID PRECIPITATION OF THE NORTHEASTERN UNITED STATES,
Cornell Univ., Ithaca, NY. Section of Ecology and Systematics.
For primary bibliographic entry see Field 5A.
W78-06025

THE CHEMICAL COMPOSITION OF ATMOSPHERIC PRECIPITATION FROM SELECTED STATIONS IN MICHIGAN,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5A.
W78-06027

EFFECT ON GROUNDWATER OF INFILTRATION AND WASTE WATER TREATMENT NEAR ANN, JAMTLAND COUNTY, (IN SWEDISH),
Chalmers Univ. of Technology, Goteborg (Sweden). Vatten Inst. Tek.
L. Carlsson.
Vatten 33(2), p 144-152, 1977.

Descriptors: *Infiltration, *Groundwater, Waste water treatment, Pre-treatment(Water), Sampling, Tracers, Ammonia, Carbonates, Chlorides, Hydrocarbonates, Oxygen, Permeability, Soils, *Sweden, Nitrates.

Pre-treated wastewater has since Jan. 1973 been infiltrated in glacifluvial sand and gravel in the neighborhood of the village of Ann in the county of Jamtland (Sweden). The amount of infiltration is 130-140 m3/day. The influence on the groundwater was observed by water samples taken from 10 observation tubes surrounding the open infiltration pond. An increase in the conductivity of the groundwater was noticed together with increases in ammonia, hydrocarbonate and chloride. At first an increase was also observed in the nitrate content but later a decrease in both Oz and nitrate occurred. By tracer experiment the percolation velocity was determined together with the permeability of the soil.--Copyright 1978, Biological Abstracts, Inc.
W78-06028

THE BIOGENIC CARBON BALANCE IN A GROUND WATER INFILTRATION ENRICHMENT SYSTEM, (IN RUSSIAN),
Academy of Municipal Economy, Moscow (USSR). Research Inst. of Public Water Supply, Water Purification.
S. N. Chekalova.
Gig Sanit 2, p 103-104, 1977.

Descriptors: Cyanophyta, Chlorophyta, Organic wastes, Groundwater, Phytoplankton, Infiltration, Water pollution control, Carbon balance, Algae, Diatoms, USSR.

The possible pollution of ground water with organic substances resulting from the drying off of phytoplankton (blue-green algae, diatoms, green algae) in a infiltration enrichment basin was studied in the Baltezers water supply basin, fed by Lake Baltezers (Riga (USSR)). Noticeable concentrations of C do not evidently pollute the ground water in this system, but ground water enrichment from a body of water during a bloom should be avoided.--Copyright 1978, Biological Absrtracts, Inc.
W78-06030

ORGANIC MATTER DISTRIBUTION CHARACTERISTICS IN THE SHOAL SEDIMENTS OF THE SELENGA DELTA IN LAKE BAIKAL, (IN RUSSIAN),
Limnologicheskii Inst., Irkutsk (USSR).
L. A. Vykhristyuk, and F. I. Lazo.
Izv Sib Otd Akad Nauk SSSR Ser Biol Nauk 2, p 40-47, 1976.

Descriptors: *Organic matter, Distribution, Path of pollutants, Sediments, *Deltas, Sediment transport, Humic acids, *Bottom sediments, Lake Baikal(USSR), Biochemistry, Pigments, Selenga Delta(USSR).

New data about qualitative components of organic matter (OB) (humic acids, vegetable pigments and components of OB which are hydrolyzed lightly) are presented. The peculiarities of OB distributions in the bottom sediments of the Selenga shoal (Siberian SSR, USSR) are considered.--Copyright 1978, Biological Abstracts, Inc.
W78-06034

BACTERIAL WATER QUALITY IN WILDERNESS AREAS,
California Univ., Davis. Dept. of Engineering; and California Univ., Davis. Dept. of Environmental Science.
R. P. Ghirelli, and L. Marler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 690, Price codes: A04 in paper copy, A01 in microfiche. Contribution No. 162, California Water Resources Center, June, 1977. 50 p, 21 fig, 43 ref. (Project UCAL-WRC-W-489).

Descriptors: *Bacteria, *Water pollution, Water quality, *California, Distribution, Watersheds(Basins), Sampling, Bioindicators, Path of pollutants, Bishop Creek(Calif), Rock Creek(Calif), *Yersinia entercolitica.

The objective of this study was to elucidate incidence and distribution of Yersinia enterocolitica in the Bishop Creek and Rock Creek Watersheds of the eastern Sierra. An intensive sampling program covering water from many locations, small mammals and soil was conducted. A second objective was to test hypotheses regarding origin of the bacterium. Results are that routinely used indicator organisms do not protect against exposure to Y. enterocolitica. The data are consistent, but in no sense conclusive, with fecal contamination by small mammals as a source. Procedures are needed both to isolate and to quantify Y. enterocolitica from source samples. (Snyder-Calif, Davis)
W78-06038

BIOSTIMULATION CHARACTERISTICS OF WASTES AND RECEIVING WATERS OF THE SNAKE RIVER BASIN.
National Field Investigations Center-Denver, CO.
For primary bibliographic entry see Field 5C.
W78-06045

THE QUALITY OF LAKE OF THE OZARKS.
Environmental Protection Agency, Region VII, Kansas, MO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 667, Price codes: A03 in paper copy, A01 in microfiche. June, 1972. 36 p, 6 fig, 9 tab, 6 ref, 1 append.

Descriptors: *Lake of the Ozarks(MO), *Water quality, *Regional development, *Recreation, *Water pollution sources, *Water pollution effects, *Missouri, Lakes, Waste treatment, Treatment facilities, Tributaries, Bacteria, Coliforms, Impoundments, Mesotrophy, Nutrients.

Monthly sampling of water quality at 21 stations in Lake of the Ozarks, Missouri between September 1970-October 1971 indicates that lake water quality is generally good and in most areas is suitable for all recreational uses. Certain problems exist, however: (1) Lack of planned development along the shoreline poses a threat to water quality. (2) Certain tributaries carry large amounts of iron-rich particulate matter from coal strip mine areas. (3) Periods of intense rainfall increase bacteria load discharged by tributaries due to land runoff. (4) Turbidity decreases downstream. (5) Drainage from septic tank leach fields was not readily apparent. (6) Significant fecal coliform densities were monitored at one station and several tributaries during limit established by the state for body contact recreation. (7) Only slight coliform increases occurred during the heavy use period. (8) No nuisance rooted plant or phytoplankton growths were observed. (9) Primary productivity studies indicated mesotrophic conditions. (10) During May and July carbon fixation rates appeared limited by lack of soluble phosphorus. (11) Major nutrient sources are tributaries, spetic tank leachates, boat wastes, and discharges from municipal and resort sewage treatment facilities. Lake of the Ozarks was created by Bagnell Dam, begun in 1929. During the summer population grows from the normal 25-30,000 to about 100,000. (Lynch-Wisconsin)
W78-06050

NATURE AND TREATABILITY OF DYEING WASTEWATERS,
Hawaii Univ. at Manoa. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W78-06080

POLLUTION INDICATORS AND OTHER MICROORGANISMS IN RIVER SEDIMENT,
Connecticut Univ., Storrs. Biological Sciences Group.
For primary bibliographic entry see Field 5A.
W78-06096

DISPERSION CALCULATIONS IN NONUNIFORM SEEPAGE,
Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.
B. Hunt.
Journal of Hydrology, Vol 36, No 3/4, p 261-277, February 1978. 11 fig, 20 ref, 1 append.

Descriptors: *Dispersion, *Groundwater movement, *Model studies, Mathematical models, Aquifers, Groundwater, Soil contamination, Pollutants, *Path of pollutants, Non-uniform flow, Permeability, Infiltration, Seepage, Hydrology.

A singular perturbation approximation was derived and applied to some examples in groundwater dispersion. This approximation is general enough to be used for nonuniform steady and unsteady seepage through heterogeneous aquifers. The approximation complements numerical methods since it becomes most accurate in regions where accurate numerical solutions are almost accurate in regions where accurate numerical solutions are almost impossible to obtain. (Sims-ISWS)
W78-06099

UPTAKE BY BARLEY OF WATER TABLE- OR SURFACE-APPLIED CADMIUM,
Oklahoma State Univ., Stillwater. Dept. of Agronomy.
M. B. Kirkham.
Soil Science Society of America Journal, Vol 41, No 6, p 1125-1129, November-December 1977. 3 fig, 3 tab, 19 ref.

Descriptors: *Cadmium, *Absorption, *Barley, Laboratory tests, Soil contamination, *Plant physiology, Water pollution, Pollutants, Path of pollutants, Groundwater, Leaching, Leachate, Effluents, Drainage, Water table, Soil science, Cadmium uptake.

Solution of Cd were placed for 66 days at the bottom or top of columns (42-cm long by 15-cm diam) containing fine sandy loam soil, half of which were planted with barley and half of which were bare, to determine rate of movement upward or downward of Cd. Three solutions with Cd, as CdS04, were used: distilled water with 0.1 microgram/ml Cd; distilled water with 10 microgram/ml Cd; secondary effluent with 10 microgram/ml Cd. An average of 200 ml/day was added to the top or bottom of columns with plants; there was not drainage water with top additions. An average of 100 or 50 ml/day was added to the top or bottom, respectively, of columns without plants. Drainage water, which collected at the bottom of columns without plants and watered from the top, was analyzed daily for Cd. Plants and soil were analyzed weekly for Cd concentation. In less than 7 days, Cd applied at the surface moved to the bottom moved to the surface. Cd than plants treated with Cd at the top because roots of plants with Cd at the Cd at the top. Columns without roots had higher concentrations of extractable Cd than columns with roots. Concentrations of Cd in leachate from columns receiving 10 microgram Cd/ml effluent were about two times higher than concentrations of Cd in leachate from columns recieving 10 microgram Cd/ml water. The results showed that barley roots more readily absorbed Cd placed in a shallow water table than Cd placed in the soil surface. (Sims-ISWS)
W78-06111

SEASONAL TRENDS OF NH4(+) AND NO3(-) NITROGEN ISOTOPE COMPOSITION IN RAIN COLLECTED AT JULICH, GERMANY,
Kerntorschungsanlage Juelich G.m.b.H. (West Germany). Inst. fuer Chemie.
For primary bibliographic entry see Field 5A.
W78-06113

COMPARATIVE CHEMISTRY OF A COOLING RESERVOIR AND ITS WATER SOURCE,
North Texas State Univ., Denton. Dept. of Biological Science.
B. L. Sams, J. K. Silvey, and J. A. Stanford.
Journal of the Water Pollution Control Federation, Vol 50, No 2, p 193-202, February 1978. 9 fig, 4 tab, 42 ref. EPA T-900115.

Descriptors: *Reservoirs, *Water chemistry, *Benthos, *Water quality, *Cooling water, Aquatic life, Biota, Industrial water, Nutrients, Chemical analysis, Nutrient removal, Analytical techniques, Phosphates, Sedimentation, Aquatic production, Water pollution sources, Phosphorus compounds, *Texas, Limnology, *North Lake Reservoir(Tex).

To better understand limnological processes in southern reservoirs receiving heated effluents, water was analyzed before and after impoundment in 330-ha North Lake. Macronutrients and metals were quantified within the water column and in the sediments during this 2-year study. Reservoir source water from Elm Fork, Trinity River contained 16 times more total phosphorus and supported 23 times more Selenastrum capricornutum cells in an algal assay than did water from the impoundment. The reservoir has essentially no drainage, and since evaporation is high, the concentrations of many dissolved solids have increased three-to sevenfold since the reservoir was first filled in 1958. North Lake is presently phosphorus-limited, based on algal assay and chemical data. Apparently altered chemical equilibria have caused adsorption of precipitation of phosphorus with calcium and iron. (Henley-ISWS)
W78-06114

BACTERIAL VARIATIONS IN STREAMS FROM A SOUTHWEST IDAHO RANGELAND WATERSHED,
Agricultural Research Service, Boise, ID. Northwest Watershed Research Center.
G. R. Stephenson, and L. V. Street.
Journal of Environmental Quality, Vol. 7, No 1, p 150-157, January-March 1978. 5 fig, 1 tab, 29 ref.

Descriptors: *Coliforms, Water pollution, *Farm wastes, *Idaho, *Range management, *Water pollution sources, Bacteria, Analytical techniques, Bioindicators, Pasture management, Pollutant identification, Pollutants, Water quality, Agricultural runoff, Livestock, Storm runoff, Investigations.

Sources and variations in bacterial indicators were reported from stream sites over a 3-year period on a 233-sq km rangeland watershed in southwest Idaho. The occurrence of fecal coliforms was related directly to the presence of cattle on summer range and winter pastures. Fecal coliforms counts in adjacent streams were found to increase soon after cattle were turned in and remained high for several months after cattle were removed. Runoff from rainstorms increased both total and fecal coliform concentrations in streams on summer range with limited management and adjacent to winter pastures, but runoff from snowmelt had little effect. Total coliform counts varied more with change in streamflow than did fecal coliform counts. In fenced summer range allotments, under deferred grazing management, the effects were the same, except bacterial counts were not as high or persistent. The decrease in bacterial concentrations at several downstream sampling sites indicated that certain stream segments were self-purifying. The presence or absence of livestock along the streams overshadow any effect variations in chemical concentration of the water might have on bacterial concentrations. (Henley-ISWS)
W78-06116

EVALUATION OF LEACHATE CHARACTERISTICS AND PHYSICAL PROPERTIES OF COMPACTED MIXTURES OF FLY ASH AND WASTEWATER SLUDGE,
West Virginia Univ., Morgantown.
R. B. Helm.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-22, 453. PhD Thesis, 1976, 224 p.

Descriptors: *Leachate, *Waste disposal, *Municipal wastes, *Water analysis, *Trace elements, Biodegradation, Analytical techniques, Leaching, Industrial wastes, Path of pollutants, Soil chemistry, Waste water disposal.

Laboratory investigations were used to assess the environmental impact of combined disposal of municipal waste water sludge and power plant fly ash as structural fill or in highway embankments. Various combinations of two municipal sludges and four different ashes were tested. Leachate characteristics, the extent of biological degradation of sludge organic matter, permeability, unconfined compressive strength, and the effects of calcium sulfate and lime as additives were examined. Analyses of the leachate samples measured pH, total dissolved solids, boron, copper, iron, manganese, nickel, lead, and zinc. Total organic carbon, sulfate, calcium, and magnesium were measured in selected samples. Leach pH ranged from 7.0 to 12.4, total dissolved solids from 400 to 3,800 ppm, and total organic carbon from 1 to 770 ppm. Trace elements which were suggested as posing a potential environmental hazard included boron and copper. Lime addition was capable of reduc-

ing the boron concentration to below 1 ppm and increasing the compressive strength up to 40 psi. No significant biological decomposition of organics was observed. Various statistical techniques were used in the data reduction. (Schulz-FIRL)
W78-06118

REVIEW AND APPRAISAL OF NUMERICAL CIRCULATION MODELS FOR LAKE MICHIGAN,
Argonne National Lab., IL. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 2H.
W78-06122

EROSION AND SEDIMENT CONTROL. SURFACE MINING IN THE EASTERN U.S. VOLUME I. PLANNING. VOLUME II. DESIGN,
Hittman Associates, Inc., Columbia, MD.
For primary bibliographic entry see Field 5G.
W78-06127

THE EFFECT OF THE SPRAY IRRIGATION OF SECONDARY TREATED EFFLUENT ON THE VEGETATION, SOILS AND GROUNDWATER QUALITY IN A NEW JERSEY PINE BARRENS HABITAT,
Rutgers - The State Univ., New Brunswick, NJ.
G. S. Sawhill.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No 77-25, 015. PhD Thesis, 1977, 194 p.

Descriptors: *Soil-water-plant relationships, *Groundwater, *Sprinkler irrigation, *Waste water disposal, *Soil water, Groundwater recharge, Base flow, Waste assimilative capacity, On-site data collections, Nitrates, Water analysis, Environmental effects, Path of pollutants, Waste water treatment, *New Jersey.

The Stockton State College spray disposal system at Pomona, New Jersey, was the site of an investigation on the waste assimilative capacity of the sandy soils of the pine barrens region for secondary treated effluent. The study area is described as a pine-oak ecosystem, having a continental climate with prevailing land and sea breezes and acidic sandy soils. The site received monthly applications of secondary treated effluent at average rates 2.13 ha-cm/ha. Analyses of seasonal samples of groundwater and effluent revealed significant variability in chemical constituents. The electrical conductivity, pH, and the concentrations of Ca, Mg, K, NH4-N, NO3-N, Cl, and SO4 were significantly higher in groundwater collected at the spray irrigation site than in the control area, with NO3-N concentrations exceeding EPA limits for potable water. Perturbations in prevailing species as well as in of total N, crude protein, Ca, Mg, Na, K, P, and Cl were observed in both summer and winter vegetation. Although groundwater levels were not affected, increased base saturation due to Ca and Na was observed. (Schulz-FIRL)
W78-06135

CHEMICAL ASPECTS OF GROUND WATER RECHARGE WITH WASTEWATERS,
California Univ., Berkeley.
L. L. Russell.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-15,842. PhD Thesis, 1976, 425 p.

Descriptors: *Artificial recharge, *Groundwater recharge, *Water management(Applied), *Aeration, Carbon dioxide, Waste water disposal, Soils, Soil chemistry, Soil contamination effects, Nitrification, Mathematical models, Waste water treatment, Waste water disposal.

Studies on waste water-soil systems and recharge water quality indicated that nitrification in the soil rather than in a waste water treatment plant could substantially reduce percolant water quality. This was attributed to low carbon dioxide concentrations in aerated effluents which could also dissolve calcareous soils, resulting in high calcium concentrations of up to 200 mg/liter. Field studies at the 14-mgd Whittier Narrows Water Reclamation Plant and the 26-mgd San Jose Creek Water Renovation Plant indicated that 90-95% of the CO2 produced during treatment was stripped during aeration. A systematic, mathematical model for the chemistry of a waste water-soil system is presented. The effects of minor buffering systems, complex ion formation, temperature, and ionic strength are incorporated into the model. The model is useful in simulating the effects of waste water treatment on effluent quality and the effects of land application on percolant quality, mixing, dilution, and subsequent chemical reactions during percolation. (Schulz-FIRL)
W78-06141

DISSOLVED ORGANIC MATTER AND LAKE METABOLISM,
Michigan State Univ., Hickory Corners. W. K. Kellogg Gull Lake Labs.
For primary bibliographic entry see Field 5C.
W78-06142

EFFECTS OF ANAEROBICALLY DIGESTED MUNICIPAL SEWAGE SLUDGE APPLICATION ON CHEMICAL PROPERTIES OF SELECTED SOILS WITH EMPHASIS ON DISTRIBUTION OF ZINC AND CADMIUM FORMS,
Cornell Univ., Ithaca, NY.
A. Koenig.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-18,175. PhD Thesis, 1976, 369 p.

Descriptors: *Fertilizers, *Sludge disposal, *Zinc, *Cadmium, *Anaerobic digestion, Heavy metals, Soil chemical properties, Nitrification, Nitrogen, Phosphorus, Nutrient removal, Toxicity, Absorption, Waste water disposal.

Sixteen parallel experiments with a series of 10 batch reactors containing a mixture of dried anaerobically digested municipal sewage sludge and soil in specific proportions were used to investigate the effects of sewage sludge application on chemical properties of soils. The study evaluated the rate of extent of changes and degradation of sewage sludge; various zinc and cadmium forms in soil-sludge mixtures; nitrogen in soils; and zinc and cadmium in leachate with respect to temperature, water regime of soil-sludge mixtures, soil type, and sludge application rate. Zinc and cadmium in soluble, exchangeable, complexed, organic, and available forms were determined with an operational extraction scheme and sequential destructive analyses. The studies indicated that the transformation of metals in sludge-amended soils was most affected by organic matter degradation and nitrification which were, in turn, influenced by temperature, pH, moisture content, and organic matter content. Zinc and cadmium were not present in leachates, although nitrates and salts were apparent. (Schulz-FIRL)
W78-06173

DETERMINATION OF BIOCHEMICAL-OXYGEN-DEMAND PARAMETERS,
Geological Survey, Bay St. Louis, MS. Water Resources Div.; and Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-06174

HYDROLOGY AND WATER QUALITY OF THE ATCHAFALAYA RIVER BASIN,
Geological Survey, Baton Rouge, LA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06184

BED CONDUCTION COMPUTATION FOR THERMAL MODELS,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
For primary bibliographic entry see Field 8B.
W78-06185

SIMULATION OF WASTEWATER INJECTION INTO A COASTAL AQUIFER SYSTEM NEAR KAHULUI, MAUI, HAWAII,
Geological Survey, Reston, VA. Water Resources Div., and Geological Survey, Tallahassee, FL. Water Resources Div., and Geological Survey, Menlo Park, CA. Water Resources Div.
S. P. Larson, S. S. Papadopulos, H. H. Cooper, Jr., and W. L. Burnham.
In: ASCE Proceedings of Hydraulics in the Coastal Zone, College Station, Texas, August 10-12, 1977, p 107-116, 1977. 5 fig, 4 ref.

Descriptors: *Model studies, *Waste water disposal, *Injection wells, *Sewage effluents, *Hawaii, Coasts, Aquifers, Saline water-freshwater interfaces, Groundwater movement, Hydrogeology, Aquifer characteristics, Path of pollutants, Computer models, Analytical techniques, *Maui(Hawaii), Kahului County(Hawaii), Kahului Bay(Hawaii).

Evaluation of the Wailuku-Kahului Wastewater Treatment Facility, near Kahului, Maui, Hawaii, required study of the potential impact of injection of effluent into the saline-water part of a lava aquifer system. To determine the distribution of injected fluid, a computer model was constructed to enable consideration of (1) an aquifer system containing fresh and saline water, (2) heterogeneous aquifer characteristics, (3) nonuniform boundary conditions, and (4) concurrent withdrawal of saline water near the injection site. A sharp interface was assumed to exist between freshwater and saline water in the aquifer, and a numerical model was employed to simulate ground-water flow in the freshwater zone. Withdrawal of 68 cfs of saline water within 2,600 feet of the injection site was modeled analytically, and the numerical and analytical models were coupled to provide an acceptable prediction of aquifer response to injection. A simulated injection rate of 6.2 cfs resulted in a steady-stage wastewater plume extending 1,200 feet upgradient from the injection site and displacing the interface between freshwater and saline water 500 feet seaward. Three-dimensional analysis indicated that if fluid was injected into the saline-water zone and if vertical hydraulic conductivity were less than horizontal conductivity the injected plume of wastewater would be contracted in size at the top of the freshwater zone and expanded at the bottom relative to isotropic conditions. (Woodard-USGS)
W78-06186

WATER-QUALITY ASSESSMENT OF THE MIDDLE FORK ANDERSON RIVER WATERSHED, CRAWFORD AND PERRY COUNTIES, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-06190

A WATER-QUALITY ASSESSMENT OF THE BUSSERON CREEK WATERSHED, SULLIVAN, VIGO, GREENE, AND CLAY COUNTIES, INDIANA,
Geological Survey, Indianapolis, IN. Water Resources Div.
S. E. Eikenberry.
Open-file report 78-13, January 1978. 36 p, 7 fig, 6 tab, 21 ref.

Descriptors: *Water quality, *Surface waters, *Mine drainage, *Municipal wastes, *Agricultural runoff, Indiana, Watersheds(Basins), Path of pollutants, Water analysis, Chemical analysis, Coal

mine wastes, Pesticides, Coliforms, Phytoplankton, Dissolved solids, Hydrogen ion concentration, Dissolved oxygen, *Busseron Creek watershed(Ind), Vigo County, Green County, Clay County.

Chemical quality of surface water in the 237-square mile Busseron Creek watershed, in Indiana, is significantly affected by drainage from coal mines and municipalities. Drainage from coal mines is primarily a problem of higher than normal dissolved-solids concentration, whereas, drainage from municipalities is generally a problem of bacteria and phytoplankton. Generally, the water is calcium bicarbonate type, except in streams affected by drainage from coal mines, where the water is a mixed calcium and magnesium sulfate type. Ranges of concentration (in milligrams per liter) of dissolved solids and of some of the chemical constituents dissolved in streams from September 1975 to July 1976 were: dissolved solids, from 104 to 2,610; iron, from 0.00 to 150; sulfate, from 14 to 1,900; chloride, from 3.3 to 130; nitrate (as nitroglen), from 0.01 to 5.3; phosphate (as phosphorus), from 0.1 to 1.7; and total organic carbon, from 2.4 to 60. Range of pH was from 2.7 to 9.6 Ranges of concentration of chlorinated hydrocarbons (in micrograms per kilogram) detected in bed material of streams were: aldrin, from 0.2 to 0.4; chlordane, from 0 to 13; DDE, from 0.0 to 0.3; dieldrin, from 0.0 to 9.8; and heptachlor epoxide, from 0 to 1.0. Streams draining municipalities had high populations of fecal coliform bacteria (as many as 46,000 colonies per 100 milliliter) and phytoplankton (as many as 190,000 cells per milliliter). Dissolved-oxygen concentration ranged from 2.8 to 15.0 milligrams per liter. (Woodard-USGS)
W78-06191

QUALITY OF RIVERS OF THE UNITED STATES, 1974 WATER YEAR--BASED ON THE NATIONAL STREAM QUALITY ACCOUNTING NETWORK (NASQAN),
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-06192

5C. Effects Of Pollution

PRIMARY PLANKTON PRODUCTION IN LAKE BAIKAL, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Zoologicheskii Inst.
V. V. Bul'on.
Zh Obshch Biol 37(4), p 517-524, 1976.

Descriptors: *Waste assimilative capacity, Chlorophyll, Lakes, Mesotrophy, *Oligotrophy, Photosynthesis, Plankton, *Primary productivity, *Lake Baikal(USSR), *Radiocarbon method, Water pollution effects.

The primary production of oligotrophic Lake Baikal (USSR) was determined Aug. 1975 using a modification of the radiocarbon method. For different areas, the daily primary production in the surface layer was 5.4-41.5 mg of C/m3 and 47-390 mg of C in the whole column of water/m2. The annual phytoplankton productivity calculated from the mean monthly values for the entire lake was 53 g of C/m2, or 558 kcal/m2. According to the chlorophyll a content, 0.5-6.5 mg/m3 (mean value 2.0 mg/m3), Lake Baikal approaches basins of the mesotrophic type. The photosynthetic activity of the phytoplankton expressed in daily assimilation values is 12.0 plus or minus 5.1 mg of C/mg of chlorophyll a. It is especially low (7.4) for the phytoplankton of the southern part of the lake. Copyright 1977 Biological Abstracts, Inc.
W78-05709

THE TOXICITY OF CARBOPHOS FOR SOME HYDROBIONTS, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
V. A. Prokopenko, L. D. Zhiteneva, T. I. Sokol'skaya, V. P. Kalyuzhnaya, and L. N. Zavgorodnyaya.
Gidrobiol Zh 12(5), p 47-52, 1976.

Descriptors: Crustaceans, Carbohydrates, *Carbophos, Carp, Ceriodaphnia reticulata, *Hydrobionts, *Insecticides, Metabolism, Ponds, Protein, Simocephalus vetulus, *Toxicity, Systematics.

Carbophos (an insecticide) in concentrations of 0.001-0.5 mg/l has different effects on cladoceran Crustacea (Simocephalus vetulus, Ceriodaphnia reticulata) but eventually causes their death. Application of the preparation in the mentioned doses for preventative treatment of ponds will lead to annihilation of copepod-filtrates, the fodder objects for valuable commercial fish fry (carp). Action of 0.05-5.0 mg/l carbophos solutions on carp at the early stages of its development evokes, depending on the dose and exposition, greater or lesser pathological changes in morphology of blood, liver, kidney and spleen cells. Considerable disturbances in carbohydrate-protein metabolism were also found by biochemical methods. Application of the tested carbophos concentrations for the sanitary treatment of ponds is inexpedient. Copyright 1977 Biological Abstracts, Inc.
W78-05711

PLANNING METHODOLOGY FOR ANALYSIS AND MANAGEMENT ON LAKE EUTROPHICATION,
Yale Univ., New Haven, CT. School of Forestry and Environmental Studies.
A. P. O'Hayer, and J. F. Dowd.
Water Resources Bulletin, Vol 14, No 1, p 72-82, February 1978. 8 fig, 2 tab, 17 ref.

Descriptors: *Lakes, *Management, *Alternative planning, *Eutrophication, *Nutrient loading, *Bayesian decision analysis, *Uncertainty analysis, *Effects, Land use, Evaluation, Cost-effectiveness, Probability, Beseck Lake(Conn), Worth of data, Mathematical models, Systems analysis, Methodology, Water quality control.

The effects of changing nutrient inputs through land use management, wastewater treatment, or effluent diversion are unclear, and managers are finding that decisions effective in reversing eutrophication for one lake are often unsuccessful when applied to another. Simple empirical relationships are often used to predict the impact of management decisions. Errors in estimation could result either in substantial costs for overdesign or in failure to meet desired eutrophication levels. Presented is a methodology to analyze the impact of alternative land use and water resource management decisions on lake eutrophication; considered herein is the uncertainty in nutrient loadings. Monte Carlo simulation is used to estimate the probability of exceeding Vollenweider's critical loading for a particular set of land use conditions. An iterative scheme is designed, whereby additional alternatives or information can be considered until a satisfactory cost-effective solution appears. Bayesian decision analysis is shown effective for determining the worth of additional information. Problems of worth of additional data and uncertainty of estimates are handled within a cost-effectiveness framework. The probability of exceeding a critical level of eutrophication is considered as a measure of effectiveness. The cost criterion is the expected value of opportunity costs, costs of analysis, and costs of additional information. Uncertainty analysis techniques are used to estimate the effectiveness of various management alternatives. A cost-effectiveness analysis of several discrete land management alternatives for controlling eutrophication in Beseck Lake, Connecticut illustrates application of the methodology. (Bell-Cornell)
W78-05715

DYNAMICS OF THE BACTERIOPLANKTON POPULATION IN THE UCHINSKOYE RESERVOIR, (IN RUSSIAN),
Moscow State Univ. (USSR).
N. A. Potapova.
Gidrobiol Zh 12(5), p 66-68, 1976.

Descriptors: *Bacterioplankton, *Bacteria, *Plankton, Reservoirs, Russian-SFSR, Saprophytes, *Seasonal, *Uchinskoye Reservoir(USSR), *Vertical distribution, *Horizontal distribution.

A study was made in 1973 of the general population of bacteria, including saprophytes, their vertical and horizontal distribution and seasonal dynamics in the Uchinskoye reservoir (Russian SFSR, USSR), constructed in 1936-38. The general population of bacteria in the course of the vegetative season of 1973, in comparison with the 1st yr of the reservoir's existence (1937) was characterized by higher resistance and lower levels. The most favorable conditions for development of saprophytes occurred in the summer period. Their maximum quantity was observed in the northern section of the reservoir. The relation of the number of saprophytes to the general population of bacteria as a whole for the season characterizes the water body as being clean.--Copyright 1977, Biological Abstracts, Inc.
W78-05729

THE PRIMARY PRODUCTION OF PHYTOPLANKTON IN EXPERIMENTS ON BIOMONITORING AT THE UCHINSKOYE RESERVOIR, (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Hydrobiolcgy.
D. V. Nakani, and M. N. Korsak.
Vestn Mosk Univ SER Vi Viol Pochvoved 31(3), p 74-77, 1976.

Descriptors: Carbon-14, *Monitoring, *Phytoplankton, *Primary, Productivity, Reservoirs, Russian-SFSR, *Uchinskoye Reservoir(USSR), Seasonal, Eutrophication, Chlorides, Nitrogen, Phosphorus, Manganese.

The object of this work was to forecast the behavior of planktonic community in 1978-1979. In the full factorial experiments 2 to the fourth power expected concentrations of N, P, Mn and Cl- in 1978-1979 were chosen as variables. Phytoplankton production was determined in situ by means of a flask method in a labeled C modification. If a trend of eutrophication in the Utchinskoye reservoir (Russian SFSR, USSR) remains, in the spring-summer season a slight increase of primary production will be observed. In summer-autumn the photosynthetic intensity will slightly decrease in connection with negative influence of salinity. However, because of eutrophication the phytoplankton production will not change significantly during the season.--Copyright 1977, Biological Abstracts, Inc.
W78-05733

PERACARIDA FROM LAKE DUSYA (BALTIC SEA BASIN) (IN RUSSIAN),
Akademiya Nauk Litovskoi SSR, Vinius. Inst. Zoologii i Parazitologii.
I. I. Gasyunas.
Gidrobiol Zh 11(1), p 46-50, 1976.

Descriptors: *Baltic Sea basin, Eels, Fish, Lakes, Lithuanian SSR, *Peracarida, Pontogammarus crassus, Pontogammarus robustoides, *Thermal stratification, *Lake Dusya(USSR), *Mesotrophy.

Mesotrophic Lake Dusya (the Baltic Sea Basin) (USSR) is distinguished for its rich species composition of Peracarida. It is inhabited by 4 spp. of endemics and 5 spp. of the Caspian complex trans-

planted from Kurshskian Bay and the Kaunas reservoir. During thermal stratification and under homothermal conditions the Peracarida inhabit mainly the littoral area (the greatest concentrations are observed to a depth of 13m). Benthic fish feed on Peracarida Pontogammarus (P. robustoides, P. crassus) is the basic food for eel.--Copyright 1977, Biological Abstracts, Inc.
W78-05737

EFFECTS OF HYDRAULIC DREDGING ON THE ECOLOGY OF NATIVE TROUT POPULATIONS IN WISCONSIN SPRING PONDS,
Wisconsin Dept. of Natural Resources, Waupaca. Bureau of Research.
R. F. Carline, and O. M. Brynildson.
Technical Bulletin, No. 98, 1977. 40 p, 19 fig, 29 tab, 41 ref, 5 append.

Descriptors: *Spring ponds, *Ponds, *Trout, *Dredging, *Wisconsin, *Environmental effects, *Sport fishing, Ecosystems, Spawning, Fish migration, Benthos, Food habits, Biological communities, Sedimentation, Costs, Fish populations, Krause Springs(WI), Sunshine Springs(WI), Groundwater, Aquatic plants, Fish management.

Dredging of spring ponds to increase living space for native trout populations such as brook trout, in an effort to reverse the natural aging process of pond filling, was begun in 1967 by the Wisconsin Department of Natural Resources. A study of the effects on pond ecology from 1977-75 indicated that the program is economically sound on the basis of increased fishermen utilization. Dredging costs ranged from $.52-$2.07/cu m of increased pond volume. Some 1700 spring ponds are found in northern Wisconsin. Two ponds were selected for intensive study, Krause Springs and Sunshine Springs. The standing crop of trout at Sunshine Springs five years after dredging nearly tripled from 36 to 90 kg/ha; fishing pressure increased from 94 to 896 hrs/ha, and catch increased from 69 to 481 trout/ha. At Krause Springs little change in standing crop was noted, but fishing pressure increased from 100 to 489 hrs/ha, and catch increased from 18 to 152 trout/ha. Dredging in the two ponds increased volumes by 400-500%. Aquatic macrophytes were completely eliminated, and recolonization was slow. Densities of benthic organisms, the primary trout food, were severely reduced. Tubificids, which previously accounted for only 4% of all organisms, became the most numerous taxa at 56-70% of all benthic organisms. None of the other taxa attained predredging levels after five years. (Lynch-Wisconsin)
W78-05739

COMBATING RIVER POLLUTION.
For primary bibliographic entry see Field 5G.
W78-05744

SOME TABLES AND REMARKS CONCERNING THE PELAGIC CRUSTACEAN-ASSOCIATION OF LAKE CONSTANCE 1952-1962, (IN GERMAN),
Staatliches Inst. fuer Seenforschung und Seenbewirtschaftung, Konstanz (West Germany). Abt. Max Auerbach-Inst.
R. Muckle, and G. Muckle-Rottengatter.
Arch Hydrobiol 78(4), p 415-455, 1976.

Descriptors: *Crustaceans, *Eutrophication, Lakes, *Pelagic crustaceans, *Lake Constance(West Germany), Water pollution effects.

The beginning eutrophication of the Lake Constance has changed the association and the cycles of the Crustacea-Plankton. Tables, remarks and discussions are given, to demonstrate these changes in comparison with classic results of Auerbach, Maerker and Schmalz (1924, 1926).--Copyright 1977, Biological Abstracts, Inc.
W78-05747

EFFECTS OF DEICING SALTS ON WOODY VEGETATION ALONG MINNESOTA ROADS,
Minnesota Univ., St. Paul. Coll. of Forestry.
For primary bibliographic entry see Field 5B.
W78-05786

EFFECTS OF DEICING SALTS AND LEAD UPON TREES, SHRUBS AND SOILS IN CONNECTICUT,
Connecticut Dept. of Transportation, Wethersfield. Bureau of Planning and Research.
For primary bibliographic entry see Field 5B.
W78-05787

THE BEHAVIORAL RESPONSES OF BLACKNOSE DACE, RHINICHTHYS ATRATULUS (HERMANN), TO DOMESTIC SEWAGE EFFLUENTS AND THEIR TOXIC CONSTITUENTS,
Maryland Univ., College Park.
J. A. Fava, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 577, Price codes: A07 in paper copy, A01 in microfiche. PhD Thesis, Physiology, 1975. 113 p, 8 fig, 14 tab, 113 ref. OWRT A-022-MD(1).

Descriptors: Fish, *Fish behavior, *Chlorine, *Sewage effluents, *Effluents, Toxicity, Fish toxins, Ammonia, Water pollution effects, *Chloramines, *Free chlorine, *Chlorinated sewage effluents, *Avoidance behavior, Lethal concentrations, Memory.

The ability of blacknose dace to detect and avoid domestic sewage effluents and their toxic constituents of free chlorine (Cl), chloramines, and ammonia was studied in the laboratory. An experimental chamber which allowed the fish to choose between clean water and test solutions was developed. Immediate responses (20-minute experimental period) and delayed responses (240 min period) were studied. The fish did not immediately avoid either unchlorinated sewage effluents or effluents chlorinated to 0.18 mg/l total Cl; they did avoid chlorinated sewage effluents at 0.51, 0.87, and 1.52 mg/l total Cl. In the free Cl solutions, initial preference, reduction in swimming activity, and mortality occurred but were not observed in the chloramine solutions or the chlorinated sewage effluents. In these solutions and effluents, the avoidance by fish was immediate and occurred at a lower total Cl concentration than in free Cl solutions, where fish showed avoidance only after initial preference. Fish exhibited delayed avoidance to free Cl and chloramine solutions as low as 0.07 mg/l total Cl. The median avoidance times for chloramine and free Cl solutions at the same total Cl concentrations were shorter than the median survival time, indicating that the fish can detect and avoid each solution before killed by it. Chloramines are the major cause of avoidance of chlorinated sewage effluents, which may explain the absence of fish below sewage outfalls in streams without evidence of fish kills. Experiments concerning role of memory of previous experiences in free Cl solutions of 0.17 mg/l total Cl were inconclusive. Fish did not immediately detect and avoid ammonia-nitrogen solutions as high as 270 mg/l. (Seip-IPA)
W78-05804

THE PHYSIOLOGICAL-HYGIENIC IMPORTANCE OF FLUORINE CONTENT IN DRINKING WATER, (IN RUSSIAN),
Kievskii Meditsinskii Inst. (USSR).
R. D. Gabovich, A. A. Minkh, and G. A. Stepanenko.
Vestn Akad Med Nauk SSSR 2, p 3-15, 1977.

Descriptors: Fluorides, Fluorine, Potable water, Public health, Water pollution effects, Water treatment, Cares, Human health, Nutrition, *USSR(Ivano-Frankovsk).

On the basis of the 30 yr studies in humans and mice a clear-cut relation between incidence rate of dental caries and the fluorine content in potable water was established. The high anti-caric effect of fluorine was corroborated by the results of the 10 yr study of fluoriniation of water in Ivano-Frankovsk (USSR). The effects of other ambient factors (nutrition, care of the oral cavity, etc.) on the incidence rate of caries are also discussed. The progress of implementation of fluorination of the main water in the Ukraine, as well as measures aimed at improvement and further development of the existing system are considered.--Copyright 1978, Biological Abstracts, Inc.
W78-05806

PHYSICAL AND CHEMICAL LIMNOLOGY AND CHLOROPHYLL-A CONTENTS IN THE PHYTOPLANKTON OF A MOUNTAIN LAKE LAKE SANTO PARMENSE, ITALY, (IN ITALIAN),
Parma Univ. (Italy). Lab. di Ecologia.
I. Ferrari, C. Bellavere, L. Camurri, and M. Catellani.
Riv Idrobiol 14(1/2), p 13-49, 1975.

Descriptors: Chemical limnology, *Chlorophyll, Italy, Lakes, *Limnology, Mountain lakes, Oxygen, Physical limnology, *Phytoplankton, *Lake Santo-Parmense(Italy), Stratification, Temperature, Seasonal, *Dimictic lakes, *Dissolved oxygen.

From June 1973-May 1974 Physical and chemical data were collected at Lago Santo Parmense. From June 16-Oct. 31, 1973 daily hydrological and meteorological data were collected to estimate the lake water budget: during this period the outflow was 500,000 m3, i.e., about half the lake volume. Santo is a dimictic lake, the maximum temperature is reached in the upper layers early in July. Transparency, expressed as Secchi disc visibility, varies from a minimum of 6.0 m to a maximum of 11.5 m: the lowest values were recorded in early June and late Sept. when a great deal of allochthonous materials was suspended in the water. The seasonal change in dissolved O2 concentrations is characterized by a noticeable hypolimnetic deficit at the height of summer stratification and during winter cover. The hypolimnetic areal O2 deficit was calculated. In summer there are metalimnetic O2 peaks. There is a good correlation between O2 concentrations and pH values. In summer pH is alkaline in epolimnetic and metalimnetic layers and acid hypolimnetic layers. Mean values of O2 and pH showed a decreasing trend during ice cover. Total alkalinity and conductivity increased significantly in the layers near the bottom, especially in winter.--Copyright 1977, Biological Abstracts, Inc.
W78-05820

PRODUCTIVITY OF ZOOPLANKTON IN DUVANKUL' LAKE IN THE SOUTHERN URALS, (IN RUSSIAN),
Siberian Research Inst. of the Fish Industry, Sverdlovsk (USSR). Ural Div.
I. V. Kozlova.
Gidrobiol Zh 12(5), p 25-30, 1976.

Descriptors: Cenological complexes, Cladocerans, Copepods, Daphnia-longispina, Diaphanosoma-brachyurum, Diaptomus-salinus, *Duvankul Lake(USSR), Plankton, *Productivity, Rotatorians, Southern Urals, *Zooplankton, Saline lakes, Eutrophication, Biomass.

The dynamics of species composition, quantity and biomass of zooplankton in the eutrophic salt lake Duvankul' (USSR) is known. Diaphanosoma brachyurum, Diaptomus salinus and Daphnia longispina are referred to the typical cenological complexes (including copepods, cladocerans and rotarians). (Diaptomus salinus was a year-round species in the lake.) Calculation of zooplankton production for the vegetative period of 1974 showed that it was created mainly in June-July;

Diaphanosoma brachyurium prevailed in the plankton (50r70% by biomass).--Copyright 1977, Biological Abstracts, Inc.
W78-05854

CORRELATION OF THE PROCESSES OF SYNTHESIS TO DESTRUCTION OF ORGANIC MATTER IN RELATION TO THE ANNUAL WATER CONTENT IN THE MOZHAISK RESERVOIR, (IN RUSSIAN),
Moscow State Univ. (USSR). Probl. Lab. Interaction Surface Underground Waters.
Yu. M. Lebedev, and E. L. Shirokova.
Gidrobiol Zh 12(5), p 20-24, 1976.

Descriptors: *Algae, Annual, *Mozhaisk Reservoir(USSR), *Primary productivity, Reservoirs, Russian SFSR, Stratification, Synthesis, Water pollution effects, Decomposing organic matter.

The total value of algal primary production and the destruction of organic matter in the Mozhaisk reservoir (Russian SFSR, USSR) was calculated monthly using the O2 method. The yearly biotic balance is made. For the years of observations (1967-1970) destruction of organic matter (R) exceeded the primary production (A). The ratio between gross primary production and destruction of organic matter in the years with low water content averaged 0.6, in the years with a greater water content it decreased to 0.3. The ratio of autochthonous and allochthonous organic matter as well as the character of water body stratification influence the value A/R.
W78-05874

FACTORS AFFECTING EFFLUENT QUALITY FROM FILL-AND-DRAW ACTIVATED SLUDGE REACTORS,
Purdue Univ., Lafayette, IN. Environmental Engineering Lab.
For primary bibliographic entry see Field 5D.
W78-05875

PHOTOTROPHIC PURPLE AND GREEN BACTERIA IN A SEWAGE TREATMENT PLANT,
Institut fuer Mikrobiologie der Gesellschaft fuer Strahlenund Umweltforschung mbH, Goettingen, West Germany.
For primary bibliographic entry see Field 5D.
W78-05883

EFFECTS OF TEMPERATURE FACTORS IN THE ACCUMULATION OF RADIOACTIVE NUCLIDES IN FISH, (IN RUSSIAN),
O. A. Balandin, and E. G. Repina.
Gig Sanit 1, p 114-115, 1977.

Descriptors: *Water temperature, *Thermal pollution, Cooling water, Reservoirs, Radioisotopes, *Cerium-144, *Cesium-137, Fish.

Accumulations of 137Cs and 144Ce in muscles and bones of fish in relation to water temperature of cooling reservoirs for atomic electrical plants were studied. Optimal water temperatures for fish growth (25 degrees C) produced accumulations of radioactive isotopes twice as high as with water temperatures of 15 degrees C (under laboratory conditions). Increasing water temperature from 0 to 17 degrees C increased accumulations of radioactive isotopes in tissues of fish (carp under 1 yr old) 2-10 times in comparison. This phenomenon was explained by increased metabolism of fish in warmer waters.--Copyright 1978, Biological Abstracts, Inc.
W78-05891

THE DEVELOPMENT OF HETEROTROPHIC BACTERIA IN CIRCULATING WATER SYSTEMS, (IN RUSSIAN),
Vsesoyuznyi-Nauchnyi Planovii Otdel Tsellyulozno-Bumazhnoi Promyshlennost, Leningrad (USSR).
N. A. Gavrishova, T. A. Dudarenko, S. A. Lashchenko, and A. A. Stolyarova.
Gidrobiol Zh 13(1), p 75-78, 1977.

Descriptors: *Heterotrophic bacteria, Pulp and paper industry, *Industrial wastes, Water reuse, *Biodegradation, Water pollution, Bacillus-mesentericus, Bacillus-subtilis, Disinfection, *Paperboard production.

The numbers of bacteria in circulating water used in paperboard production varied from 0.07-4.8 million/ml at a factory adding a higher volume of fresh river water to the cycle and 63-466 million/ml at a factory where the circulating water approximated a closed cycle. The density of bacterial contamination of the circulating water was a function of the bacterial population in the water entering the cycle, the rate of which the water was used and the bacterial contamination of the raw material (waste paper). The significant development of bacteria dominant in the waste paper microflora (principally the Bacillus subtillus-B. mesentericus group) in the circulating water and deposits on equipment indicated the importance of disinfecting the raw material when closed water systems are used.--Copyright 1978, Biological Abstracts, Inc.
W78-05893

NEW APPROACH TO BACTERIAL KINETICS IN WASTEWATER,
Syracuse Univ., NY. Dept. of Chemical Engineering and Materials Science.
G. F. Andrews, and C. Tien.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 103, No EE6, p 1057-1074, December, 1977. 8 fig, 1 tab, 21 ref, 1 append.

Descriptors: *Activated sludge, *Bacteria, *Biochemical oxygen demand, *Biomass, *Model studies, Carbon, Nitrogen, Mathematical models, Growth rates, Flocculation, Waste water treatment, Liquid wastes.

A bacterial growth kinetics model is presented for the prediction of biomass growth and cell yield behavior based on substrate concentrations. The growth expressions predicted by this model are reduced to Monad-type rates for low, constant substrate concentrations. The kinetic model is examined with respect to data on the effects of dentrifying bacteria on dextrose metabolism. The kinetic model can be used to qualitatively predict the carbon to nitrogen ratio of the sludge during the activated sludge process. For a more accurate prediction, the relationship of substrate concentration to the carbon to nitrogen ratio must be clarified. The quantity of floc matrix material considered as stored substrate must also be determined. The kinetic model of bacterial growth also predicts the substrate uptake rates during contact stabilization, the delayed response of the activated sludge process after changes in influent concentration, and the difference between flow culture and batch culture cell yield. (Lisk-FIRL)
W78-05894

STUDY OF THE CONTAMINATION OF MARINE CULTURES, (IN FRENCH),
Centre d'Etudes et de Recherches de Biologie et d'Occanographie Medicale, Nice (France).
For primary bibliographic entry see Field 5B.
W78-05897

SEWAGE EFFLUENT ON PASTURE SHOWS LITTLE EFFECT.
For primary bibliographic entry see Field 5G.
W78-05898

THE PROBLEM OF POLLUTION IN THE MONTPELLIER REGION, (IN FRENCH),
For primary bibliographic entry see Field 5B.
W78-05906

OIL POLLUTION ON THE POLISH COAST OF THE BALTIC SEA, (IN POLISH),
K. Wolk.
Ochr Przyr 40, p 229-246, 1975.

Descriptors: *Oil pollution, Water pollution effects, *Birds, Clangula-Hyemalis, Mortality, *Baltic Sea, *Poland(Coastal area).

The oil menace on the Polish Coast of the Baltic Sea which occurs from Sept.-April and attains greater intensity from Nov.-March is discussed in relation to its effect on the shorebirds of the area, particularly the longtailed duck (Clangula hyemalis). Data are given for the number of dead birds as a direcrt result of this environmental pollution.--Copyright 1978, Biological Abstracts, Inc.
W78-05907

COASTAL WATER RESEARCH PROJECT. ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1977.
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-05911

CHLORINATED BENZENES IN PALOS VERDES FLATFISH,
Southern California Coastal Water Research Project, El Segundo.
D. R. Young, and T. C. Heesen.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 149-152, 1977. 1 tab, 2 ref.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water pollution sources, *Water pollution effects, *Toxicity, Fish, Coasts, Benthos, Outer Continental Shelf, *Southern California Bight, Chlorinated benzenes(CB's), Dover sole, Flatfish, Ecosystems, Microstomus pacificus.

Municipal wastewaters discharged into southern California coastal waters contain relatively high concentrations of a newly identified series of chlorinated hydrocarbons, the chlorinated benzenes (CB's). The chlorinated benzenes are accumulated by Dover sole to a much smaller degree than are the PCB and DDT compounds. The results obtained to date sugest that despite the recent relatively high inputs of chlorinated benzenes off Palos Verdes Peninsula, levels of these contaminants are relatively low in benthic organisms from this coastal region. (See also W78-05911) (Sinha - OEIS)
W78-05920

METALS IN SEAFOODS NEAR OUTFALLS,
Southern California Coastal Water Research Project, El Segundo.
T. K. Jan, M. D. Moore, and D. R. Young.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 153-157, 1977. 2 tab, 4 ref.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water pollution sources, *Water pollution effects, *Heavy metals, Fish, Shellfish, Outfall sewers, Invertebrates, Toxicity, Chlorinated hydrocarbon pesticides, California, Outer Continental Shelf, Southern California Bight.

This study revealed no demonstratable metals contamination of the edible portion (Muscle) of the six fish species surveyed. There was some evidence of metals contamination in three of the six invertebrate species studied; however, with one major exception, mediam values of the metals in question in outfall specimens were never more than three to four times those measured in the controls. The outfall areas selected for this study were the Palos Verdes shelf, which is the site of the out-

fall system of Los Angeles County's Joint Water Pollution Control Plant (JWPCP), and the area off Newport Beach in which the Orange County Sanitation Districts' outfalls are located. (See also W78-05911) (Sinha - OEIS)
W78-05921

METALS IN MUSSELS FROM HARBORS AND OUTFALL AREAS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-05922

A SAFE LEVEL OF HEXAVALENT CHROMIUM FOR A MARINE POLYCHAETE,
Southern California Coastal Water Research Project, El Segundo.
P. S. Oshida.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 169-180, 1977. 3 fig, 4 tab, 13 ref.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water pollution sources, *Water pollution effects, *Chromium, Toxicity, Water quality, California, *Outer Continental Shelf, Southern California Bight, Polychaeta, Neanthes arenaceodentata.

Experiments have been conducted to determine the maxiumum seawater concentration of hexavalent chromium that is safe for a marine polychaete, Neanthes arenaceodentata, and to investigate the possible association between tissue accumulation of chromium in the polychaete and alterations in its reproduction (specifically, in number of offspring). Although there are undoubtedly specific differences in reactions to hexavalent chromium exposure, data suggest that N. arenaceodentata accumulates chromium in proportion to the ambient water concentration and that most of the accumulated chromium is located in the body wall, gut wall, and parapodial regions. Although this experiment resulted in no acute effects of individual N. arenaceodentata, the work revealed chronic effects, which were reduction in the numbers of offspring and bioaccumulation of chromium in the tissues. (See also W78-05911) (Sinha - OEIS)
W78-05923

EFFECTS OF HEXAVALENT CHROMIUM ON SEA URCHIN EMBRYOS AND BRITTLE STARS,
Southern California Coastal Water Research Project, El Segundo.
P. S. Oshida, and J. L. Wright.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 181-185, 1977. 6 ref.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water pollution sources, *Water pollution effects, *Chromium, Toxicity, California, *Outer Continental Shelf, Southern California Bight, Hexavalent chromium, Sea urchins, Brittle stars, Ophiothrix spiculata, Strongylocentrotus purpuratus.

A species of brittle star, Ophiothrix spiculata, appears to be as acutely sensitive to hexavalent chromium as the polychaete, Neanthes arenaceodentata--the species that had been shown to be most sensitive in previous comparisons. Work completed in the past year and described here, has revealed that the two species have very similar acute sensitivities to hexavalent chromium. Tests of the effects of hexavalent chromium on the development of sea urchin embryos are also described. Tests were designed to identify the levels of hexavalent chromium that interfere with the early embryological stages of development in the sea urchin, Strongylocentrotus prupuratus. Results indicate that there is a concentration between 2.9 and 29 gm hexavalent chromium/liter that causes a 50% reduction in the numbers of normally developing embryos. (See also W78-05911) (Sinha - OEIS)
W78-05924

TOXICITY OF A CHLORINATED BENZENE TO SEA URCHIN EMBRYOS,
Southern California Coastal Water Research Project, El Segundo.
P. S. Oshida.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 187-192, 1977. 3 fig, 5 ref.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water pollution effects, *Sediments, Aquatic life, Toxicity, Embryos, California, *Outer Continental Shelf, Southern California Bight, Chlorinated benzene, Sea urchin, Stongylocentrotus purpuratus, Dichlorobenzene(o-DCB).

The study described here was a preliminary investigation of a chlorinated benzene compound, ortho-dichlorobenzene's (o-DCB) potential as a mitotic poison in the marine environment. Recently fertilized sea urchin eggs were exposed to an o-DCB concentration of about 21 mg/liter, and their development morphology and rate were observed during the subsequent 52 hours. The results showed that o-DCB has the potential to interfere with embryological development: Gossly abnormal sea urchin embryos were evident at about 28 hours past fertilization. (See also W78-05911) (Sinha - OEIS)
W78-05925

MARINE BIRD DEATHS AT LOS ANGELES ZOO,
Southern California Coastal Water Research Project, El Segundo.
D. R. Young, and T. C. Heesen.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 193-198, 1977. 3 tab, 3 ref.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water pollution effects, *Toxicity, DDT, Birds, Pesticide residues, Path of pollutants, *Southern California Bight, Cormorants, Gulls.

During the spring of 1976, nearly the entire collections of Brandt's cormorants (Phalacrocorax penicillatus), guanay cormorants (P. bougainvillii), and California gulls (Larus californicus) in the Los Angeles County Zoo died after exhibiting signs of pesticide poisoning. The study revealed that levels of DDT residues in the specimens were within the range that had been found to be lethal to American kestrels in laboratory feeding studies. The zoo birds apparently were exposed to the DDT when they were fed fish collected in the general vicinity of Palos Verdes Peninsula. Results of tests show another indication that, despite termination of the dominant DDT input to the JWPCP municipal wastewater system in 1970, potentially toxic levels of DDT residues are still found in certain fishes occupying the discharge region off the Palos Verdes Peninsula. (See also W78-05911) (Sinha - OEIS)
W78-05926

ANIMALS THAT ARE INDICATORS OF MARINE POLLUTION,
Southern California Coastal Water Research Project, El Segundo.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 199-206, 1977, p 199-206, 1977. 4 fig, 8 re

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water pollution effects, *Bioindicators, Benthos, Invertebrates, Toxicity, Municipal wastes, California, Southern California Bight, Polychacta, Pelecypoda, Ophiuroids.

Indicator species are those whose changes in abundance reflect overall changes in the normal patterns of invertebrate communities. By monitoring the changes in a few selected indictor species, the expense of biological monitoring can be drastically decreased. The objectives of this study were to select indicator species for five southern California areas that receive major discharges of municipal wastewaters. The result was the identification of four groups of indicator species, containing a total of nine soutern California subtaida benthic invertebrates, which did in fact--by their abundances--define the areas of impact around each of the five discharg locations. (See also W78-05911) (Sinha - OEIS)
W78-05927

HISTOLOGY OF LIVER TISSUE FROM DOVER SOLE,
Southern California Coastal Water Research Project, El Segundo.
K. V. Pierce, B. McCain, and M. J. Sherwood.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 207-212, 1977. 4 fig, 3 ref.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water pollution effects, *Bottom sediments, Fishes, DDT, Polychlorinated biphenyls, Toxicity, *Outer Continental Shelf, Southern California Bight, Histology, Dover sole, Chlorinated hydrocarbons.

In southern California studies, Dover sole (Microstomus pacifucus) collected from the Palos Verdes shelf have been found to have enlarged livers, as have individuals of this species exposed to Palos Verdes sedinment in the laboratory. The objectives of this preliminary study were to determine (1) if there were differences between the histologic characteristics of the livers of Dover sole collected from the Palos Verdes shelf and those of specimens from a control area and (2) if these differences were similar to those found in populations of English sole and starry flounder from contaminated and control areas in Seattle waters. In both areas, the bottom sediments and the fish themselves are contaminated with chlorinated hydrocarbons--PCB's in the Duwamish River Estuary and PCB's and DDT's off Palos Verdes. (See also W78-05911) (Sinha - OEIS)
W78-05928

FIN EROSION DISEASE AND LIVER CHEMISTRY: LOS ANGELES AND SEATTLE,
Southern California Coastal Water Research Project, El Segundo.
M. J. Sherwood.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 213-219, 1977. 1 fig, 4 tab, 4 ref.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water pollution effects, Fish diseases, Waste disposal, Metals, Toxicity, California, Washington, New York, *Dunwamish River Estuary(Wash), *Outer Continental Shelf, *Southern California Bight, *New York Bight, Fin erosion, Liver disease, Dover sole, Starry flounder.

Marine flatfishes with fin erosion diseases have been found in three coastal regions of the United States in which toxic wastes have been discharged-southern California, the Duwamish River Estuary in Seattle, Washington, and the New York Bight. Similarities in the nature of the diseases and in the distribution of affected individuals in each region have suggested the possibility that the diseases have a common cause related to the discharge of toxic wastes. A comparison of the levels of seven trace metals in the

liver tissue of Dover sole and starry flounder suggests that patterns in increase and decrease between specimens from control sites were not the same in the two regions. A possible exception is the depression in cadmium levels, which was evident in starry flounder in this study and has been reported previously in Dover sole from southern California. The occurrence of enlarged livers in specimens from the high-disease-prevalence sites in both regions and the measurement of increased amounts of lipid in the livers of Palos Verdes Dover sole suggest, with histologic observations, that liver damage is occurring at these sites and that it may precede the appearance of fin erosion. (See also W78-05911) (Sinha - OEIS)
W78-05929

FIN REGENERATION IN DOVER SOLE,
Southern California Coastal Water Research Project, El Segundo.
M. J. Sherwood.
In: Southern California Coastal Water Research Project Annual Report for the Year Ended 30 June 1977, p 221-224, 1977. 1 fig, 1 tab, 6 ref.

Descriptors: *Baseline studies, *Environmental effects, Resources development, *Water pollution effects, Fish diseases, Southern California Bight, Fin erosion, Tissue regeneration, Dover sole.

The objective of this study was to determine if local Dover sole maintained in the laboratory could regenerate portions of their dorsal and anal fins that had been artificially removed. Information on the ability of individuals to regenerate their fins might shed light on the process by which fin erosion takes place in the field. The Dover sole used in this experiment were selected from collections of fish taken by otter trawl off Palos Verdes and Point Dume in September 1976 and maitained for up to 10 weeks in recirculating aquaria in the Project's laboratory. The results of this study suggest that Dover sole are able to repair and regenerate dorsal fin tissue. It is therefore possible that these processes are occurring in the field. However, the percentage of individuals with fin erosion in which repair and regrowth take place appears to be low. Laboratory data support this conclusion to some extent. (See also W78-05911) (Sinha - OEIS)
W78-05930

HYDROGEOLOGY OF THE LAKE METIGOSHE BASIN NORTH DAKOTA AND MANITOBA,
North Dakota Univ., Grand Forks. Dept. of Geology; and Geological Survey, Grand Forks, ND.
For primary bibliographic entry see Field 5B.
W78-05933

THE USE OF SATELLITE IMAGERY FOR LAKE CLASSIFICATION IN WISCONSIN,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2H.
W78-05935

METHODOLOGY FOR ANALYZING EFFECTS OF URBANIZATION ON WATER RESOURCE SYSTEMS,
Texas Univ. at Austin. Dept. of Civil Engineering.
L. W. Mays, and Y.-K. Tung.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 663, Price codes: A08 in paper copy, A01 in microfiche. Center for Research in Water Resources, Technical Report No CRWR-156, January 1978. 158 p, 33 fig, 6 tab, 60 ref, 5 append. OWRT A-043-TEX(1). 14-34-0001-7092.

Descriptors: State variable modeling, Lumped mathematical model, Nonlinear hydrologic system model, *Urbanization, Statistical analysis, *Texas, *Model studies, Mathematical models, Methodology, Sewers, Networks, Watershed management, Waller Creek Watershed(Tex), Austin(Tex).

A technique called state variable modeling which is relatively new to water resources has been applied to analyze two major phases of the urban water resources system. The first phase is based upon a lumped mathematical model to describe unsteady, nonuniform sewer flow in terms of a set of first order ordinary differential equations. This model can be used to route urban storm water through multi-level branching sewer networks. The model is compared with other routing techniques through the use of an example sewer network. For the second phase a nonlinear hydrologic system model has been formulated in the state variable form. Hydrograph analysis in conjunction with optimization search technique is performed to thirty-seven rainfall storm events in the period of fifteen years on a watershed in order to examine how the model parameters vary with levels of urbanization. Statistical analysis is used to suggest general trend equations for the model parameters.
W78-05938

THE BACTERIAL POLLUTION OF THE COASTAL WATERS OF THE PROVINCE OF ROME, (IN ITALIAN),
Ufficio Medico Provincial di Rome (Italy).
P. Zucchetti, B. Cisbani, M. Floccia, and G. Palmieri.
Ann Sclavo 17(4), p 543-562, 1975.

Descriptors: *Bacteria, Water pollution effects, Coastal waters, *Italy(Rome coastal area), Waste disposal, Sewage disposal, *Fecal coliforms, Hepatitis, Human diseases, Sewage, Typhoid.

Because of the dangers of infection by hepatitis, typhoid, and fecal coliforms, a 4 yr study was made which included 2400 samples from 440 locations along the coast of the province. A list of the local communities was compiled and the number of inhabitants, bodies of water, type of sewage, sewage discharge location and water purification systems were reported. Data on fecal coliform concentrations from different sections of the coastline are given. Along a 140 km coast, of which 120 km are used for bathing, 12 km were declared unit for bathing, 21 km required further examinations and 87 km were considered suitable for bathing.--Copyright 1978, Biological Abstracts, Inc.
W78-05948

ACUTE TOXICITY OF UN-IONIZED AMMONIA TO FINGERLING COHO SALMON,
Metro Water Quality Lab., Seattle, WA.
J. A. Buckley.
The Progressive Fish-Culturist, Vol. 40, No. 1, January 1978, p 30-32, 2 tab, 16 ref.

Descriptors: Environmental effects, *Water pollution effects, *Ammonia, Salmon, Fry, *Toxicity, Mortality, Fingerlings, *Sockeye salmon, Lethal limit, Sewage effluents, Un-ionized ammonia.

Hatchery-reared coho salmon were acclimated to river water (un-ionized ammonia <0.001 mg/l) for 7 days and were then exposed in groups of 10 fish each to 9 concentrations of un-ionized ammonia ranging from <0.001 to 0.910 mg/l for a period of 96 h. The 96-h LC50 was 0.45 mg un-ionized ammonia per liter, with 95% confidence limits of 0.43 to 0.47. The highest concentration tested with no acute effect was 0.178 mg/l. (Chilton-ORNL)
W78-05952

EFFECT OF DISSOLVED OXYGEN ON THE SURVIVAL AND HATCHING OF EGGS OF SCALE CARP,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Zoology-Entomology.
K. Kaur, and H. S. Toor.
The Progressive Fish-Culturist, Vol. 40, No. 1, January 1978, p 35-37, 1 tab, 23 ref.

Descriptors: Environmental effects, *Dissolved oxygen, Mortality, Hatching, *Carp eggs, *Water pollution effects, Growth stages, Growth rates, Fish eggs, *Embryonic growth stage, Incubation.

Freshly fertilized eggs of scale carp were exposed to dissolved oxygen (DO) levels of approximately 12.0, 9.0, 6.0, 3.0, 1.2, and 0 mg/l. Survival and hatching rate were seen to increase directly with increasing concentrations of DO. Levels below 6.0 mg/l were inadequate for survival. It was observed that embryos became more sensitive to low concentrations as development advanced. (Chilton-ORNL)
W78-05953

POTENTIAL TOXICITY OF TACONITE TAILINGS TO AQUATIC LIFE IN LAKE SUPERIOR,
Reserve Mining Co., Silver Bay, MN.
J. R. Oxberry, P. Doudoroff, and D. W. Anderson.
Journal Water Pollution Control Federation, Vol. 50, No. 2, February 1978, p 240-251, 5 ref.

Descriptors: Environmental effects, *Water pollution effects, *Lake Superior, Waste water(Pollution), Fish, Invertebrates, *Toxicity, Juveniles, Trout, Rainbow trout, Brook trout, Yellow perch, Aquatic life, Bioassay, Mining, Metals, Mine wastes, Tailings, *Taconite tailings.

Investigations were made on the effects of continuous exposure to fish and invertebrate animals to Reserve Mining Company's tailings launder effluent, a slurry of taconite tailings. The test animals were juvenile rainbow trout, brook trout, yellow perch, adult amphipods, and opossum shrimp. Tests with juvenile fish lasted for 22 to 49 days and those with invertebrates for 98 to 363 days. No adverse effects of exposure were observed. Continuous exposure to partially clarified and periodically renewed tailings launder effluent also had no adverse effect on the hatching of eyed eggs of rainbow trout and lake trout and on the survival of the hatching larvae. It was concluded that under no conceivable circumstances could the somewhat alkaline waters of Lake Superior be rendered even slightly toxic to fish by the discharge into the lake of taconite tailings and their deposition on the lake bottom. (Chilton-ORNL)
W78-05954

EFFECTS OF POLLUTANTS ON NATALITY OF MUSCULIUM SECURIS (BIVALVIA:PISIDIIDAE),
Guelph Univ., (Ontario). Dept. of Zoology.
G. L. Mackie.
The Nautilus, Vol. 92, No. 1, January 1978, p 25-33, 4 tab, 42 ref. National Research Council of Canada A2386 and A9882.

Descriptors: Environmental effects, *Water pollution effects, Pollutants, Temperature, Wastes, Domestic wastes, Water pollution sources, Sewage, Reproduction, Salts, Sodium chloride, Sulfates, *Bioindicators, *Natality, Sphaeriids, Slaughterhouse wastes, Road salts, *Musculium securis.

The objectives were to determine the effects of some common pollutants, temperature, road salts, sulfate, domestic and slaughterhouse wastes, and pulp and paper effluent on the natality of Musculium securis and to assess the use of sphaeriid natality as an index for assessment of water quality. Laboratory experiments showed optimum reproduction to be near 18C with significant reduction below 10C and above 25C. In tests of road salts, sodium chloride was found to have greater adverse effects than did calcium chloride. Concentrations of sulfate less than 100 mg/l had no significant effect on natality of M. securis. There was not

reproduction in a creek carrying raw sewage and slaughterhouse wastes. Natalities of M. securis were significantly greater above outfall of pulp and paper wastes than below the outfalls and tended to increase with increasing distance below the outfalls. It was concluded that natality is potentially a good index for assessment of water quality. (Chilton-ORNL)
W78-05956

EFFECTS OF CLIMATIC CYCLES ON THE RELATIVE ABUNDANCE AND AVAILABILITY OF COMMERCIAL MARINE AND ESTUARINE SPECIES,
Maine State Dept. of Marine Resources, Augusta.
For primary bibliographic entry see Field 2L.
W78-05957

IMPORTANCE OF EELGRASS BEDS IN PUGET SOUND,
National Marine Fisheries Service, Beaufort, NC. Beaufort Lab.
For primary bibliographic entry see Field 2L.
W78-05958

DIVERSITY AND DISTRIBUTION OF MUSSELS (BIVALVIA: UNIONACEA) IN A EUTROPHIC RESERVOIR, LAKE ASHTABULA, NORTH DAKOTA,
North Dakota Univ., Grand Forks. Dept. of Geology.
A. M. Cvancara, and P. G. Freeman.
The Nautilus, Vol. 92, No. 1, January 1978, p 1-9, 1 fig, 5 tab, 19 ref.

Descriptors: Environmental effects, *Trophic levels, Lakes, *Mussels, Oxygen, Reproduction, *Eutrophication, *North Dakota, Reservoirs, Water pollution effects, *Lake Ashtabula(ND), Sheyenne River(ND).

Lake Ashtabula is a 28-year-old eutrophic reservoir on the Sheyenne River in southeastern North Dakota. Surveys showed that there are considerably fewer mussel species found in the lake than are known to exist in the river above and below the lake. Those found in the lake were the same species as those found at most stations in the river. It was suggested that possible causes for fewer mussel species in the lake are alteration of reproductive processes and periodic low levels of oxygen content. (Chilton-ORNK)
W78-05959

STRUCTURE OF PELAGIC FOOD CHAIN AND RELATIONSHIP BETWEEN PLANKTON AND FISH PRODUCTION,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.
For primary bibliographic entry see Field 2L.
W78-05961

THE CYCLE OF HEAVY METALS IN LAKES, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasservorsorgung, Abwasserreinigung und Gewaesserschutz, Kastienbaum (Switzerland). Seenforschungslab.
For primary bibliographic entry see Field 5B.
W78-05962

CHLORDANE CONTAMINATION OF A MUNICIPAL WATER SYSTEM,
Center for Disease Control, Atlanta, GA. Environmental Hazards Activity, Cancer and Birth Defects Div.
J. M. Harrington, E. L. Baker, Jr, D. S. Folland, J. W. Saucier, and S. H. Sandifer.
Environmental Research, Vol. 15, No. 1, February 1978, p 155-159, 1 fig, 1 tab, 11 ref.

Descriptors: Water quality, *Water pollution effects, *Pesticides, *Chlordane, Municipal water, Tennessee, *Public health, Human diseases.

An episode is documented of pesticide (chlordane) contamination of a segment of a municipal water system. Thirteen persons (18% of affected residents) exposed to contaminated water reported mild symptoms consistent with chlordane exposure. Symptoms did not persist and chronic damage was not observed. Contamination probably occurred because of careless handling of a concentrated chlordane solution. It was estimated that approximately a quart of concentrated pesticide entered the water supply. A rise in oxychlordane levels in the symptomatic residents may have been related to redistribution form fat where chlordane was deposited after acute exposure or to seasonal variation in levels. (Chilton-ORNL)
W78-05963

EFFECTS OF DIETARY ADDITION OF VITAMINS C AND D3 ON GROWTH AND CALCIUM AND PHOSPHORUS CONTENT OF POND-CULTURED CHANNEL CATFISH,
Kansas State Univ., Manhattan. Div. of Biology.
C. A. Launer, O. W. Tiemeier, and C. W. Deyoe.
The Progressive Fish-Culturist, Vol. 40, No. 1, January 1978, p 16-20, 2 fig, 3 tab, 24 ref.

Descriptors: Environmental effects, *Fish diets, *Channel catfish, Nutrient requirements, *Vitamins, *Calcium, *Phosphorus, Dietary supplement, Vitamin C, Vitamin D3.

Similar weight gains, feed conversions, and survival for fingerling channel catfish fed diets contaning Vitamin C, Vitamin D3, or both, indicated that no increase in growth was achieved by adding those vitamins to the diet. Sampling data differences showed that calcium and phosphorus levels in catfish do vary but no direct correlation was seen between levels of vitamin C or D3 and the calcium and phosphorus in eviscerated bodies and fat-free skeletons of fingerlings. (Chilton-ORNL)
W78-05964

PHOSPHORUS LOADING AND RESPONSE IN LAKE VANERN NEARSHORE AREAS,
National Swedish Environmental Protection Board, Uppsala.
E. B. Welch, and L. T. Lindell.
Environmental Science and Technology, Vol 12, No 3, March 1978, p 321-327, 5 fig, 6 tab, 13 ref.

Descriptors: Environmental effects, *Phosphorus, Trophic levels, Lakes, Retention, Nutrients, Forecasting, *Water pollution effects, *Lake Vanern(Sweden), *Waste assimilative capacity, *Waste loading, Estimating.

Five nearshore areas of Lake Vanern were studied during 1973-75 to determine present trophic state, their effect on whole lake P retention, and effects of changed nutrient loading. Phosphorus concentration was predicted from known P loading, flushing rate, water distribution, and estimated retention coefficients in the areas. Five archipelagic areas retained about 38% of the P load and the open lake retained a similar fraction. On-half of the incoming P was retained in nearshore areas. Predicted P content agreed reasonably well with observed, and even estimates of chlorophyll a content from predicted P fell largely within the confidence intervals of chlorophyll a previously predicted from observed P concentrations for whole lake systems. It was concluded that with reasonably good data on P loading, retention coefficient, and flushing rate, predictions of trophic state changes and retention capacity are possible in archipelagic areas of large lakes. (Chilton-ORNL)
W78-05966

SEASONAL CHANGES IN THE COMMUNITY STRUCTURE OF THE MACROBENTHOS INHABITING THE INTERTIDAL SAND AND MUD FLATS OF BARNSTABLE HARBOR, MASSACHUSETTS,
Chicago Univ., IL. Committee on Evolutionary Biology.
For primary bibliographic entry see Field 2L.
W78-05967

PRODUCTION OF CHIRONOMUS, PROCLADIUS, AND CHAOBORUS AT DIFFERENT LEVELS OF PHYTOPLANKTON BIOMASS IN LAKE MEMPHREMAGOG, QUEBEC-VERMONT,
McGill Univ., Montreal (Quebec). Dept. of Biology.
R. M. Dermott, J. Kalff, W. C. Leggett, and J. Spence.
Journal of the Fisheries Research Board of Canada, Vol 34, No 11, November 1977, p 2001-2007, 2 fig, 2 tab, 23 ref.

Descriptors: Environmental effects, Biological communities, Nutrients, Lakes, Trophic levels, *Productivity, Benthos, Standing crop, *Lake Memphremagog(Quebec), *Canada, *Water pollution effects, *Eutrophication, *Biomass.

The Lake Memphremagog Study, initiated in 1972, seeks to quantify the response of communities occupying various trophic levels to the pronounced nutrient gradient that occurs along the long (north-south) axis of the lake. The mean annual benthic standing stock in the south basin was found to be 2.8 times greater than in the north basin. Mean annual standing stock of Procladius denticulatus and Chironomus anthracinus were 5.8 and 3.1 times, respectively, higher in the south basin. No significant difference was noted in standing stock of Chaoborus puncipennus between the two areas. Annual production of C. punctipennis was greater in the north while it was greater for the other two species in the south. Daily P:B ratios did not differ significantly between basins for the two species exhibiting increased biomass and production in the more productive southe basin, in spite of the differences in the availability of food there. (Chilton-ORNL)
W78-05968

NUTRIENT ENRICHMENT AND EUTROPHICATION OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
C. L. Schelske, and C. O. Davis.
Available from the National Technical Information Service, Springfield, VA 22161 as COO-2003-26, Price codes: A02 in paper copy, A01 in microfiche. Prepared for Energy Research and Development Administration, Report No. COO-2003-26, 1975/76. 15 p, 6 fig, 4 tab, 5 ref. AT(11-1)-2003.

Descriptors: *Nutrients, *Eutrophication, *Lake Michigan, Phytoplankton, Algae, Diatoms, Phosphorus, Silica, Nitrogen, Chlorophyll, Great Lakes, Lakes, Tributaries, Grand River(MI), Species composition, Limiting factors, Chemostats, Stratification, Michigan, Wisconsin.

Relationships between phytoplankton and major nutrients (phosphorus, silica, and nitrogen) in Lake Michigan are discussed in a report on four studies in progress: (1) open lake, (2) tributaries, (3) Grand River, and (4) diatom chemostat studies. Open lake studies have been conducted since 1972 on changes in phytoplankton species composition and nutrients. The size of the spring phytoplankton bloom is controlled by phosphorus supply, while the summer standing crop minimum results from nutrient depletion in the epilimnion. Since nitrate is never depleted in the open waters, nitrogen supply has virtually no effect of chlorophyll standing crops. Silica is limiting in spring and summer in the epilimnion, with a change from diatom domination to chlorophyte dominance. This shift in species composition is apparently a recent phenomenon related to

phosphorus loading. In summer, diatom domination persists in subsurface waters where adequate silica supplies remain. Lake Huron is a source of silica through the Straits of Mackinac. Tributary studies in 1972 showed chemical and phytoplankton compositions different from the open lake. Nutrient levels in the Grand River, surveyed in 1974-76, were always high during high flow; diatoms made up 98% of phytoplankton near the river mouth. A chemostat system for diatom studies was put into operation in January 1976, but initial experiments were unsuccessful. (Lynch-Wisconsin)
W78-05970

BACTERIAL CONTAMINATION OF LAKE POWELL WATERS: AN ASSESSMENT OF THE PROBLEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5B.
W78-05972

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 4. PHYTOPLANKTON OF LAKE MICHIGAN,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environment Research Lab.
S. J. Tarapchak, and E. F. Stoermer.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/ES-40, Price codes: A10 in paper copy, A01 in microfiche. Technical Report ANL/ES-40, Argonne National Laboratory, Illinois, December 1976. 211 p, 89 fig, 37 tab, 249 ref.

Descriptors: *Environmental effects, *Trophic level, *Lake Michigan, *Phytoplankton, *Baseline studies, *Algae, *Distribution, Primary productivity, Diatoms, Eutrophication, Cyanophyta, Chlorophyta, Lakes, Great Lakes, Phosphorus, Nutrients, Model studies, Seasonal, Green Bay(WI), Wisconsin, Basic data collections.

As part of an overall baseline assessment of the environmental status of Lake Michigan a compilation of published data on phytoplankton in the lake includes an evaluation of trophic level. Phytoplankton abundance and primary productivity vary seasonally, but generally are higher and more variable inshore than offshore. Seasonal phytoplankton development in the central basin is bimodal in southern and nearshore waters, but unimodal with a summer peak offshore. Critical water temperatures and higher nutrient concentrations in the southern basin and critical mixing depths are responsible for these dissimilarities. A trend toward serious cultural eutrophication is evidenced by a significant increase in algal abundance inshore near Milwaukee and Chicago, and by a shift in the southern basin offshore community from the historical dominance by diatoms to a notable fraction of chlorophytes and cyanophytes. These trends are attributed to increases in phosphorus loading rates, which have reached unacceptable levels in southern Green Bay and some inshore regions of the southern and central basins. Lake Michigan's trophic state generally is intermediate between that of Lake Superior and the western basin of Lake Erie. Since the year 1900, over 200 taxa of algae have been recorded in open water in the lake. Of these, 1300 diatoms have been identified and the remaining 700-800 divided among other algal groups. (Lynch-Wisconsin)
W78-05973

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 6. ZOOBENTHOS OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
S. C. Mozley, and R. P. Howmiller.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/ES-40, Price codes: A07 in paper copy, A01 in microfiche. Technical Report ANL/ES-40, Argonne National Laboratory, Illinois, September 1977. 148 p, 59 fig, 13 tab, 291 ref.

Descriptors: *Environmental effects, *Benthic fauna, *Lake Michigan, *Baseline studies, *Bioindicators, *Tubificids, *Benthos, *Macroinvertebrates, Oligochaetes, Pontoporeia affinis, Great Lakes, Green Bay(WI), Methodology, Research equipment, Water quality indexes, Species composition, Sampling, Amphipoda, Species diversity, Basic data collections, Lakes.

As part of a series of baseline assessments of the environmental status of Lake Michigan, this summary of zoobenthic studies through mid-1974 includes power plant surveys and describes the ecology of macroinvertebrates and some microfauna. Conclusions include: (1) zoobenthos are dominated by the amphipod Pontoporeia affinis; (2) tubificid oligochaetes are useful in mapping environmental quality; and (3) there are pronounced qualitative gradients in zoobenthos related to depth. Sampling techniques are compared and evaluated, including the following samplers: Smith-McIntyre, Ponar, Petersen, orange peel, and Ekman grab samplers, and the free-falling corer and Fager hand-corer. Most studies prior to 1965 used the relatively inefficient Petersen sampler, and the superior Ponar sampler has since become the most widely used; comparative use of older data is therefore difficult. Also discussed are zoobenthic pollution indicators; zoobenthic effects on sediment-water exchanges; and total macroinvertebrate numbers, biomass, and production. The autecology of Arthropoda (Crustacea, Insecta), Mollusca (Gastropoda, Pelecypoda), and Annelida (oligochaeta, Hirudinea) is described. No simple relationship has been found between species diversity and pollution among Great Lakes macrobenthos, but changes in species composition (relative abundance) have provided useful indices of eutrophication and pollution. Such indicators in Green Bay have been extensively studies. (Lynch-Wisconsin)
W78-05974

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 14. BIRDS OF THE LAKE MICHIGAN DRAINAGE BASIN,
Michigan State Univ., East Lansing.
G. J. Wallace.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/ES-40, Price codes: A06 in paper copy, A01 in microfiche. Technical Report ANL/ES-40, Argonne National Laboratory, Illinois, July 1977. 112 p, 1 fig, 6 tab, 82 ref, 1 append.

Descriptors: *Environmental effects, *Birds, *Lake Michigan basin, *Baseline studies, *Migratory birds, *Faunal lists, Habitats, Basic data collections, Great Lakes, Lakes, Migration patterns, Pesticides, Wisconsin, Michigan, Illinois, Indiana, Basins, Checklists, Wildlife, Wildfowl.

Birds of Lake Michigan's drainage basin are discussed as part of a series of baseline assessments of the environmental status of the lake. Wildfowl found in one hundred counties of Wisconsin, Michigan, Illinois and Indiana are described in terms of habitat (including state parks, lakeshores, refuges, and sanctuaries), patterns of historical occurrence and abundance, migration patterns, and the influence of disease, hunting pressure, pesticides and pollution. An extensive annotated list of species regularly found in the basin includes additional lists of extinct, extirpated, endangered, threatened, declining, and introduced species. Of some 360 species recorded in the watershed in the past century, at least 264 currently occur regularly as permanent or summer residents or as transients. More than 90% are migratory, the majority nocturnal. Spring migration in the northern states is concentrated in April and May; fall migration extends from July to November, with a maximum number of species migrating in September. Major habitats include: (1) the Lake Michigan shoreline (loons, grebes, waterfowl, gulls, sandpipers); (2) inland lakes (Ducks, kingfishers, spotted sandpipers); (3) rivers and streams (herons, river ducks, eagles, ospreys); (4) marshes (numerous birdlife); (5) fields and open spaces (bobolinks, meadowlarks, horned larks, sparrows); and (6) woodlots (about 80 species). (Lynch-Wisconsin)
W78-05975

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 16. AMPHIBIANS AND REPTILES OF THE LAKE MICHIGAN DRAINAGE BASIN,
Wisconsin Univ.-Madison. Dept. of Zoology.
E. D. Pentecost, and R. C. Vogt.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL/ES-40, Price codes: A04 in paper copy, A01 in microfiche. Technical Report ANL/ES-40, Argonne National Laboratory, Illinois, July 1976. 69 p, 59 fig, 2 tab, 76 ref.

Descriptors: *Environmental effects, *Lake Michigan basin, *Reptiles, *Amphibians, *Faunal lists, *Habitats, Basins, Lakes, Checklists, Wisconsin, Michigan, Indiana, Illinois, Hiberation, Distribution, Abundance.

As part of a series of baseline assessments of the environmental status of Lake Michigan, an annotated checklist of the 25 amphibian and 35 reptilian species currently inhabiting the basin is presented, with information on regional distribution and abundance, diet, reproduction, and habitat requirements. The influence of environmental disturbances, importance of hibernation sites, and economic and ecological importance of reptiles and amphibians are discussed. Amphibian species include 11 frogs, nine salamanders, two newts, two toads, the mudpuppy, and the western lesser siren. Reptile species include 21 snakes, ten turtles, and three lizards. Fifteen habitat types by vegetation and their associated herpetofauna are described. Many ubiquitous species are found in the area in all types of vegetation. These include the American toad and eastern garter snake. Others are very specific in their habitat requirements, including the four-toed salamander, redbacked salamander, and queen snake. (Lynch-Wisconsin)
W78-05976

EUTROPHICATION IN VERMONT,
Vermont Dept. of Water Resources, Montpelier. Water Quality Div.
J. W. Morse, II, K. J. Little, and V. A. Garrison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 844, Price codes: A04 in paper copy, A01 in microfiche. Water Quality Surveillance Series, Report No. 3, 1975. 69 p, 8 tab, 58 ref, 6 append.

Descriptors: *Eutrophication, *Vermont, *Lakes, *Trophic level, *Water pollution sources, Phosphorus, Nutrients, Chemcontrol, Biocontrol, Mechanical control, Lake Champlain, Algal control, Aquatic weed control, Lake stages, Waste water disposal, Nonpoint pollution, Limiting factors, Water pollution effects.

In the 287 Vermont freshwater lakes larger than 20 acres, 32.2% of the total surface area of 223,642 acres is classified as eutrophic, 32.9% as mesotrophic, 29.6% as oligotrophic, and 5.3% unclassified. Most Vermont lakes receive 42.3% of its annual phosphorus loading from point sources and 57.7% from nonpoint sources, while Lake Cahmplain receives 26.6% from point sources and 73.4% from nonpoint sources. St. Albans Bay is one of the few bodies of water receiving more

nutrients from point than nonpoint sources; eutrophication in most small lakes in Vermont is caused by nonpoint pollution. Even the Winooski River, with 17 wastewater treatment facilities, receives more than 50% of its phosphorus inputs from nonpoint sources. The drainage basins of Lakes Champlain and Memphremagog constitute 52.8% of Vermont's land area and receive effluents from 38 municipal treatment plants; Vermont's portion of Lake Champlain comprises 77% (172,032 acres) of the state's total surface area for lakes larger than 20 acres. Phosphorus is the limiting nutrient in all Vermont lakes tested. A detailed review of wastewater and plant control measures is included, with a discussion of the eutrophication process, a glossary, and statistical tables. In total there are 527 freshwater lakes in Vermont covering 225,669 acres. (Lynch-Wisconsin)
W78-05977

APPROACHES TO THE STUDY OF MICROBIAL TRANSFORMATIONS OF METALS,
National Bureau of Standards, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-05978

EFFECTS OF SUBMERGED MACROPHYTES ON HELEOPLANKTONIC CLADOCERA,
Rhode Island Univ., Kingston.
T. J. Vigerstad, and L. J. Tilly.
Available from the National Technical Information Service, Springfield, VA 22161 as DP-MS-75-125, Price codes: A03 in paper copy, A01 in microfiche. In: 39th Annual Meeting of the American Society of Limnology and Oceanography, Inc, June 21-24, 1976, Savannah, GA. p 1-21. 6 fig, 1 tab, 17 ref. Report DP-MS-75-125. ERDA AI(07-2)-1.

Descriptors: *Cladocera, *Zooplankton, *Thermal pollution, *Water temperature, *Macrophytes, Submerged plants, Environmental effects, Nuclear powerplants, *South Carolina, *Par Pond(SC), Bosmina logirostris, Ceriodaphnia, Diaphanosoma brachyurum, Effluents, Predation, *Heleoplankton, Reservoirs, Fish, Ponds, Water pollution effects.

Three helioplanktonic cladocera in the littoral of Par Pond, a reservoir near Aiken, South Carolina, were sampled during July-August 1974 to study relative effects of thermal effluent from a nuclear power plant and high densities of rooted submerged macrophytes. Conclusions were that: (1) dense-rooted vegetation, perhaps providing a refuge, allows higher standing crops of Ceriodaphnia spp. and Diaphanosoma brachyurum; and (2) lower temperatures away from the thermal effluent favor Bosmina longirostris, while higher temperatures favor Ceriodaphnia spp. and D_{si}(brachyurum. The interaction of temperature and vegetation could not be determined because of nonparametric treatment of the data. To test the relative effect of the macrophytes in the thermal area, two 2 x 2 x 1 m chicken-wire exclosures were installed. One, Pen NV, was cleared of vegetation (Potamogeton pusillus and Najas guadalupensis), and the other left with the plants intact (Pen V). Total numbers were highest in Pen V, next highest in the vegetated area between the pens (Area NP), and lowest in Pen NV. The totals primarily reflected standing crop of the abundant Ceriodaphnia; the standing crop of B. longirostris was not significantly affected by either exclosure or vegetation removal, while both Ceriodaphnia and D. brachyurum were highest in Pen V (a 'pen effect'), intermediate in Area NP, and lowest in Pen NV. Reactor effluent variations during the exclosure experiment permitted study of thermal effects. (Lynch-Wisconsin)
W78-05980

EUTROPHICATION AND WATER POLLUTION,
Federal Water Pollution Control Administration, Washington, DC.
E. J. Martin, and L. W. Weinberger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 271, Price codes: A02 in paper copy, A01 in microfiche. In: Great Lakes Research Division, University of Michigan, Publication No. 15, p 451-469, 1966. 4 fig, 8 tab, 45 ref.

Descriptors: *Water pollution control, *Eutrophication, *Nutrients, *Waste treatment, *Nutrient removal, Waste disposal, Phosphates, Nitrates, Phosphorus, Nitrogen, Algae, Municipal wastes, Industrial wastes, Lakes, Streams, Trophic level, Nuisance algae, Oligotrophy.

The nature of accelerated eutrophication, its extent in the United States, and means of control are discussed. Naturally-occurring eutrophication may succeed oligotrophy following the birth of a lake, but increased availability of nutrient material may stimulate biological production and promote premature lake aging. Accelerated eutrophication may be defined as the state of a body of water resulting from the intentional or unintentional, natural or man-made modifications to the aquatic environment to the extent that the ecological system supports an imbalance in biological production, which creates a nuisance or interferes with water use. A discussion of nutrient characteristics is presented, and includes tables of eutrophic waters in the United States, abundance of algae in American rivers, and the most common nuisance algal species. Some human activities which increase nutrients in waters are: (1) discharge of inadequately treated sewage and industrial wastes; (2) improper agricultural and other watershed practices; and (3) canalization of streams. A detailed evaluation of eight nutrient removal systems is given: (1) activated sludge, (2) algal removal systems, (3) chemical precipitation, (4) ion exchange, (5) ammonia stripping, (6) electrodialysis and other membrane processes, (7) effluent spraying on land, and (8) distillation. Tables summarize removal rates for each process. (Lynch-Wisconsin)
W78-05982

UTAH LAKE-JORDAN RIVER BASIN MODELING PROJECT. VOLUME I. SUMMARY REPORT. VOLUME II. APPENDIX.
Environmental Dynamics Inc., Los Angeles, CA.
For primary bibliographic entry see Field 5B.
W78-05983

MUSKEGON, MICHIGAN INDUSTRIAL-MUNICIPAL WASTEWATER STORAGE LAGOONS: BIOTA AND ENVIRONMENT,
Northeast Michigan Council of Governments, Gaylord.
For primary bibliographic entry see Field 5D.
W78-05986

THE PERMISSIBLE CONCENTRATION OF LEAD IN WATER, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Inst. of Physiology and Experimental Pathology Arid Zone.
For primary bibliographic entry see Field 5G.
W78-05989

EDTA AND DTPA: THEIR EFFECT ON THE GROWTH OF BACTERIA AND ATTEMPTS TO ISOLATE BACTERIA CAPABLE OF USING THEM AS CARBON AND NITROGEN SOURCES,
Institutet for Vatten-Och Luftvardsforskning, Stockholm (Sweden).
A. Neilson, and C. Hoglund.
Swedish Water and Air Pollution Research Laboratory, Stockholm Report IVL B 349, February 1977. 16 p, 6 fig, 2 tab, 15 ref.

Descriptors: *EDTA, DTPA, *Bacteria, *Chelation, *Biodegradation, Carbon, Nitrogen, Pseudomonas aeruginosa, Assay, Pulp and paper industry, Gram-positive bacteria.

With increased use of metal chelating agents such as EDTA and DTPA by the paper industry, concern has been expressed over their possible presistence in the environment. However, none of the bacteria isolated from water and sludge samples from localities subject to inputs of these agents were capable of using them as sole carbon or nitrogen sources in pure culture. No difference between the magnesium and iron complexes was noted. Most bacteria examined were tolerant toward high concentrations (500 mg/l) of EDTA (DTPA) in the presence of 100 mg/l of magnesium (2+). As this concentration was decreased to 8 mg/l Gram-positive bacteria and Pseudomonas aeruginosa became increasingly sensitive. Although no isolated bacteria could use EDTA (DTPA) as sole carbon or nitrogen sources, it should not be concluded that microbial degradation cannot occur. Factors which must be considered include: (1) methods used may have failed to isolate the required organisms; (2) degradation may be possible only in the presence of normal substrates required for growth of the cell (co-metabolism); and (3) degradation may be achieved only by a mixed microbial population. Increasing evidence supports the prevalence of co-metabolism among less readily assimilable substrates, such as fluoroaromatic compounds and lignin, and biodegradation by mixed populations has been demonstrated with organophosphorus insecticides. (Lynch-Wisconsin)
W78-05995

RELATIVE TOXICITY IN WATER QUALITY PLANNING,
Anglian Water Authority, Huntingdon (England). Directorate of Scientific Services.
For primary bibliographic entry see Field 5G.
W78-05996

ENVIRONMENTAL INFLUENCES ON THE ACCUMULATION OF LEAD, CADMIUM, MERCURY, ANTIMONY, ARSENIC, SELENIUM, BROMINE AND TIN IN UNICELLULAR ALGAE CULTIVATED IN THAILAND AND IN GERMANY,
Gesellschaft fuer Strahlen- und Unweltforschung m.b.H., Neuherbergbei Munich (West Germany).
H. D. Payer, K. H. Runkel, P. Schramel, E. Stengel, and A. Bhumiratana.
Chemosphere, Vol. 5, No. 6, p 413-418, 1976. 5 fig, 2 tab, 14 ref.

Descriptors: *Algae, *Heavy metals, *Water pollution effects, *Water pollution sources, *Scenedesmus obliquus, *Thailand, *West Germany, Lead, Cadmium, Mercury, Antimony, Arsenic, Selenium, Bromine, Tin, Precipitation(Atmospheric), Air pollution, Fertilizers, Environmental effects, Bangkok(Thailand), Chiengmai(Thailand), Dortmund(West Germany).

Relative inputs of heavy metal to the edible chlorophyte alga Scenedesmus obliquus by various sources were determined for polluted and unpolluted environments in West Germany and Thailand. Tests conducted in 1972-73 in rural areas of Chiengmai and Bangkok, Thailand, and in agricultural areas of Dortmund, West Germany examined the role of atmospheric dust, rainfall, water quality, and fertilizers. Algae were grown outdoors under natural climatic conditions, simulating a model agricultural crop. Twice as much lead was found in algae from industrialized Bangkok than from Chiengmai, a remote rural district 700 km from Bangkok, while the lead content of algae from Dortmund was six times that of Chiengmai. Direct determination of dust fallout lead content showed that lead inputs were the results of air pollution. Superphosphate fertilizers accounted for about 50% of the cadmium, tapwater 25%, dustfall 15%, and rainwater 10%. Fertilizers were also the main source of arsenic, cadmium, selenium in

Dortmund samples, whereas tapwater was the main source of bromine, mercury, and tin, and air pollution was the primary contributor of lead and antimony. (Lynch-Wisconsin)
W78-05998

NITROGEN - AN ESSENTIAL LIFE FACTOR AND A GROWING ENVIRONMENTAL HAZARD, REPORT FROM NOBEL SYMPOSIUM NO. 38.
For primary bibliographic entry see Field 5B.
W78-05999

ALKALINE POTASSIUM PERMANGANATE DEGRADATION OF INSOLUBLE ORGANIC RESIDUES (KEROGEN) ISOLATED FROM RECENTLY-DEPOSITED ALGAL MATS,
California Univ., Berkeley. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-06000

THE INTERTIDAL SEDIMENT HABITATS OF THE LOWER MEDWAY ESTUARY, KENT,
Sir John Cass Coll., London (England). School of Science and Technology.
J. R. Wharfe.
Environmental Pollution, Vol. 13, No. 2, p 79-91, 1977. 6 fig, 4 tab, 16 ref.

Descriptors: *Intertidal areas, *Medway Estuary(England), *Estuaries, Habitats, *Sediments, *Benthic fauna, England, Ecology, Macroinvertebrates, Oligochaetes, Tubificids, Bioindicators, Chlorophyta, Algae, Organic matter, Oxidation-reduction potential, Particle size, Mud flats, Eutrophication, Sulfides, Ions.

Sediment cores were taken at 10 shore sampling sites in the lower Medway Estuary in Kent, England, at mid-tide level between 1973-75 during an ecological study of the benthic invertebrates macrofauna. Sediments were analyzed for particle size, redox potential profiles, total organic matter, and free sulfide ions. Supplementary data on air and water temperatures, salinity, and pH were obtained, and visual assessments were made of the percentage cover of chlorophyte algae (predominantly Entermorpha intestinalis and Ulva lactuca). In general, sites sheltered from influences of the main tidal channel (East Rainham, Bedlam Bottom, Hoo, and Damhead Creek) supported algal blooms which, upon decay, resulted in oxygen depletion in the sediment. Depletion was characterized by negative redox potentials and high organic matter and free sulfide ion levels. Populations of the tubificids Peloscolex benedeni and Hydrobia ulvae increased during these periods, and the capitellid Capitella capitata appeared. At more open sites (Motney Hill, Gallingham, Lower Upnor, and Colemouth Creek), chlorophytes were absent from the mudflats and sediments were characterized by higher redox potentials and lower organic matter and free sulfide ion levels. Nereis diversicolor was the most common phlychaete at these sites. The sediment parameters of this study proved most useful in characterizing conditions within the sediment habitats, which were not reflected in the overlying water. (Lynch-Wisconsin)
W78-06002

NITROGEN CYCLES IN A POLLUTED SEA AREA,
Tokyo Univ. (Japan). Dept. of Chemical Engineering.
H. Nishimura.
The Chemical Engineer, No. 315, p 760-764, November-December 1976. 9 fig.

Descriptors: *Seto Sea(Japan), *Nitrogen cycle, *Water pollution sources, *Oil pollution, *Organic loading, *Chemical oxygen demand, *Water pollution effects, Japan, Nutrients, Water pollution control, Oceans, Inland seas, Sediments, Benthos, Red tide, Fisheries, Fishkill, Chemical industry, Model studies, Recycling, Industrialization, Urbanization.

A model is proposed for quantitative analysis of the nitrogen cycle to determine the relative importance of two terrestrial sources of organic loading to Japan's Seto Sea. This narrow inland sea, 400 km long by 40 km wide between the mainland and Shikoku Island, is a very fertile fishing ground, but 15 years of extensive urbanization and petrochemical industrialization along its shores have resulted in severe water pollution. Oil-tainted fish, red tides, and heavy fishkills have been observed, and catches of prawn, crab, and sea bream have declined to one-third previous levels. A 1974 governmental act requires reduction of chemical oxygen demand to 60% of the 1972 level. Although the fish catch of plankton feeders (such as anchovy) has increased, a substantial decrease in benthic crustacea (prawn, crab) and benthic feeders (sea bream, turbot) is attributed to pollution of bottom sediments with organic matter. Excessive organic matter in sediments is lethal to benthic organisms as it produces sulfides in sediments while reducing sulfates in the sea water. Organic loading comes from both terrestrial sources and marine plankton. Plankton growth depends on feed rates of phosphorus and nitrogen nutrients from land; these rates are therefore nearly equivalent to the organic load in the marine environment. Thus, two sources of terrestrial organic loading are present: a direct source, in the form of organics, and an indirect source, in the form of nutrients. (Lynch-Wisconsin)
W78-06004

ABOUT THE EUTROPHICATION PROCESS OF LAKES, (IN HUNGARIAN),
Lajos Kossuth Univ., Debrecen (Hungary). Dept. of Anthropology; and Lajos Kossuth Univ., Debrecen (Hungary). Dept. of Zoology.
G. Deval, G. Kollar, and G. Ollos.
Acta Biol Debrecina 13, p 163-192, 1976.

Descriptors: *Eutrophication, *Trophic level, Decomposing organic matter, Shallow lakes, *Energy budget(Lakes), *Hungary, Nutrients, Organisms, *Photosynthesis, Regulation, Respiration, Sewage, Water pollution effects, Plant physiology.

The most important features of shallow lakes, the general character of the material and energy budget of water ecosystems, and the eutrophicational processes of shallow lakes are summarized. The role of photosynthetic production of organic material (FP) and the respiratory decomposition of organic material (RD) in the material budget of water ecosystems are discussed. The influence of the factors having the most important role in shaping the FP-RD relationship are examined. The material and energy budget of shallow waters in Hungary in extremely intensive; thus they easily reach oversaturation in nutrients, especially as a consequence of human interference causing pollution. This makes its appearance in increased trophicity. Of potential sources of nutrients causing eutrophication of shallow waters, all polluting agents must be taken into consideration, i.e., sewage, and trickling and ground water. Other inorganic plant nutrients and organic materials available for living organisms can also be sources of danger. Therefore the planning of regulations concerning water quality and the prediction of water quality should be based on these facts.--Copyright 1978, Biological Abstracts, Inc.
W78-06005

UPTAKE OF DISSOLVED AMMONIUM AND NITRATE ION BY THE FRY OF COMMON CARP, CRUCIAN CARP AND LOACH FROM SURROUNDING WATER, (IN JAPANESE),
Freshwater Fisheries Research Lab., Tokyo (Japan).
T. Ito.
Bull Freshw Fish Res Lab (Tokyo) 26(1), p 27-33, 1976.

Descriptors: *Absorption, Tracers, *Ammonium ions, *Carp, Crucian carp, Ecology, Fry, Ions, *Loach, Mineral, Nitrate ions, Trophic level, Vitamin, Water pollution effects.

Trophic relationships were studied between fish and their food organisms with the aid of 14C. 15N, instead of 14C, is preferable as a tracer for the evaluation of protein assimilation rate in fish from the view point of trophic ecology. Fish uptake various substances, such as minerals, vitamins and other molecules of minor complexity, from the environmental water. Direct absorption of dissolved nitrogenous compounds must be examined before the 15N-tracer method can be applied to the study of the trophic ecology of fish, especially in case of fry. The uptake of ammonium-15N and nitrate-15N from environmental water kept at 23-24.5 degrees C was estimated at various concentration of these substances using carp fry, crucian carp fry and loach fry. 15N was analyzed by optical spectrography after being converted into N2 gas. All of the fry showed ammonium-15N absorption directly from the water. The rate of 15-N replacement in the body N increased expotentially to the concentration of ammonia in the water as well as the time exposed to labeled ammonia for carp and crucian carp, whereas loach fry absorbed 15N more actively in linear relation and proportionally to the concentration in water. In case of nitrate-15N, less 15N was absorbed and no apparent correlation was observed between the rate of replacement and the concentration in water. When the carp fry were returned to normal water free from labeled ammonia after being exposed for 48 h, relatively large amounts of 15N were excreted within the 1st h, followed by a very slow rate of excretion. More than 50% of absorbed 15N were still retained in the body of carp after 48 h. Appreciable 15N was found in the fish killed beforehand and exposed to ammonium-15N. The amount, however, was about 1/2-1/3 that of the living carp.--Copyright 1977, Biological Abstracts, Inc.
W78-06006

NUTRIENT RELEASE FROM ANAROBIC SEDIMENTS,
Limno-Tech Inc., Ann Arbor, MI.
P. L. Freedman, and R. P. Canale.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 103, No 2, p 233-244, April 1977. 7 fig, 1 tab, 29 ref, 2 append. EPA G005104 (Michigan) Water Resources Commission Subcontract 73-0100).

Descriptors: *Lake sediments, *Nutrients, Sediments, *Anaerobic conditions, *Nutrient flux, *White Lake(MI), Lakes, Michigan, Eutrophication, Phosphorus, Nitrogen, Ammonia, Model studies, Aquatic weeds, Algae, Municipal wastes, Industrial wastes, Sediment-water interfaces.

Anerobic sediment nutrient release in White Lake (Muskegon County, Michigan) was studied to assess the role of sediments in prolonging eutrophic conditions in lakes following sewage diversion. Field monitoring, laboratory analysis, and in-situ measurements suggest that sediments can contribute nutrients to overlying water at levels sufficient to support nuisance plant growths, thus delaying water quality improvement. Average sediment nutrient release rates were 25.1 mg P/sq m/day soluble reactive phosphorus, 38.0 mg P/sq m/day total dissolved phosphorus, and 36.2 mg N/sq m/day ammonia. The associated net diffusion coefficient across the sediment-water interface was calculated at 0.00001-0.000015 sq cm/sec. Theoretical and results for silicon release did not agree well within experimental results. A sewage-diversion spray irrigation project was implemented in the basin to divert nutrient loadings, improve water quality, excessive growths of aquatic

weeds and algae, attributed to high nutrient loadings from municipal and industrial discharges. Chlorophyll-a concentrations often exceed 40 micrograms/l and peak summer carbon uptake rates may be 100 micrograms C/cu m/hr. Average total phosphorus concentrations range from 50-75 micrograms P/l, winter nitrate and ammonia concentrations can exceed 300-400 micrograms N/l, and dissolved silicon concentrations often approach 5 mg Si/l. (Lynch-Wisconsin)
W78-06007

DIELDRIN-INDUCED DESTRUCTION OF MARINE ALGAL CELLS WITH CONCOMITANT DECREASE IN SIZE OF SURVIVORS AND THEIR PROGENY,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
C. D. Powers, R. G. Rowland, and C. F. Wurster.
Environmental Pollution, Vol 12, No 1, p 17-25, January 1977. 4 fig, 27 ref. NSF GB-11902 and BMS74-19665.

Descriptors: *Dieldrin, *Algae, *Water pollution effects, *Pesticide residues, Dinoflagellates, Exuviella baltica, Environmental effects, Pesticides, Insecticides, Phytoplankton, Pollutants, Organochlorine pesticides, DDE, Cytological studies.

Axenic cultures of the marine dionflagellate Exuviella baltica showed reduced growth and widespread cell disintegration within 12 hours of exposure to the organochlorine insecticide dieldrin at 10 parts/trillion. Surviving cells averaged 11.2% smaller than controls, and the size reduction persisted for at least four generations after transferral to a dieldrin-free medium. By contrast, DDE inhibited growth rate only. Initial cell concentrations in the experiments ranged from 3800-6400 cells/ml. Dieldrin was tested at concentrations of 0,0.1 and 10 parts/trillion growth apparently was stimulated. Mean diameter of cells from control cultures was 15.2 micrometers, compared with 13.5 micrometers for cells surviving the 10 parts/trillion treatment (a decrease of 11.2% in diameter, and 18% in cell volume and biomass). It was not determined whether dieldrin selectively ruptured the larger cells with only smaller cells surviving, or randomly affected the entire population. If a certain size class of cells were selectively affected, the availability of food for herbivores could be disturbed. The importance of cell size for copepod grazing is well-documented. Concentrations of DDE at 5 parts/trillion or higher merely inhibited growth without disrupting cells. (Lynch-Wisconsin).
W78-06011

THE EFFECT OF CHEMICAL SUBSTANCES AND THEIR COMBINATIONS ON WATER MICROFLORA, (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
A. N. Zakharkina, E. A. Mozhaev, and L. E. Korsh.
Gig Sanit 3, p 108-109, 1977.

Descriptors: Potable water, *Chemical compounds, Chemical wastes, Water pollution, Acetone, *Bacteria, Coli, *Alkyl sulfates.

A series of tests were run with raw dechlorinated and sterile tap water to which was added day-old cultures of bacteria isolated from sewage to study the possibility and degree of stimulating effect of different chemical compounds on sanitary-indicative microflora and possible potentiating effects of certain combinations. The combined stimulating effect of acetone plus the liquid surfactant alkyl sulfate (AS) was greater than that of each taken separately. This potentiating effect was also noted in the combination of AS and dibasic sodium salt of monoalkylsulfosuccinic acid while AS reduced the bactericidal action of Cu. AS in concentrations of 100 mg/l and duration of contact with Escherichia coli for 6-25 days resulted in a 9% increase of biochemical changes in the bacteria, primarily, reduced capacity for gas formation.--Copyright 1978, Biological Abstracts, Inc.
W78-06014

OCEAN DUMPING: PHILADELPHIA'S STORY.
For primary bibliographic entry see Field 5E.
W78-06021

A SEARCH FOR CYTOPATHOGENIC VIRUSES IN SURFACE AND COASTAL SEA WATER IN THE PROVINCE OF PISA (ITALY), (IN ITALIAN),
Pisa Univ. (Italy). Ist. di Igine.
For primary bibliographic entry see Field 5B.
W78-06023

TEN YEARS OF WATER FLUORINATION IN IVANO-FRANKOVSK, (IN RUSSIAN),
Kievskii Meditsinskii Inst. (USSR).
For primary bibliographic entry see Field 5F.
W78-06024

HYDROGEN INPUT TO THE HUBBARD BROOK EXPERIMENTAL FOREST, NEW HAMPSHIRE, DURING LAST DECADE,
Cornell Univ., Ithaca, NY. Section of Ecology and Systematics.
For primary bibliographic entry see Field 5A.
W78-06026

SHOULD DAMS BE BUILT. THE VOLTA LAKE EXAMPLE,
United Nations Environment Program, Nairobi (Kenya).
L. Obeng.
AMBIO, Vol. 6, No. 1, p 46-51, 1977. 2 fig, 16 ref.

Descriptors: *Volta Lake(Ghana), *Dams, *Impoundments, *Environmental effects, *Multiple-purpose reservoirs, *River basin development, Ghana, Africa, Developing countries, Hydroelectric power, Planning, Lakes, Sediment load, Human diseases, Schistosomiasis, Ecology, Water storage, Water supply, Reservoirs, Aquatic weeds, Water distribution(Policy).

Environmental and societal effects of the creation of such impoundments as Volta Lake in Ghana are evaluated. Given the critical developmental importance of large dam projects for hydroelectric power and water storage in many parts of the world, dam construction is unavoidable and major attention must therefore be focused on minimizing negative effects. Volta Lake, created in 1964, is currently the world's largest fresh-water impoundment, with a shoreline of 4800 km, an area of 8500 sq km, and an estimated capacity of 165 cu km, and a depth range of 19-75 m. Primarily physical and ecological changes included: (1) the residential displacement of 80,000 persons; (2) high turbidity and greatly reduced transparency (as low as 10 cm) resulted from large quantities of suspended, dissolved, and colloidal organic matter; (3) a decreasing surface-to bottom temperature gradient and mixing of waters, with no persistent stratification; (4) low chemical ion load; (5) well-developed plankton and invertebrate populations; (6) the spread of aquatic weeds; and (7) an increase in urinary schistosomiasis. Many objectives have been met, including fisheries, water supply, irrigation, electricity production, destruction of breeding grounds of the Simulium damnosum fly, and transportation. (Lynch-Wisconsin)
W78-06033

MORTALITY OF FISH AND ENVIRONMENTAL CONDITIONS IN LAKE CHAD DURING A PERIOD OF DROUGHT, (IN FRENCH),
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de N'Djamena.
For primary bibliographic entry see Field 2H.
W78-06037

BACTERIAL WATER QUALITY IN WILDERNESS AREAS,
California Univ., Davis. Dept. of Engineering; and California Univ., Davis. Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W78-06038

ALGAL ASSAY PROCEDURE BOTTLE TEST.
Pacific Northwest Water Lab., Corvallis, OR.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 419, Price codes: A05 in paper copy, A01 in microfiche. National Eutrophication Research Program, August 1971. 82 p, 5 fig, 15 tab.

Descriptors: *Bottle test, *Bioassay, *Algal assay, *Analytical techniques, *Eutrophication, *Laboratory tests, Nutrients, Bioindicators, Methodology, Algae, Water quality, Water pollution sources, Waste treatment, Limiting factors, Nutrient requirements, Pollutant identification, Water pollution effects.

The procedure described for the Bottle Test algal assay is based on Liebig's law of the minimum, or the limiting factor. In general terms, it is intended for use in: (1) determining the nutrient status of a receiving water and its sensitivity to change; (2) evaluating the potential effects of materials and products on algal growth in receiving waters; and (3) assessing effects of waste treatment process changes on receiving waters. More specifically the test can be used to: (1) identify algal growth-limiting nutrients; (2) determine biologically the availbility of algal growth-limiting nutrients; and (3) quantify the biological response to changes in algal growth-limiting nutrient concentrations. Bottle algal assays consist of three steps: (1) selection and measurement of such parameters as biomass indicators; (2) presentation and statistical evaluation of measurements made during the assay; and (3) interpretation of results. The basic approach is to add selected test alga to the water, and then determine algal growth at appropriate time intervals. Procedural steps and considerations include: (1) preparation of glassware; (2) maintenance of pH below 8.5; (3) determination of maximum specific growth rate and/or maximum standing crop; and (4) biomass monitoring (related to dry weight). (Lynch-Wisconsin)
W78-06043

EFFECTS OF POLLUTION ON WATER QUALITY, PERDIDO RIVER AND BAY, ALABAMA AND FLORIDA.
Federal Water Pollution Administration, Athens, GA. Southeast Water Lab.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 702, Price codes: A04 in paper copy, A01 in microfiche. January 1970. 66 p, 15 fig, 6 tab, 3 append.

Descriptors: *Water pollution effects, *Perdido Bay(AL FL), *Industrial wastes, Pulp and paper industry, *Perdido River(AL FL), *Alabama, *Florida, St. Regis Paper Company, Rivers, Bays, Streams, Waste disposal, Dissolved oxygen, Organic wastes, Carbon, Effluents, Phosphates, Sewage disposal, Biochemical oxygen demand, *Pulp wastes.

Inadequately treated effluent from the St. Regis Paper is seen as the major cause of low dissolved oxygen, unsightly foam, excessive sludge deposits, and increased lignin in Perdido Bay and River (Alabama and Florida). The company, located north of Pensacola, Florida, discharges an average of 27 million gallons of pulp and bleach waste per day into Eleven Mile Creek, which flows into Perdido Bay. The waste effluent constitutes most of the dry weather flow of the creek. Water quality problems at the mouth of Bayou

Marcus are caused by discharges from six small sewage treatment plants. Dissolved oxygen in 36% of bottom waters of Perdido Bay north of Double Point and the lower mile of Perdido River is less than the 4.0 mg/l minimum set by law in Alabama and Florida. About 86% of the bottom of the bay and the lower river is covered by sludge deposits containing over 3.0% organic carbon, exercising a major oxygen demand on the overlying water. Water quality in Eleven Mile Creek is completely degraded and falls below official industrial use criteria for which the stream is classified. The St. Regis wastes account for 98% of BOD from all point sources to Perdido Bay. Recommendations for the St. Regis effluent enclude: (1) 90% removal of carbonaceous wastes, (2) removal of foam and solids, (3) reduction of color, (4) limits of 8,880 lbs/day of five-day BOD and 2,610 lbs/day total organic carbon, and (5) consideration of recirculation, treatment, and processing water reuse, (Lynch-Wisconsin)
W78-06044

BIOSTIMULATION CHARACTERISTICS OF WASTES AND RECEIVING WATERS OF THE SNAKE RIVER BASIN.
National Field Investigations Center-Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 598, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-330/2-74-001, September 1974. 63 p, 5 fig, 16 tab, 12 ref, 2 append.

Descriptors: *Snake River Basin(Idaho), *Reservoirs, *Eutrophication, *Nutrients, *Water pollution sources, *Water pollution effects, *Idaho, American Falls Reservoir(ID), Brownlee Reservoir(ID), Milner Pool Reservoir(ID), Minidoka Reservoir(ID), Phosphorus, Algae, Nitrogen, Limiting factors, Primary productivity, Aerial photography, Waste water disposal, Agricultural runoff, Municipal wastes, Industrial wastes, Algal control, Aphanizomenon.

Algal conditions in four reservoirs on the Snake River in Idaho were evaluated during 1973-74 for stimulation by various nutrient-rich wastewater effluents. Laboratory tests complemented field data. In each reservoir--American Falls, Brownlee, Milner Pool, and Minidoka--algal bloom conditions (20 mg/l dry weight) occurred at total phosphorus concentrations of 0.1 mg/l and inorganic nitrogen levels of 1.0 mg/l. Maximum algal growth (71 mg/l dry weight) was stimulated by 1.0 mg/l total phosphorus and 10.0 mg/l inorganic nitrogen. During the summer bloom season nitrogen was the growth-limiting nutrient except in American Falls, which contained sufficient natural nutrients to sustain algal blooms. The cyanophyte Aphanizomenon was the dominant bloom alga, capable of fixing atmospheric nitrogen as a limiting nutrient. Phosphorus was the spring limiting nutrient, and was more important than nitrogen as long as cyanophyte blooms occurred. Elimination of algal blooms in the reservoirs would require reduction of total phosphorus to concentrations less than 0.1 mg/l (preferably less than 0.05 mg/l); lowering inorganic nitrogen would also be beneficial. During the summer up to 44% of nutrient load comes from agricultural sources, and blooms would not be eliminated with even a 90% reduction in nutrients from municipal and industrial sources; agricultural sources, including feedlots, must therefore be controlled. Idaho water quality standards for dissolved oxygen and nuisance plant growths are in violation in all four reservoirs. (Lynch-Wisconsin)
W78-06045

SEASONAL ABUNDANCE AND SPATIAL DISTRIBUTION OF LAKE MICHIGAN MACROBENTHOS, 1964-67,
California State Univ., Los Angeles. Dept. of Biology.
W. P. Alley, and S. C. Mozley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 708, Price codes: A06 in paper copy, A01 in microfiche. Report EPA-905/9-75-004, Special Report No. SR-54, Great Lakes Research Division, University of Michigan, Ann Arbor, 1975. 103 p, 30 fig, 12 tab, 49 ref, 1 append. FWPCA-WP-00311 and NSF GA-1337.

Descriptors: *Lake Michigan, *Basic data collections, *Benthic fauna, *Invertebrates, *Water pollution effects, *Eutrophication, Bioindicators, Seasonal, Distribution, Species composition, Stylodrilus heringianus, Pontoporeia affinis, Oligochaetes, Sphaeriidae, Chironomidae, Amphipoda, Insects, Ecology, Environmental effects, Sublethal effects, Water temperature, Depth.

Lakewide sampling of Lake Michigan macrozoobenthos on 16 cruises during 1964-67 indicated a rapid decline in nearshore benthic environmental quality in many areas of the southern basin. These conditions may be affecting some offshore areas as well, in spite of the persistence of such relatively sensitive species as Stylodrilus heringianus and Pontoporeia affinis. Amphipods formed 79.4% of zoobenthic dry weight, followed by oligochaetes (12.0%), sphaeriids (7.7%), and chironomids (0.9%). Biomass composition was, respectively, 87.8%, 9.1%, 2.2%, and 0.9%. No year-to year comparative differences were seen in the 15-30 meter depth interval for any taxonomic groups in terms of dry weight or biomass; within the 31-50 meter interval oligochaetes were most numerous in 1967 and biomass was greatest in 1965, but no significant yearly variations were found for dry weight or for other taxonomic groups. Below the 50 meters, amphipods were most abundant in 1965 and 1966, oligochaetes were most abundant in 1965 and 1967, chironomids were fairly consistent, and sphaeriid abundance was lowest in 1964 but increased in each succeeding year. Abundance and biomass were also influenced by upwelling and distance from shore. Average total counts, dry weight, and biomass were significantly lower in the southern basin, and the proportion of amphipods decreased while oligochaetes increased in a progression from north to south. All data are presented in tables. (Lynch-Wisconsin)
W78-06046

PHYTOPLANKTON GROWTH, DISSIPATION AND SUCCESSION IN ESTUARINE ENVIRONMENTS,
Johns Hopkins Univ., Baltimore, MD.
H. H. Seliger.
Available from the National Technical Information Service, Springfield, VA 22161 as COO-3278-35, Price codes: A02 in paper copy, A01 in microfiche. Report COO-3278-35, to Energy Research and Development Administration, April 1976. 7 p. AT911-10 3278.

Descriptors: *Phytoplankton, Ecology, *Estuarine environment, *Chesapeake Bay, Transport, *Growth rates, Estuaries, Plant growth, Prorocentrum mariae labouriae, Dinoflagellates, Bays, Measurement, Methodology, Research equipment, On-site tests, Bioassay, Eutrophication, Powerplants, Algae, Seasonal, Succession.

Two advances are reported in a study of phytoplankton ecology in Chesapeake Bay: (1) tracing of subsurface transport of a dinoflagellate for 120 nautical miles, and (2) development of a cage technique for on-site measurement of growth rates of natural mixed populations. In the lateral transport part of the study, the dinoflagellate Prorocentrum mariae labouriae was followed from the mouth of Chesapeake Bay of the vicinity of Bay Bridge via an intensive series of cruises between May 1975-April 1976. This believed to be the first direct evidence of large-scale lateral transport of an estuarine phytoplankton. Microscopic identification and counting were necessary to track Prorocentrum, which is transported and accumulated in the net northward-moving bottom waters of the bay annually between January and April. The growth rate measuring system is based on use of defined pore-size, nontoxic, minimum fouling Nucleopore filters as the cage bars. Captured phytoplankton are retained but soluble nutrient exchange across the membrane is permitted, with a half-time for exchange of less than an hour--much less than the minimum 12-hour doubling time of phytoplankton. Net growth rate is determined by microscopic counting or by chlorophyll-a assay of functions of time. This technique can be used for in-situ impact assessment of power plant heat and toxic chemical discharges. (Lynch-Wisconsin)
W78-06047

THE QUALITY OF LAKE OF THE OZARKS.
Environmental Protection Agency, Region VII, Kansas, MO.
For primary bibliographic entry see Field 5B.
W78-06050

MERCURY CONCENTRATIONS IN FISH IN LAKE OAHE, SOUTH DAKOTA, APRIL 16 TO SEPTEMBER 27, 1972.
Environmental Protection Agency, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 452, Price codes: A04 in paper copy, A01 in microfiche. Report SA/TSB-20, June 1973. 57 p, 13 fig, 3 tab, 12 ref, 1 append.

Descriptors: Fish, *Mercury, *Water pollution effects, *Lake Oahe(SD), *Public health, *South Dakota, Sport fish, Reservoirs, Impoundments, Toxicity, Heavy metals, Data collections, Standards.

Surveys during 1972 of sport fish in six areas of Oahe Reservoir, South Dakota showed that of 1032 fish collected, 286 (28%) had mercury levels greater than 0.5 ppm, the toxicity limit set by the FDA and EPA. Consumption of most species of sport fish from the Cheyenne Arm of the reservoir poses a threat to human health, particularly in the spring when fishing pressure is heaviest. Consumption of white bass, crappie, and sauger from Whitlock Bay could also be hazardous to health. The fish sampled were: walleye (Stizostedion vitreum vitreum), northern pike (Esox lucius), channel catfish (Ictalurus punctatus), white bass (Morone chrysops), sauger (Stizostedion canadense), black crappie (Pomoxis nigromaculatus), white crappie (P. annularis), and yellow perch (Perca flavescens). All fish were collected with sinking gill nets or frame nets. Of fish sampled from the Cheyenne Arm, 36% had mercury at or above 0.5 ppm, and fish with the highest concentrations were found in the Foster Bay (upper arm) area with 50% or more of each species containing hazardous levels during at least one sampling period. Fish from the middle and lower arms had less mercury, but both bodies of water contained fish with sufficient concentrations to represent a health hazard. Fishes from the control areas (tailrace and Lake Enemy Swim) showed small amounts of mercury. (Lynch-Wisconsin)
W78-06051

ANALYSIS OF OPERATION 'DEEP SIX' BENTHIC INVERTEBRATES.
Marine Research Inc., Falmouth, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 722, Price codes: A05 in paper copy, A01 in microfiche. Report to Environmental Protection Agency, Washington, D.C., August 1975. 83 p, 2 fig, 10 tab, 23 ref. EPA-68-01-3179.

Descriptors: *Benthic fauna, *Invertebrates, Operation deep six, *Water pollution effects, *Sludge disposal, Industrial wastes, Waste disposal, Oceans, Ocean dumping, Faunal lists, Basic data collections, Animal populations, Spe-

cies diversity, Diversity indexes, Species composition, *Delaware Bay, Environmental effects, Polychaetes, Amphipoda, Bivalvia, Operation Ides.

Sampling during 1974 of benthic invertebrates at a dumpsite for sludge and industrial wastes in ocean water of the mid-Atlantic continental shelf east of Delaware Bay showed no significant change in benthic fauna as a result of the dumping, begun in 1973. Diversity index values inside and outside the dumpsite were not significantly different, and at present no adverse effects of dumping in this area can be documented. Twenty-five stations were chosen in and around the dumpsite, located about 50 miles off the coast, and benthic samples were taken in triplicate. In the 75 samples taken, 23,043 individuals representing 194 species in 19 phyla were found. Polychaetes were most abundant, followed by amphipods and bivalves. A remarkable similarity in community composition between this study and Operation Ides (begun March 1974), conducted in the same area, was noted; 12 of 22 stations in common had the same dominant species, and nine had many of the same dominants. With respect to feeding categories, composition has not appreciably changed since the first post-dumping cruise in November 1973: deposit feeders remain high at 86%, followed by omnivores at 10.1%, carnivores at 3.3%, and suspension feeders at 0.6%. Crustacean feeders were largely absent. The study area is important because of the presence of ocean-going vessels, demersal fishing, an inshore surf clam fishery, sportfishing, and a spawning and nursing ground for several fish and invertebrate species. (Lynch-Wisconsin)
W78-06052

THE ENVIRONMENTAL IMPACT OF FRESHWATER WETLAND ALTERATIONS ON COASTAL ESTUARIES.
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
Conference Report, Technical Planning Seminar, held at Savannah, Georgia on June 23, 1976. 85 p, 16 fig, 7 tab, 42 ref.

Descriptors: *Environmental effects, *Estuaries, *Freshwater-saline water interfaces, *Coastal zone management, Freshwater marshes, Wetlands, Coastal marshes, Coastal engineering, Planning, Drainage effects, Productivity, Eutrophication, Nutrients, Southeast US, Regulated flow, Model studies, Cycling nutrients, Discharge(Water), Bayous, Alteration of flow, Shoals, Channeling, Marshes, Water quality, Drainage systems, Methodology.

In order to provide a forum to review the environmental impact of freshwater wetland alterations on coastal estuaries, a coastal resource planning seminar was held June 23, 1976 at Savannah, Georgia. Seminar papers emphasized relationships observed between freshwater wetlands and estuarine values, and the use of such data for coastal planning and management. Four of the five papers are case studies about interactions between the freshwater ecosystems and estuaries. Results of the studies show that freshwater ecosystems benefit marshes and estuaries by: (1) assimilating and altering pollutants which would otherwise harm estuarine fish and wildlife; (2) regulating freshwater flow into the estuaries, and hence creating proper environmental conditions for fish and wildlife, and also preventing downstream flooding during heavy storms; (3) regulating a flow to the estuary of nutrients and other minerals, some of which are essential to the nearshore and offshore productivity. One paper is concerned with integrating scientific data into environmental planning analysis. The paper suggests application of scientific data descriptive of a system under evaluation to the alternative models designed to solve a particular planning problem. A model that maximizes the benefits and minimizes the costs to the existing ecosystem should be selected as the solution to a problem. (See also W78-06054 thru W78-06058) (Harris-Wisconsin)
W78-06053

PRODUCTIVITY AND NUTRIENT EXPORT STUDIES IN A CYPRESS SWAMP AND LAKE SYSTEM IN LOUISIANA,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
J. W. Day, T. J. Butler, and W. H. Conner.
In: The Environmental Impact of Freshwater Wetland Alterations on Coastal Estuaries, Conference held at Savannah, Georgia on June 23, 1976. p 17-23, 1 fig.

Descriptors: *Productivity, *Cycling nutrients, *Translocation, *Estuaries, *Discharge(Water), *Bayous, Photosynthesis, *Barataria Bay(LA), Phosphorus, Nitrogen, Freshwater marshes, Carbon cycle, Sediments, Nitrates, *Louisiana.

The nutrient cycle and materials budget of the upper drainage basin of the Barataria Bay estuary, Louisiana were studied over a 14-month period in 1973-74. Carbon input from allocthonus sources plus the carbon fixed in the lake were nearly equal (within 10%) to that consumed, harvested and exported. Import of total nitrogen into the lake was 1.9 times greater than export, while import of phosphorus was 1.8 greater than export. Activity in the sediment (nitrate stored and/or denitrified and phosphorus adsorbed to the clay sediments) probably account for these differences. Export of materials from the wetland watershed into the lake equaled 19.3 g C per sq m per year, 2.7 g N per sq m per year, and 0.39 g P per sq m per year. Within the freshwater wetland system water serves as a vehicle for waste removal and nutrient supply. Sediments function in removal and storage of large amounts of phosphorus and nitrogen and thus represent a buffer that slows lake eutrophication. The freshwater wetland system is functionally interconnected with the estuary. It supplies it with nitrogen, phosphorus, carbon, and organic nutrients. It also serves as a nursery for the estuarine fish species. Therefore in any coastal management program the dependence between freshwater wetlands and estuary should be considered. (See also W78-06053) (Harris-Wisconsin)
W78-06054

CASE STUDY: THE SANTEE RIVER, S.C.,
South Carolina Univ., Columbia.
B. Kjerfve.
In: The Environmental Impact of Freshwater Wetland Alterations on Coastal Estuaries, Conference held at Savannah, Georgia on June 23, 1976. p 25-31, 2 fig, 2 ref.

Descriptors: *Alteration of flow, *Santee River(SC), *Environmental effects, *Shoals, Discharge(Water), Salinity, Circulation, Sediment transport, Deposition(Sediments), Coastal engineering, Accelerated erosion, Vegetation effects, Water pollution effects, Shellfish farming, Cooling water, Industrial water, Dredging, Wildlife habitats, Ducks(Wild), Hydroelectric power, *South Carolina.

The Santee River with an annual mean discharge of 525 cu m/sec was the fourth largest river on the east U.S. coast prior to 1942. In that year most of the Santee's flow was diverted into the tidally-dominated Cooper River by construction of dams at Wilson's landing and Pinopolis and the creation of Lakes Marion and Moultrie. The Santee's main discharge was thereby lowered to 62 cu m/sec. Conversely, the discharge of the Cooper River experienced an increase from 2 to 422 cu m/sec. Other non-desirable effects of the 1942 diversion project were: (1) a drastic increase in salinity of the lower Santee and a decrease of the Cooper River salinity (from 31 to 16 ppt measured 8 km from the mouth); (2) a return of salty water by way of bottom layers of the Cooper River; (3) transport of sand into Charleston Harbor from the ocean; (4) settling of fine sediments throughout the estuary; (5) erosion of barrier islands and spits in the vicinity of the Santee's mouth; (6) replacement of hardwoods along the lower Santee by grasses. Desirable effects were: (1) a decrease of water pollution in the Cooper; (2) availability of water from the Cooper for processing industrial requirements; (3) increased shellfish harvest in the lower Santee; (4) supply of 1.52% of the State's total electrical power. Dredging costs prompted the 1975 decision to redivert 80% of the Cooper flow back to the Santee via a proposed rediversion canal at the cost of $100 million. However, the same result could be accomplished at the fraction of the proposed cost by opening a spillway at Wilson Landing and letting the Santee return to prediversion conditions with time. (See also W78-06053) (Harris-Wisconsin)
W78-06055

OBSERVATION ON PRODUCTIVITY OF SWAMP STREAMS IN EASTERN NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
E. J. Kuenzler.
In: The Environmental Impact of Freshwater Wetland Alterations on Coastal Estuaries, Conference held at Savannah, Georgia on June 23, 1976. p 34-45, 2 fig, 3 tab, 10 ref.

Descriptors: *Productivity, *Environmental effects, *Channeling, *Marshes, *Water quality, Atlantic Coastal Plain Province(NC), Conetoe Creek(NC), Creeping Swamp(NC), Palmetto Swamp(NC), Chicod Creek(NC), Tracy Swamp(NC), Grindle Creek(NC), *North Carolina.

Monthly discharge, water conductivity, color, turbidity, nitrate concentrations and contributions of organic matter in six small streams situated in the Atlantic Coastal Plain province in North Carolina were measured as part of a study on the functioning of natural swamp streams in relation to possible impact of swamp alterations on the downstream estuaries. Results of the experiments indicate at least six important ways in which natural bottomland swamp systems may influence estuaries in a manner generally considered desirable. Natural swamps: (1) decrease the impact of freshwater floods upon the salinity structure of the estuary; (2) decrease the amount of silt which otherwise would adversely affect oysters and shipping; (3) control eutrophication of the lower river and upper estuary; (4) reduce the level of individual wastes and pesticides in estuarine waters; (5) provide nursery grounds for anadromous fishes; and (6) export substantial amounts of organic matter to the estuary where some of it finds its way into fish and shellfish harvests. (See also W78-06053) (Harris-Wisconsin)
W78-06056

HYDROLOGIC AND ENVIRONMENTAL EFFECTS OF A LONG-TERM DRAINAGE ON A COASTAL AREA, (CASE STUDY: MELBOURNE TILLMAN DRAINAGE DISTRICT, PALM BAY, FLORIDA),
Florida Inst. of Tech., Melbourne. Center for Coastal Zone Research.
For primary bibliographic entry see Field 2L.
W78-06057

INTEGRATING SCIENTIFIC DATA INTO ENVIRONMENTAL PLANNING AND IMPACT ANALYSIS, GENERAL METHODOLOGY AND A CASE STUDY,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 6G.
W78-06058

EFFECTS OF TEMPERATURE ON AQUATIC ORGANISM SENSITIVITY TO SELECTED CHEMICALS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
J. Cairns, Jr., A. L. Buikema, A. G. Heath, and B. C. Parker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 763, Price codes: A05 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 106, February 1978, (VPI-WVRRC-BULL 106). 88p, 20 tab, 15 fig, 103 ref. OWRT B-084-VA(1).

Descriptors: *Toxicity, *Water pollution effects, Algae, Zooplankton, *Bioassay, Benthos, Fish, *Chemicals, Copper, Zinc, *Thermal pollution, Chromate, Chlorine, Cyanide, Phenols, *Food webs, Invertebrates, Oligochates, Aeolosoma, *Toxicants, Aquatic organisms.

This research evaluates the effect of temperature on the sensitivity of food web oganisms to selected chemicals. Test organisms included plantonic algae, zooplankton, microbenthos, macrobenthos, and fishes. The chemicals used were copper, zinc, chromate, chlorine, cyanide, and phenol. The sensitivity of the test organisms to these chemicals was studied over a temperature range of 5 deg to 35 deg C. The specific temperatures studied was studied with each species. Results indicate considerable variation in the sensitivity of each species, depending on the chemical and the test temperature. Generally, the algal responses to the temperature and chemicals varied depending on the thermal sensitivity of the algal species in question. The invertebrates usually exhibited the classic response of increased sensitivity to chemicals at higher temperatures. Two notable exceptions were the 'reverse' response to temperature and cyanide of the oligochaete Aeolosoma and the temperature-independent response of the invertebrates to phenol. For fish, survival was enhanced (a) at low concentrations of chemicals and high temperatures and (b) at high chemical concentrations and low temperatures. Some fish species had chemical threshold concentrations which were not influenced by temperature.
W78-06063

EFFECTS OF SILT AND TURBIDITY FROM AGRICULTURAL DRAINAGE ON BENTHIC INVERTEBRATES IN STREAMS IN WESTERN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.
For primary bibliographic entry see Field 4D.
W78-06065

EFFECTS OF STREAM CHANNELIZATION ON FISH POPULATIONS IN THE BUENA VISTA MARSH, PORTAGE COUNTY, WISCONSIN,
Wisconsin Cooperative Fishery Research Unit, Stevens Point.
M. R. Headrick.
Prepared for Stream Alteration Project, Office of Biological Services, Fish and Wildlife Service, September, 1976. 38 p, 4 fig, 17 tab, 40 ref, 1 append.

Descriptors: *Ditches, *Channeling, *Stream fisheries, *Brook trout, Fish, Suckers, Sculpins, *Wisconsin, Productivity, Water temperature, Spoil banks, *Marshes, *Buena Vista Marsh(Wis), Instream cover, Angler success.

Fish populations from ditches 6-8 years old and 52-62 years old were compared with populations in adjacent portions of natural streams. Two study areas were selected: an upstream zone of good brook trout habitat and a downstream zone of marginal trout habitat. Loss of year-round instream cover through channelization limited brook trout density, which reduced annual brook trout production to 28.8 kg/ stream km in the upstream new ditch compared to 72.2 kg/km and 65.5 km/km in the upstream old ditch and the upstream natural stream, respectively. Angler success was also reduced in the upstream new ditch. Midsummer water temperatures reached upper lethal levels for brook trout in the downstream ditches where current velocity was reduced and white sucker abundant. Mottled sculpin were consistently absent from the upstream new ditch and scarce in the downstream new ditch. The natural stream had the greatest number of fish species in both study areas; the new ditch had the fewest species. Recovery was more rapid in ditches where spoil was spread on adjacent fields and bank vegetation left in place than where spoil was left on the banks. (Stihler-Mass)
W78-06090

BACTERIAL VARIATIONS IN STREAMS FROM A SOUTHWEST IDAHO RANGELAND WATERSHED,
Agricultural Research Service, Boise, ID. Northwest Watershed Research Center.
For primary bibliographic entry see Field 5B.
W78-06116

AN ECOLOGICAL MODEL FOR LAKE ONTARIO MODEL FORMULATION, CALIBRATION, AND PRELIMINARY EVALUATION,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W78-06119

HIGHWAY OPERATION AND PLANT DAMAGE-DATA APPENDIX (SOIL CHEMISTRY, SALT APPLICATION, OZONE, PRECIPITATION),
California State Dept. of Transportation, Sacramento. Transportation Lab.
For primary bibliographic entry see Field 4C.
W78-06131

HERBICIDE REPORT: CHEMISTRY AND ANALYSIS, ENVIRONMENTAL EFFECTS, AGRICULTURAL AND OTHER APPLIED USES.
Environmental Protection Agency, Washington, D.C. Hazardous Materials Advisory Committee.
For primary bibliographic entry see Field 5A.
W78-06133

I. DYNAMICS OF MERCURY IN LAKE SEDIMENTS. II. STUDIES ON ORGANIC PHOSPHORUS IN SOILS IRRIGATED WITH MUNICIPAL WASTEWATERS,
Purdue Univ., Lafayette, IN.
M. Floyd.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No 77-15, 404. PhD Thesis, 1976, 103 p.

Descriptors: *Mercury, *Soils, *Phosphorus, *Waste water disposal, *Irrigation practices, *Chemical reactions, Municipal wastes, Humic acids, Phosphorus compounds, Analytical techniques, Polymers, Alkylmercury, Phosphotase.

The synthesis and degradation of alkylmercury compounds in sediments, the effects of municipal waste water irrigation on the levels of phosphotase in soils, and the stability of organic phosphorus compounds in humic polymers were examined in laboratory experiments. Studies indicated that mercury was not significantly transformed in sediments, and that microbial activity was necessary for the degradation of alkylmercury compounds in natural sediments. Studies with waste water irrigated soils revealed that phosphotase activity was dependent on the crop grown and based on the following relationship: reed canary grass > hardwood forest on clay loam > old field > hardwood forest on sandy loam > corn. (Schulz-FIRL)
W78-06137

SEWAGE SLUDGE-SOIL SYSTEMS: A STUDY OF METAL FORMS AND EFFECT OF METALS ON CARBON AND NITROGEN TRANSFORMATIONS,
Purdue Univ., Lafayette, IN.
D. J. Silviera.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No 77-15, 470. PhD Thesis, 1976, 106 p.

Descriptors: *Heavy metals, *Solvent extractions, *Mineralogy, *Soils, *Soil chemical properties, X-ray diffraction, Sludge disposal, Chemical analysis, Copper, Zinc, Lead, Cadmium, Nickel, Nitrification, Environmental effects, Waste water disposal, Diethylenetriamine-pentaacetic acid, Synthetic sludge, Metals-soils relationships.

The fate and distribution of heavy metals, including Cu, Zn, Cd, Pb, and Ni, were investigated for sewage sludge and soils amended with sewage sludge. X-ray diffraction analyses of sludge from six Indiana cities revealed that quartz, feldspar, montmorillonite, chlorite, mica, dolomite, and calcite were present in crystalline form. DTPA (diethylenetriamine-pentaacetic acid) extractibility was used in studies on the effect of soil, sludge, and environmental factors on the distribution of sludge-borne heavy metals. Metal movement through soils was reduced during frequent applications of small amounts of sludge relative to larger, more infrequent applications and was observed to be at its lowest level when sludge was applied at a rate of 22.4 metric tons/ha. The extraction of metals with DTPA was reduced under anaerobic conditions. In studies with synthetic sludge, the DTPA extractabilities of Cu, Zn, Pb, and Ni were altered by the presence of sludge organic matter while Cd was unaffected. In studies on the interaction of Cu, Zn, Cd, Pb, and Ni with C and N transformations, high heavy metal concentrations were reported to reduce nitrification by as much as 50%. The reasonable agreement of data obtained in studies with municipal and synthetic sludges has led to the suggestion that synthetic sludges be used in studies on soils-microbes-metals relationships. (Schulz-FIRL)
W78-06139

AERATION/CIRCULATION KEEPS ALGAL BLOOMS IN CHECK,
Tetra Tech, Inc., Lafayette, CA.
For primary bibliographic entry see Field 5G.
W78-06140

DISSOLVED ORGANIC MATTER AND LAKE METABOLISM,
Michigan State Univ., Hickory Corners. W. K. Kellogg Gull Lake Labs.
R. G. Wetzel.
Available from the National Technical Information Service, Springfield, VA 22161 as COO-1599-104P1, Price codes: A03 in paper copy, A01 in microfiche. Technical Progress Report, COO-1599-104 (Part 1), Prepared for Energy Research and Development Administration, Argonne, Illinois. 47 p, 1 fig, 94 ref. (1977). ERDA E(11-1)-1999.

Descriptors: *Organic matter, *Metabolism, *Lakes, *Dissolved organic matter, *Eutrophication, Lawrence Lake(MI), Michigan, Trophic level, Oligotrophy, Nutrients, Algae, Macrophytes, Limiting factors, Carbon, Phytoplankton, Photosynthesis, Nutrient flux.

An interim report covers 12 months (1975-76) of study on interactions of dissolved organic matter with inorganic nutrient cycling and regulation of the photosynthetic and decompositional metabolism of microflora and macroflora. Major efforts cover: (1) sources, fates, pathways, and interactions of dissolved organic matter in inorganic

chemical cycling; (2) allochthonous sources, metabolism en route, and inputs to the lake systems of increasing stages of eutrophication; and (3) relationships of these compounds to the nutrient physiology and metabolism of phytoplankton, sessile algae, macrophytes, and bacterial populations. Analyses of regulatory mechanisms of growth and rates of carbon cycling center on evaluation of quantitative control interactions among: (1) microflora of the pelagic zones of several lakes of progressively greater eutrophication; (2) littoral photosynthetic producer-decomposer complex; and (3) allochthonous inorganic-organic influxes and their biotic processing. The underlying thesis of the project is that quantification of the dynamic carbon fluxes among these components and their rate control mechanisms are necessary to clarify the rate functions of lake eutrophication. Most current research is directed towards the fate and mechanisms regulating utilization and losses of organic carbon. Integrated research activities have concentrated on oligotrophic Lawrence Lake, Michigan. (Lynch-Wisconsin)
W78-06142

SODIUM BICARBONATE, AN INEXPENSIVE FISH ANESTHETIC FOR FIELD USE,
Wisconsin Cooperative Fishery Research Unit, Stevens Point.
H. E. Booke, B. Hollender, and G. Lutterbie.
The Progressive Fish Culturist, Vol. 40, No. 1, p 11-13, 1978. 1 tab, 8 ref.

Descriptors: *Sodium, *Carbon dioxide, Rainbow trout, *Toxicity, *Public health, *Sodium compounds, Fish physiology, *Animal metabolism, Brook trout, Carp, *Hydrogen ion concentration, *Bicarbonates, *Anesthetics(Fish), Buffers.

Sodium bicarbonate was tested as a fish anesthetic at combinations of 142 to 642 mg/l, pH 6.5 to 7.5, with rainbow trout (Salmo gairdneri), brook trout (Salvelinus fontinalis), and carp (Cyprinus carpio). The combination of pH 6.5 and 642 mg/l sodium bicarbonate was the most effective treatment for causing fish, within 5 min, to cease locomotion and slow opercular rate, but to retain reflex response to pressure on the caudal fin. We suggest that pH-controlled carbon dioxide release from the sodium bicarbonate caused the anesthetic response. (Dael-EIS)
W78-06143

SUBLETHAL EFFECTS OF OIL ON MOLLUSC SPECIES FROM THE BALTIC SEA,
Swedish Water and Air Pollution Research Lab., Nykoping.
O. Linden.
Water, Air, and Soil Pollution, Vol. 8, No. 3, p 305-314, 1977. 3 fig, 30 ref.

Descriptors: *Animal metabolism, *Reproduction, *Oil spills, *Oil pollution, *Toxicity, *Mollusks, *Mussels, *Snails, Animal behavior, Spectrophotometry, Water pollution effects, Baltic Sea, *Crude oil, *Bivalves, *Macoma, *Theodoxus.

Sublethal effects of Iranian crude oil were studied using molluscs from the brackish Baltic Sea. In blue mussels (Mytilus edulis) low concentrations caused a reduction in byssal attachment. The sensitivity of the mussels appeared to increase with increasing size. The burrowing behavior of the bivalve Macoma baltica was found to be affected at oil concentrations of 70 micrograms l-1. Also small individuals appeared less sensitive to the oil than large ones. The effect of oil on the crawling rate of the snail Theodoxus fluviatilis was studied. Low concentrations apparently increased the rate of crawling initially while at the end of exposure time the activity decreased. At higher concentrations the crawling rate was very low throughout the experimental period and stress symptoms like complete immobolization occurred. (Dael-EIS)
W78-06144

ACID PRECIPITATION AND REPRODUCTIVE SUCCESS OF AMBYSTOMA SALAMANDERS,
Cornell Univ., Ithaca, NY. Section of Ecology and Systematics.
F. H. Pough, and R. E. Wilson.
Water, Air, and Soil Pollution, Vol. 7, No. 3, p 307-316, 1977. 3 fig, 1 tab, 25 ref.

Descriptors: *Salamanders, *Reproduction, Animal physiology, *Chemical precipitation, *Acidic water, *Acidity, Mortality, *Toxicity, Populations, *Growth stages, Animal behavior, *Embryonic growth stage, *Larval growth stage, Hydrogen ion concentration, Water temperature, *Ambystoma.

The two species of mole salamander that occur in the Ithaca, New York, region (Ambystoma jeffersonianum and A. maculatum) breed in temporary ponds that are formed by accumulation of melted snow and spring rains. Water in many of these ponds during the breeding season is acid; pH values as low as 3.5 have been measured. In laboratory experiments, A. maculatum tolerated pHs 4 to 8 and was most successful at pH 5 to 6. Mortality rose abruptly beyond the tolerance limits. The pH optimum shifted upward with increasing temperature for A. jeffersonianum and downward for A. maculatum. (Dael-EIS)
W78-06145

ORGANOCHLORINE RESIDUES IN NEW JERSEY OSPREY EGGS,
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.
For primary bibliographic entry see Field 5A.
W78-06150

METAL TOXICITY TO EMBRYOS AND LARVAE OF SEVEN FRESHWATER FISH SPECIES - I. CADMIUM,
Environmental Research Lab.-Duluth, MN.
J. G. Eaton, J. M. McKim, and G. W. Holcombe.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 1, 1978, p 95-103. 3 tab, 11 ref.

Descriptors: *Cadmium, *Metals, Toxicity, Bioassay, *Freshwater fish, Juvenile fish, Larvae, Laboratory tests, Methodology, Brook trout, Brown trout, Lake trout, Pikes, Bass, Salmon, Suckers, *Water pollution effects, Coho salmon, Smallmouth bass.

The embryos and larvae of seven freshwater fish were exposed to low concentrations of cadmium in soft water. All species were killed or their growth retarded by concentrations ranging from about 4 to 12 micrograms Cd/liter. The larvae were consistently more sensitive than the embryos. The agreement between these results and those from life-cycle chronic toxicity studies indicates that embryo and larval exposures will give reliable estimates of the chronic toxicity of cadmium to additional fish species. a 60-day exposure period appears to be appropriate for determining larval sensivity to cadmium. (Katz-EIS)
W78-06151

THE ACUTE AND CHRONIC EFFECTS OF CADMIUM ON THE ESTUARINE MYSID MYSIDOPSIS BAHIA,
Environmental Research Lab., Gulf Breeze, FL.
D. R. Nimmo, R. A. Rigby, L. H. Bahner, and J. M. Sheppard.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 1, 1978, p 80-85. 2 tab, 16 ref.

Descriptors: *Bioassay, Metals, *Cadmium, *Toxicity, Methodology, *Zooplankton, *Crustacea, Water pollution effects, Laboratory tests, Laboratory animals, Pollutant identification, *Acute toxicity, Chronic toxicity, *Mysids, Mysidopsis bahia, LC50.

Mysids, small shrimp-like crustacea, proved to be a practical bioassay animal for investigating the effects of cadmium in seawater and may serve this purpose for other pollutants. In the laboratory under flow-through test conditions, the mysid, Mysidopsis bahia, was more sensitive to cadmium than other crustaceans tested. LC50 values were 15.5 micrograms/l within 96 hrs and 11.3 micrograms/l during a 17-day life cycle, whereas LC50's for other selected crustaceans were between 120 and 720 micrograms/l. Results of life-cycle bioassays can aid in the establishment of water quality criteria for marine and estuarine organisms. (Katz-EIS)
W78-06152

SURVIVAL OF STEELHEAD TROUT (SALMO GAIRDNERI) EGGS, EMBRYOS, AND FRY IN AIR-SUPERSATURATED WATER,
Environmental Protection Agency, Corvallis, OR.
A. V. Nebeker, J. D. Andros, J. K. McCrady, and D. G. Stevens.
Journal of the Fisheries Research Board of Canada, Vol. 35, 1978, p 261-264. 1 fig, 2 tab, 8 ref.

Descriptors: Bioassay, *Rainbow trout, *Mortality, *Fish eggs, Juvenile fish, *Supersaturation, Methodology, Laboratory test, *Aquiculture, Water temperature, Growth stages, Fish diseases, *Air supersaturation, *Gas supersaturation, *Steelhead trout, Fish embryos, Yolk-sac stages, *Gas bubble disease.

Eggs, embryo, fry, and swim-up stages of steelhead trout (Salmo gairdneri) were exposed to water at total gas saturation levels ranging from 130 to 115%. Eggs, embryos, and newly hatched fry were not affected at 126.7%, but at about day 16 posthatch when the fish began swimming up deaths occurred rapidly, and at the end of the test post button-up mortality ranged from 99% at 126.7% saturation to 45% at 115.3% saturation. Bubbles in the mouth, gill cavity, and yolk sac caused flotation and severe respiratory difficulties. Rupture of yolk-sac membranes also caused death. No differences were noted in survival between fish exposed from egg to fry, and those exposed only from swim-up to fry stage. In summary, there were differences in susceptibility among steelhead life stages to air-supersaturated water; eggs, embryos, and pre-swim-up larvae were more resistant than swim-up and later fry stages. (Katz-EIS)
W78-06153

BENTHOS OF AN ACID LAKE,
Uppsala Univ. (Sweden). Dept. of Entomology.
T. Wiederholm, and L. Eriksson.
Oikos, Vol. 29, 1977. p 261-267. 3 tab, 3 fig, 13 ref.

Descriptors: *Benthos, *Hydrogen ion concentration, *Acidic water, Acidity, Acids, Lakes, *Animal populations, Aquatic insects, Limnology, On-site investigations, Oligotrophy, Polyhumic lakes, *Chironomids, *Lake Trestickeln(Sweden).

Data on composition and distribution of the bottom fauna in a very acid lake (pH 3.9-4.6) in western Sweden are reported. In comparison with three other lakes with higher pH values the fauna is low in abundance with few taxa represented. The benthos is most similar to that of a typically polyhumic reference lake. Molluscs and large crustaceans are missing but many chironomid species show little or no reduction in their distribution. (Katz-EIS)
W78-06154

TWO ANOMALIES OF FISH LARVAL TRANSPORT AND THEIR IMPORTANCE IN ENVIRONMENTAL ASSESSMENT,
Power Authority of the State of New York.
D. N. Wallace.
New York Fish and Game Journal, Vol. 25, No. 1, p 59-71, 1978. 8 fig, 2 tab, 8 ref.

Descriptors: *Entrainment, *Larval growth stage, *Fish populations, *Intakes, *Intake structures, *Electric powerplants, *Larvae, *Striped bass, *Fish behavior, *Cooling towers, *Cooling water, *Currents(Water), Environmental effects, Hudson River, *Entrainment impact.

Environmental impact assessments for industrial plants using water generally include estimates of ichthyoplankton entrainment. The pattern of transport of fish larvae in water currents determines the proportion of a population which will pass through the zone of intake influence and the proportion of those passing the intake which will be entrained. Sampling studies revealed two anomalies of importance to such estimates: (1) data from field surveys in the Hudson River estuary showed that larvae are not transported in the water mass like solute particles; and (2) data from entrainment monitoring at generating plants on the Great Lakes showed that larval densities in the entrained water are not always the same as those in the surrounding ambient water. Realistic assessment of entrainment impact is both environmentally and economically important, and laboratory observation of the conditions that determine patterns of larval transport would be desirable. (Dael-EIS)
W78-06155

ROTENONE TOLERANCES OF STREAM-BOTTOM INSECTS,
New York State Dept. of Environmental Conservation, Livingston Manor. DeBruce Inland Fisheries Lab.
R. Engstrom-Heg, R. T. Colesante, and E. Silco.
New York Fish and Game Journal, Vol. 25, No. 1, p 31-41, 1978. 1 fig, 3 tab, 15 ref.

Descriptors: *Insects, *Insecticides, *Rotenone, *Piscicides, *Pesticides, *Fish control agents, Fish stocking, *Fish food organisms, *Oxygen requirements, Resistance, *Toxicity, Mortality, Fish populations, *Respiration, Caddisflies, *Mayflies, Benthos.

Stream-bottom insects varied greatly in their tolerance to rotenone. Tolerances did not adhere closely to taxonomic lines, but showed a possible relationship to oxygen requirements. The more sensitive genera tended to have short life cycles, high mobility and a potential for rapid repopulation. In many streams an exposure of 5 per cent emulsifiable rotenone formulation would eliminate undesired fish with only mild and temporary damage to the bottom fauna. Very few immature aquatic insects could survive a 48-hour exposure to 3 ppm of 5 per cent formulation. (Dael-EIS)
W78-06156

INHIBITORY EFFECTS OF COPPER ON MARINE DINOFLAGELLATES,
Biologische Anstalt Helgoland (West Germany). Meeresstation.
S. M. Saifullah.
Marine Biology, Vol. 44, p 299-308, 1978. 5 fig, 1 tab, 28 ref.

Descriptors: *Copper, *Toxicity, *Growth rates, *Dinoflagellates, *Gymnodinium, *Chlorophyll, Inhibitors, *Tracers, *Radioactivity techniques, *Photosynthesis, Mortality, Path of pollutants, Cytological studies, Aquatic microorganisms, Metabolism, *Scrippsiella, *Prorocentrum.

The effects of copper on three species of marine dinoflagellates was studied. It inhibited the growth of all species and was lethal to one species in batch cultures. The effect was more pronounced in semicontinuous culture than in batch cultures. Chlorophyll concentrations and rate of uptake of radioactive carbon by cells of Scrippsiella faeroense were affected in a manner similar to cell numbers. Copper inhibited growth of cells, most probably either by arresting cell division or by penetrating inside the cell and affecting metabolism. (Dael-EIS)
W78-06157

THE RESIDUE UP TAKE AND HISTOLOGY OF AMERICAN OYSTERS (CRASSOSTREA VIRGINICA GMELIN) EXPOSED TO DIELDRIN,
Mote Marine Lab., Sarasota, FL.
M. Emanuelsen, J. L. Lincer, and E. Rifkin.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 1, 1978, p 121-129. 3 tab, 3 fig, 14 ref.

Descriptors: *Dieldrin, *Oysters, *Chlorinated hydrocarbon pesticide, Bioassay, Toxicity, Laboratory tests, Florida, Gas chromatography, Commercial shellfish, *Absorption, *Animal physiology, Pathology, Water pollution effects, *American oysters, Histopathology, Histochemistry.

The results reported herein strongly suggest that relatively short-term exposures of low levels of dieldrin do not cause histopathological damage to C. virginica. It was found that C. virginica, after a 43-day exposure to 3 levels of dieldrin, concentrated approximately 5 x 10 to the 3rd power times (based on OD weight of tissue) the level of contaminant found in the water, regardless of its nominal concentration. The percent lipid was found to vary directly with the concentration of pesticide in the water. (Katz-EIS)
W78-06158

MOVEMENT OF BENTHOS DURING THE RECOLONIZATION OF TEMPORARY STREAMS,
Toronto Univ. (Ontario). Div. of Life Sciences.
D. D. Williams.
Oikos, Vol. 29, 1977, p 306-312, 2 tab, 5 fig, 7 ref.

Descriptors: *Benthos, *Invertebrates, Animal groupings, Animal populations, *Temporary pond stage, *Drifting(Aquatic), *Aquatic insects, Migration, Migration paths, On-site investigation, Methodology, Ephemeral streams, *Temporary streams, *Recolonizers, Substrate, Ontario, Canada, Upstream migration, Vertical migration, Aerial migration.

The relative importance of each of four main sources of animals is examined experimentally during the annual repopulation of two temporary streams. The sources are: drift, and upstream migration from pools, migration from within the substrate, and aerial sources. Animals which have spent the summer drought as dormant forms buried in the substrate are the most important recolonizers, although isolated pools may also act as faunal refuges. Drift provides an effective means of dispersing clumped individuals at the start of each new lotic phase, and upstream migration is also prevalent at this time. (Katz-EIS)
W78-06159

TROUT HEPATIC ENZYME ACTIVATION OF AFLATOXIN B1 IN A MUTAGEN ASSAY SYSTEM AND THE INHIBITORY EFFECT OF PCBS,
Oregon State Univ., Corvallis. Dept. of Food Science and Technology.
W. T. Stott, and R. O. Sinnhuber.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 1, 1978, p 35-47. 2 fig, 22 ref.

Descriptors: *Fish diseases, Fish physiology, Rainbow trout, *Polychlorinated biphenyls, Laboratory tests, Methodology, *Water pollution effects, Laboratory devices, Enzymes, Animal biochemistry, Pathology, *Aflotoxins, *Aroclor 1254, Bacterial Mutagen Assay Systems, Mutagen Assay Response.

In summary, it was demonstrated that the trout post mitochordrial fraction successfully employed in the Ames mutagen assay method by utilization of proper salts solution and a metabolic preincubation period at 25C. It has also been observed that, unlike the rat, pretreatment of rainbow trout with various PCBs decrease the mutagen assay response to aflatoxin B. (Katz-EIS)
W78-06160

THE FATE OF FENITROTHION IN AN AQUATIC ECOSYSTEM,
Ottawa Univ. (Ontario). Dept. of Biology.
R. P. Moody, L. Greenhalgh, L. Lockhart, and P. Weinberger.
Bulletin of Environmental Contamination and Toxicology, Vol. 19, No. 1, 1978, p 8-14. 1 fig, 2 tab, 11 ref.

Descriptors: *Insecticides, *Gas chromatography, On-site investigation, Methodology, *Phosphothioate, Pesticides, Algae, Phytoplankton, *Degradation(Decomposition), Aquatic plants, Water pollution effects, Path of pollutants, Canada, *Fenitrothion, *Aminofenitrothion, Duckweed, Lemna minor, Hornwort, Ceratophyllum demersum, Flowering rush, Metabolites.

Fenitrothion, an insecticide used in Canada, has been shown to persist in aquatic vegetation. Duckweed have been observed to pick up fenitrothion within 10 hours after application. A strong partition of fenitrothion in the water may be due to adsorption of the particulate matter but may be indicative of active uptake by unicellular algae. (Katz-EIS)
W78-06161

PHOTOTACTIC AND THERMOTACTIC RESPONSES FACILITATING SURVIVAL OF CLOEON DIPTERUM (EPHEMEROPTERA) LARVAE UNDER WINTER ANOXIA,
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
B. Nagell.
Oikos, Vol. 29, 1977, p 342-347. 1 tab, 5 fig, 6 ref.

Descriptors: Ponds, *Aquatic insects, *Benthos, *Oxygen, Freezing, Ice, Ice cover, Water temperature, Animal behavior, Animal metabolism, Light intensity, Light penetration, Juvenile growth stage, *Mayflies, *Ephemeroptera, Cloeon dipterum, *Winter anoxia, Phototactic responses, Thermotactic responses.

About 10 d after the freezing up of a pond, and coincident with the total water-body becoming anoxic, larvae of Cloeon dipterum L. were observed to suddenly migrate to the underside of the ice. Larvae remained there for the winter. Laboratory experiments were performed to examine the factors responsible for causing this migration. In aeration water larvae, acclimated to 2.5C and 120 lux, were negatively phototactic in a light gradient (25 to 1 lux), but positively thermotactic in a temperature gradient (4.1 to 1.9C). Both responses were reversed under anoxia. Light was more directing than temperature under the prevailing conditions. (Katz-EIS)
W78-06162

DELETERIOUS EFFECTS OF CYANIDE ON EARLY LIFE STAGES OF ATLANTIC SALMON (SALMO SALAR),
Concordia Univ., Montreal (Quebec). Dept. of Biological Sciences.
G. LeDuc.
Journal of the Fisheries Research Board of Canada, Vol. 35, 1978, p 166-174. 4 tab, 4 fig, 27 ref.

Descriptors: *Bioassay, *Water pollution effects, Methodology, Laboratory tests, *Atlantic salmon, *Industrial wastes, *Toxicity, Juvenile fish, *Fish eggs, Hatching, Salmon, Growth stages, Growth rates, Fish reproduction, Fish physiology, *Cyanide, *Hydrogen cyanide, Newly fertilized eggs, *Sublethal concentrations.

Hydrocyanic acid, a common industrial pollutant, caused severe damage to developing embryos of Atlantic salmon (Salmo sala) when newly fertilized eggs were continually exposed to sublethal concentrations of the poison (0.01-0.10 mg/L HCN) up to the end of the sac-fry stage. At 0.08 and 0.10 mg/L, cyanide delayed hatching by 6-9 days but all concentrations reduced hatching success by about 15-40%. During incubation conversion of yolk into body tissues was reduced at all concentrations above 0.01 mg/L. The most striking effect of cyanide, however, was a high incidence of abnormalities ranging from about 6% at 0.01 mg/L to about 19% at 0.10 mg/L. During incubation cyanide had reduced development, but after hatching survival was not affected and growth of cyanide-exposed sac fry was either equal to or faster than that of the controls as a result of higher yolk conversion efficiency. To protect salmon streams during embryo-larval stages, the maximum acceptable toxicant concentration for cyanide should not exceed 0.005 mg/L HCN. (Katz-EIS)
W78-06163

BLOOMS OF GYRODINIUM AUREOLUM (DINOPHYCEAE) IN NORTH EUROPEAN WATERS, ACCOMPANIED BY MORTALITY IN MARINE ORGANISMS,
Oslo Univ. (Norway). Dept. of Limnology. and Oslo Univ. (Norway) Inst. of Marine Biology.
K. Tangen.
Sarsia, Vol 63, p 123-133, 1977. 3 fig, 1 tab, 36 ref.

Descriptors: *Dinoflagellates, *Mortality, *Eutrophication, *Oxygen demand, *Oxygen requirements, *Red tide, *Fishkill, *Gymnodinium, *Fish toxins, Aquatic algae, Littoral, Salinity, Invertebrates, *Gyrodinium, *Norway coastal water.

Mass occurrence of the dinoflagellate Gyrodinium aureolum in coastal waters was accompanied by fish mortality in floating net cages and by mortality in various littoral organisms. Cell concentrations above 20 million cells per litre were recorded in coffebrown patches in sheltered localities. The hydrographical and meteorological records indicate that the bloom started after a wind-conditioned upwelling, and proceeded in water masses affected by heavy freshwater runoff. The morphology and taxonomy of G. aureolum are discussed, and a synopsis is presented of the occurrence of this species. Mortality in various marine organisms during blooms of G. aureolum is discussed. (Dael - EIS)
W78-06165

THE EFFECT OF TEMPERATURE ON THE DISTRIBUTION AND BIOMASS OF MYTILUS EDULIS IN THE ALAMITOS BAY AREA,
Claremont Graduate Schools, CA. Dept. of Joint Science.
C. R. Feldmeth, and M. Alpert.
The Veliger, Vol 20, No 1, p 39-42, 1977. 1 fig, 1 tab, 7 ref.

Descriptors: *Thermal pollution, *Thermal water, *Water temperature, *Cooling water, Electric powerplants, *Dissolved oxygen, *Salinity, *Larval growth stage, *Mussels, *Biomass, Growth stages, Water pollution effects, *California, Distribution, *Alamitos Bay(Calif).

The effects of thermal effluent on the distribution of this bivalve are examined. The waterway used by four electrical power generating plants for cooling purposed was found to have a much lower abundance of M. edulis. The elevation of water temperature by up to 10C was postulated to affect the survival of the gamete and larval stages. (Dael - EIS)
W78-06166

SOURCES OF VARIABILITY IN THE BENTHIC MACROFAUNA OFF THE SOUTH NORTHUMBERLAND COAST, 1971-1976,
Dove Marine Lab., Cullercoats, (England).
For primary bibliographic entry see Field 2L.
W78-06167

PHYSIOLOGICAL INDICES OF STRESS IN MYTILUS EDULIS,
Institute for Marine Environmental Research, Plymouth (England).
J. Widdows.
Journal of the Marine Biological Association of the United Kingdom, Vol 58, p 125-142, 1978. 9 fig, 3 tab, 33 ref.

Descriptors: *Mussels, Size, *Growth rates, *Growth stages, *Seasonal, *Mortality, *Suspension, Animal physiology, *Animal metabolism, Regression analysis, Oxygen, Nitrogen, Methodology, Bivalve, Acclimation.

Multiple regression equations and response surfaces are used to describe the combined effects of body size, food concentration, acclimation temperature, and season on physiological integrations such as the scope for growth, growth efficiency and O:N ratio. Maintenance and optimum ration levels are estimated for Mytilus edulis adapted to different factor combinations. Response surfaces illustrate the validity and sensitivity of the physiological integrations in quantifying the 'physiological condition' and the degree of stress experienced, under conditions ranging from near optimal, through sub-lethal to lethal. (Dael-EIS)
W78-06168

HEAVY METALS IN THE BURROWING BIVALVE SCROBICULARIA PLANA FROM THE TAMAR ESTUARY IN RELATION TO ENVIRONMENTAL LEVELS,
Marine Biological Association of the United Kingdom, Plymouth (England). Plymouth Lab.
G. W. Bryan, and H. Uysal.
Journal of the Marine Biological Association of the United Kingdom, Vol 58, p 89-108, 1978. 8 fig, 3 tab, 21 ref.

Descriptors: *Heavy metals, Lead, Copper, Calcium, Cobalt, Chromium, Manganese, Nickel, Zinc, *Seasonal, Size, *Sediments, *Mollusks, Metals, *Animal metabolism, *Animal physiology, Water pollution effects, Path of pollutants, *River Tamar estuary(England), Tissue analysis, Bioaccumulation, Bivalve, *Scrobicularia.

Concentrations of ten metals (Ag, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Zn) have been measured in the the whole soft parts and digestive gland of Scrobicularia plana. Four metals (Cu, Fe, Mn, Zn) have been analysed in the individual tissues including the shell. As far as possible, cncentrations in the animals have been related to those in the environment. Seasonal variation, level on the shore and size of animal have also been considered. Partitioning of metals between the digestive gland and remaining soft tissues suggests that uptake of Cd, Co, Cr, Ni, Pb, and Zn occurs mainly through ingestion of sediments. Scrobicularia plana appears to have potential as an indicator of the availability of metals in estuaries and results for Cu, Fe, Mn, and Zn suggest that there were no important changes in the Tamar estuary between 1969 and 1974. (Dael-EIS)
W78-06169

FEEDING RATE OF MYTILUS EDULIS L. (BIVALVIA) FROM DIFFERENT PARTS OF DANISH WATERS IN WATER OF DIFFERENT TURBIDITY,
Copenhagen Univ. (Denmark). Zoological Lab.
For primary bibliographic entry see Field 2L.
W78-06170

MAINTENANCE OF A TROUT FISHERY BY AERATION IN A EUTROPHIC LAKE,
Adelphi Univ., Oakdale, NY. Inst. of Marine Science; and Adelphi Univ., Garden City, NY.
For primary bibliographic entry see Field 5G.
W78-06171

RELATION OF WATER TEMPERATURE TO INFECTIONS OF COHO SALMON (ONCORHYNCHUS KISUTCH), CHINOOK SALMON (O. TSHAWYTSCHA), AND STEELHEAD TROUT (SALMO GAIRDNERI) WITH AEROMONAS SALMONICIDA AND A. HYDROPHILA,
Oregon State Univ., Corvallis. Dept. of Microbiology.
W. J. Groberg, Jr., R. H. McCoy, K. S. Pilcher, and J. L. Fryer.
Journal of the Fisheries Research Board of Canada, Vol 35, No 1, p 1-7, 1978. 1 fig, 6 tab, 6 ref.

Descriptors: *Water temperature, *Fish diseases, *Juvenile growth stage, *Salmonids, *Infection, *Chinook salmon, *Sockeye salmon, *Rainbow trout, Mortality, *Bacteria, *Epizootiology, Growth stages, Growth rates, *Septicemia, *Aeromonas, *Furunculosis.

Juvenile steelhead trout, coho salmon, and spring chinock salmon were infected by injection with Aeromonas salmonicida or A. hydrophila at seven temperatures from 3.9 to 20.5C. At 3.9 and 6.7C, mortality in fish infected with A. salmonicida varied from 2 to 26% among the three salmonid species. At 20.5C, 93-100% of these animals died within 2 or 3 days; at 6.7C or lower the fish survived for 12-23 days. Growth of A. salmonicida in vitro was influenced by temperature in a manner very similar to its influence on the in vivo infection. Comparable experiments with A. hydrophila gave results much like those with A. salmonicida, though some differences were noted. At a temperature of 20.5C percent mortality ranged from 64 to 100%. At 9.4C or below no deaths attributed to A. hydrophila occurred. Fatally infected fish died more rapidly at the higher temperature. (Dael-EIS)
W78-06172

PALEOGEOCHEMISTRY AND INTERSTITIAL WATER CHEMISTRY FROM SEDIMENTS OF FIVE MAINE LAKES,
Maine Univ. at Orono. Dept. of Geological Sciences.
For primary bibliographic entry see Field 2H.
W78-06199

5D. Waste Treatment Processes

A WATER QUALITY PLANNING MODEL WITH MULTIPLE TIME, POLLUTANT, AND SOURCE CAPABILITIES,
Meta Systems Inc., Cambridge, MA.
For primary bibliographic entry see Field 5B.
W78-05702

AN EVALUATION OF ALTERNATIVE SLUDGE TECHNOLOGIES: A SURROGATE WORTH TRADEOFF APPROACH,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 5E.
W78-05707

TREATMENT OF WASTE WATER CONTAINING AMMONIUM SULPHATE AND ORGANIC CPDS.--BY ADDING LIME TO PPTE. CALCIUM SULPHATE; CONTACTING WITH HOT AIR TO REMOVE AMMONIA AND INCINERATING RESIDUE.
French Patent FR 2338-902. Issued September 23, 1977. Derwent French Patents Abstracts, Vol Y, No 48, p 2. January, 1978.

Descriptors: *Ammonium compounds, *Sulfur compounds, *Ammonia, *Patents, *Lime, Chemical precipitation, Sulfates, Organic wastes, Evaporation, Incineration, Industrial wastes, Chemical wastes.

A patent has been issued for a lime treatment process to be used in the removal of ammonium ions, sulfate ions, and organic materials from waste water resulting from the production of acrylonitrile and methacrylate. Lime is added to the ion-bearing effluent to bring about the precipitation of sulfate ions as calcium sulfate and the conversion of ammonium ions to ammonia. The recovery of ammonia and water from the effluent is accomplished by the distillation of the ammonia and water with the introduction of hot air. The residue, which must be maintained at a pH of at least 8.5, is placed in a furnace with a fluidized bed and incinerated at a temperature of 700-1,000C. The hot combustion gases created during the incineration of the residues are recovered and reused in the hot air evaporation process. (Lisk-FIRL)
W78-05708

A MODEL FOR PLANNING AND LOCATION OF ON-SITE WASTE DISPOSAL SYSTEMS,
Wisconsin Univ., Madison. Coll. of Agricultural and Life Sciences.
For primary bibliographic entry see Field 5E.
W78-05713

DESIGN OF LARGE URBAN SEWER SYSTEMS WITH A WATER-FLOW SIMULATION PROGRAM,
Balzari Blaser Schudel, Bern (Switzerland).
P. Kaufmann, and C. de Rham.
In: Mathematical Models for Environmental Problems. Proceedings of the International Conference, University of Southampton, England, September 8-12, 1975. C.A. Brebbia (Ed.), Southampton Univ. John Wiley & Sons, N.Y., p 79-86, 1976. 5 fig, 3 ref.

Descriptors: *Simulation analysis, *Computer models, *Sewers, *Networks, Computer programs, Design, Planning, Urban runoff, Hydrographs, Construction costs, Optimization.

This short article discusses a simulation model built to calculate the hydrographs (discharges, depths, velocities and volumes in function of time) at every node of large sewage networks. The computer program in FORTRAN includes elements like stormwater tanks, outflow sewers, storage sewers and downward ramifications. The computer modeling method has been applied successfully for the optimal design of networks, extensions and special cases. (See also W78-05720) (Bell-Cornell)
W78-05722

BIOLOGICAL TREATMENT OF SPENT VEGETABLE TANNINS WITH FUNGAL DOMINANT SYSTEM,
West Virginia Univ., Morgantown.
M. D. Atluru.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 552, Price codes: A12 in paper copy, A01 in microfiche. PhD Thesis, 1972. 244 p, 34 fig, 61 tab, 106 ref, 3 append. OWRT A-015-WVA(2).

Descriptors: *Fungi, *Biological treatment, Activated sludge, Industrial wastes, Degradation(Decomposition), Water purification, Aerobic treatment, *Waste water treatment, Water pollution, *Tannins.

Feasibility of aerobic biological treatment of spent vegetable tannins with primarily fungal culture was investigated. Growth rate of cells, yield coefficients, oxygen uptake rate, specific substrate utilization rates, sludge settleability, and process performance in a mixed culture with a high percentage of fungi under various conditions of detention time, organic loading, and pH of the reaction were examined. Laboratory batch culture work was followed by two continuous flow benchscale reactors (10 liter capacity). Continuous flows culture treatment determined 10 days as the optimum detention time for best removals of organics at a tannic acid level of 5,200 mg/l. Sludge settling characteristics improved at higher detention times. With same conditions, reactor performance improved as the pH of the reactor increased and a sludge with better settling characteristics was produced. With increased organic loading rate, process efficiency and sludge settleability decreased at a constant hydraulic loading. Sludge settling characteristics of the treated tans seemed to correlate with fungal-bacterial-protozoan interrelationships. Chromatographic analysis indicated that primary degradation products of hydrolyzable tans and sugars in the spent liquor were removed possibly by some biological action in the tannery. Total oxygen content constitution was attributed to non-tannin phenolic compounds, Flavonoid compounds, and nonphenolics. Spent vegetable tannins wer biodegradable by an adapted fungal culture and appropriate for biological treatment in an external aeration type activated sludge process. (Wares-IPA)
W78-05807

EFFECT OF ARTIFICAL AERATION ON PROCESSES OF SELF-PURIFICATION IN CLARIFIERS OF A SUGAR REFINERY, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
A. K. Ryabov, T. Ya. Smikun, L. V. Podgaevskaya, and Zh. M. Aryamova.
Gidrobiol Zh 13(1), p 28-35, 1977.

Descriptors: *Self purification, Clarifiers, Industrial wastes, *Aeration, Waste water treatment, Artificial aeration, *Sugar refinery wastes, Aphanizomenon-flos-aquae, Nitrogen, USSR.

The dynamics of the main components of water chemical composition and the changes in microflora were studied under the effect of aeration by the method of air bubbling through the disc aerators. Application of artificial aeration in ponds of the Bobrovitsa (USSR) sugar-refinery caused a 2.5-fold increase in the mineralization rate of N-containing organic compounds as a result of which the sanitary state and organoleptic properties of water improved. Artificial aeration is established to suppress development of blue-green algae (Aphanizomenon flos -aquae) in the spring-summer period.--Copyright 1978, Biological Abstracts, Inc.
W78-05812

URBAN STORM WATER MANAGEMENT,
For primary bibliographic entry see Field 5G.
W78-05821

SIMPLE METHODS FOR RAINFALL-RUNOFF-PROCESS. RUNOFF HYDROGRAPH CURVES FOR RAIN AND MIXED WATER CANALS (EINFACHE MODELLE FUER NIEDERSCHLAG-ABFLUSS-PROZESSE. ABFLUSSGANGLINIEN FUER REGEN UND MISCHWASSERKANAELE),
H. W. P. Schulz.
Wasser und Boden, Vol. 30, No. 1, p 2-5, 1978. 7 fig, 3 ref.

Descriptors: *Storm water, *Urban runoff, *Mathematical models, *Model studies, *Sewers, Rainfall-runoff relationships, Hydrograph analysis, Estimating, Design criteria, Analytical techniques, Hydrologic aspects, Waste water treatment.

Runoff retention and runoff hydrograph curves were derived from rainfall curves on the basis of translation and retention of water as applied to sewer system design. The basic models integrated by means of hyperbolic functions, are suitable for engineering calculations. They are also more flexible than the summation curve and time constant methods. (Takacs-FIRL)
W78-05823

GROUND PROBLEMS OVERCOME ON CRAWLEY SEWER JOB.
For primary bibliographic entry see Field 8D.
W78-05824

TOXIC WASTE DUMPING INCIDENT DEMONSTRATES SURVEILLANCE NEEDS.
For primary bibliographic entry see Field 5G.
W78-05825

PROTECTION OF UNDERGROUND WATER MAINS AGAINST CORROSION,
Bombay Municipal Corp., Bombay (India).
For primary bibliographic entry see Field 8G.
W78-05826

USE OF MIXING PIPES TO IMPROVE THE FLOW OF WASTE WATER INTO LAKES (EINSATZ VON MISCHROHREN ZUR VERBESSERUNG DER EINLEITUNG VON ABWASSER IN SEEN),
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie.
For primary bibliographic entry see Field 5E.
W78-05829

FLOW ATTENUATION IN SEWERS,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W78-05830

ELECTROLYTIC FLOCCULATION PLANT--ESPECIALLY FOR ACTIVATED SEWAGE SLUDGE PROCESSING.
German Patent DS 2259-020. Issued November 17, 1977. Derwent German Patents Abstracts, Vol. Y, No. 47, p 2-3, January, 1978.

Descriptors: *Activated sludge, *Flocculation, *Anodes, *Cathodes, *Electrodes, *Patents, Separation techniques, Design data, Sludge disposal, Waste water treatment, Municipal wastes, Treatment facilities.

A process for the treatment of sludge using electrolysis has been patented. Sludge is fed into a flotation cell which has inlets for sludge and outlets for the treated water. A uniform surface scum layer and more efficient water drainage are created by the homogeneous flow conditions within the cell. The sludge inlet and clarified water drain are located along the full length of the gas bubble-producing electrode apparatus. Anodes and cathodes are superimposed on the bottom of the cone-shaped container. The anodes form a grid with the cathode plate placed beneath them. Sludge is passed along the entire length of this arrangement to bring about electrolytic flocculation. The process is especially effective in activated sludge treatment. (Lisk-FIRL)
W78-05831

PURIFICATION AND CLARIFICATION OF SEWAGE--USING A FINELY DIVIDED COAGULATION-ADSORPTION MATERIAL HAVING A THIN HYDROXYLATED SURFACE.
Netherlands Patent NL 7704-854. Issued November 7, 1977. Derwent Netherlands Patents Report, Vol. Y, No. 47, p 6, January, 1978.

Descriptors: *Zeta potential, *Coagulation, *Adsorption, *Oxides, *Silicates, *Patents, Separation techniques, Waste water treatment, Municipal wastes, Water treatment.

A patent has been issued for a waste water treatment process which involves the use of a coagulant-adsorbing agent for clarification. Suspended solids, covered matter, and microorganisms are removed by the addition of a finely divided material which has the capacity for both coagulation and adsorption. The material has a thin hydroxylated layer which is derived from the finely divided material or from other materials. This coagulating and adsorbing material has individual particles with thin hydroxylated surfaces having positive zeta potentials. The zeta potential is determined by pH absorption. The coagulating agent with a hydroxylated layer in the form of finely divided material is preferably derived from oxides or silicates. (Lisk-FIRL)
W78-05832

PLANT FOR ACTIVATED SLUDGE TREATMENT OF EFFLUENT--OF COMPACT DESIGN AND CONSTRUCTION.
Belgian Patent BE-855-140, Issued November 28, 1977. Derwent Belgian Patents Abstracts, Vol Y, No 48, p 3-4, January, 1978.

Descriptors: *Activated sludge, *Sludge disposal, *Aeration, *Settling basins, *Sewage treatment, Separation techniques, *Patents, Equipment, Design data, Waste water treatment, Municipal wastes.

A compact plant for the treatment of waste water by the activated sludge process has been patented. Screening of large solids from the effluent is conducted in an excavated earthen basin formed by a dam. The resulting solids are pulverized with a comminuting pump. The waste water is aerated and stirred in a circular motion by gas jets in the aeration basin. Waste material is contantly removed from the center of the basin. A channel runs horizontally from the top of the aerator to a distributor in the center of the settling basin. A scraper continuously removes sludge from the settling basin. The sludge is stored in a lagoon. One side of the unit corresponds in length to the largest dimension of the largest piece of equipment. The parallel remaining side is equal in length to the summation of the smallest dimension of the largest unit and the largest dimension of another unit. (Lisk-FIRL)
W78-05833

TREATING WASTE WATER, ESPECIALLY FROM CESS PITS, WITH FLOCCULANTS--THEN GRAVITY FILTRATION THROUGH TEXTILE TO REDUCE SOLIDS AND BOD.
Belgian Patent BE-854-634. Issued November 14, 1977. Derwent Belgian Patents Abstracts, Vol Y, No 47, p 2, January, 1978.

Descriptors: *Flocculation, *Filtration, *Cesspools, *Patents, *Waste water treatment, Separation techniques, Design data, Biochemical oxygen demand, Chemical oxygen demand, Municipal wastes.

A waste water treatment process utilizing flocculation followed by filtration through a support material has been patented. Flocculants are applied to the effluent in the first stage of treatment. The waste water is then passed through a gravity filter for the removal of suspended solids. The gravity filter consists of an apparatus containing a textile support and the separated solids. The process has proven effective in reducing the BOD and removing up to 20,000 mg/liter of COD from the effluent. The treatment has been shown to be an effective initial separation step in the processing of cesspool and sludge collector effluents. This preliminary separartion process is reported to be less expensive, more adaptable, and less time consuming than conventional separation techniques. (Lisk-FIRL)
W78-05834

AEROBIC SEWAGE TREATMENT SYSTEM.
Australian Patent 487,544. Issued October 27, 1977. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol 47, No 40, p 3642, October, 1977.

Descriptors: *Aeration, *Aerobic treatment, *Patents, *Activated sludge, *Design data, Sewage treatment, Waste water treatment, Waste water disposal, Equipment.

A patent has been issued for a divided aeration tank which provides automatic sewage treatment with low maintainance for individual domestic use. The unit employs an aeration tank with a perforated divider forming two aeration chambers. Raw sewage enters the first aeration chamber through an inlet and passes into the second aeration chamber. An airlift pump in the second chamber continuously pumps sewage and waste water into a separate tank for settling and maintains a constant level of fluid just below the sewage inlet. Liquid level maintenance by the airlift pump enables the aeration tank to withstand shock hydraulic loads. The separate settling tank is equipped with several settling acceleration plates, slanted in the direction of the aeration tank, which transfer effluent to a filter bed. (Lisk-FIRL)
W78-05835

HORIZONTAL AXIS AERATING ROTOR FOR WASTE WATER TREATMENT--USES POLYGONAL ROTOR NODULES WITH ANGLED BEATER BLADES.
French Patent FR-2344-503. Issued November 18, 1977. Derwent French Patents Abstracts, Vol A, No 2, p 3-4, February, 1978.

Descriptors: *Activated sludge, *Rotors, *Aeration, *Oxygenation, *Patents, Biological treatment, Design data, Equipment, Waste water treatment, Municipal wastes.

A waste water aeration system with modular polygonal rotors and angled beater blades has been patented. Polygonal end plates forming coaxial modules are attached to a horizontal rotary shaft. The corresponding end plates are connected by flat stringer plates equipped with beater blades along the outer edges. The beater blades are all positioned at the same angle with respect to the rotary shaft's axis. Subsequent modules are fitted with increasingly angled beater blades, with increments of 15 degrees for each successive module. The maximum angle of the beater blades should be no more than 60 degrees. The hexagonal side plates are bent toward the center of the module. As the rotary shaft turns the module, the beater blades along the stringer plates mix the waste water. The water is oxygenated by the rotating beater blades as it passes through the biological treatment tank. It is suggested that beater blades are more easily installed on the flat surface of a polygonal rotor. (Lisk-FIRL)
W78-05836

SEWAGE SETTLING TANK WITH FLOATING SIPHON SYSTEM--HAS BAFFLES FORMING CLEAR WATER ZONE ABOVE TUBE SETTLERS.
French Patent FR-2344-502. Issued November 18, 1977. Derwent French Patent Abstracts, Vol A, No 2, p 3, February, 1978.

Descriptors: *Settling basins, *Water purification, *Sludge treatment, *Siphons, *Patents, Conveyance structures, Design data, Equipment, Waste water treatment, Sludge disposal, Separation techniques, Municipal wastes.

A patent has been issued for a waste water settling system which produces clarified water and siphons off settled sludge. Th settling tank contains two or more banks of tube settlers located on a horizontal plane near the tank's bottom. Baffles, containing scaled floating carriage openings at one end, extend vertically from rhe settler banks to form a clarified water area. Water levels are maintained by outlets in the clear water zone. A siphon, supported by the foating carriage, extends horizontally between the settlers and removes sludge through inlets located on lateral branches. Untreated liquid is prevented by a seal from flowing through the carriage inlet in the baffle and into the clarified water zone. The clear liquid is removed through outlets located near the settling banks. (Lisk-FIRL)
W78-05837

ACTIVATED SLUDGE EFFLUENT TREATMENT--WITH EJECTOR AERATING/EFFLUENT CIRCULATING SYSTEM IN A TREATMENT TRENCH.
German Patent DS-2404-289. Issued December, 29, 1977. Derwent German Patents Abstracts, Vol. A, No. 2, p 3, February, 1978.

Descriptors: *Activated sludge, *Aeration, *Patents, *Sludge treatment, *Bubbles, Gases, Pressure, Design data, Equipment, Waste water treatment, Municipal wastes.

An effluent aeration and circulation tank to be used during activated sludge treatment of waste water has been patented. Gas-injecting aeration nozzles are mounted near the bottom of the activated sludge tank. A gas-fluid mixture is injected into the sewage sludge at an impulse density of 3-5 kilopascals to produce a sludge impulse density of 90-500 pascals. The gas-liquid injection nozzles are positioned asymmetrically with respect to the tank's cross section. This causes the activated sewage sludge to flow in a closed horizontal circuit within the tank. The columns of rising bubbles are rotated by the injected gas-fluid mixture. This motion prevents the settling of the activated sludge within the system during treatment. (Lisk-FIRL)
W78-05838

AEROBIC BIOLOGICAL PURIFICATION OF POLLUTED EFFLUENT--BY DISSOLVING OXYGEN AT PROGRESSIVELY INCREASING LIQUID PRESSURE.
Netherlands Patent NL-7706-126. Issued December 12, 1977. Derwent Netherlands Patents Report, Vol. A, No. 1, p 2, February, 1978.

Descriptors: *Biological treatment, *Aeration, *Water pressure, *Patents, *Oxygenation, Waste water treatment, Design data, Equipment, Activated sludge, Municipal wastes.

A patent has been issued for a compact waste water aeration process using compression and decompression coils for increased oxygenation during biological treatment. The compression coil is a flat, spiral pipe which rotates about a vertical axis. Waste water is introduced into the center of the coil and the force of rotation draws the liquid towards the periphery of the coil. The pressure of the liquid increases to a maximum at the periphery of the coil; oxygen-bearing air is injected to the liquid as it passes through the coil. This coil also rotates around a vertical axis, preferably attached to the same drive shaft and rotating coaxially with the compression coil. The liquid passes from the outside of the decompression coil. The liquid passes from the outside of the decompression coil towards its interior axis, decreasing in pressure as it approaches the central outlet. A portion of liquid-entrained sludge is removed from the decompression coil before it passes through the outlet and is returned to the compression coil. The purified liquid from the decompression coil is passed through a degassing device before discharge. (Lisk-FIRL)
W78-05839

BAND PRESSURE FILTER FOR DEHYDRATING WASTE WATER SLUDGE ETC.--HAS POWER CYLINDER BAND TENSIONING TO COMPENSATE FOR CAKE THICKNESS VARIATION.
Netherlands Patent NL-7705-632. Issued December 13, 1977. Derwent Netherlands Patents Report, Vol. A, No. 1, p 2, February, 1978.

Descriptors: *Dewatering, *Sludge treatment, *Hydraulic structures, *Patents, *Filtration, Separation techniques, Design data, Equipment, Dehydration, Waste water treatment, Sludge disposal, Municipal wastes.

A patent has been issued for a pressurized sludge filtration and dewatering system. A set of filter bands is positioned on a series of rollers which rotate in alternate directions. The sequential rollers have diminishing diameters; the first roller has a diameter five times greater than that of the next two rollers and twice that of the fourth and fifth rollers. The rollers, which are positioned to hold the filter bands in tension, are mounted on pivoting arms whose axes are rotated by power cylinders. The cylinders are provided with actuating liquid at a pressure equal to the pressure of the tension rollers. The sludge is dewatered as it is passed between the bands and the rollers. As the bands rotate around the rollers, one band acts as a filtering device while the other applies pressure. Since the bands remain taut, sludges of differing thicknesses are allowed to pass between the bands for dewatering. (Lisk-FIRL)
W78-05840

BIOLOGICAL EFFLUENT PURIFICATION AND CLARIFICATION EQUIPMENT--WITH AERATORS, FLOTATORS AND SCRAPER CONVEYOR TO REMOVE ACTIVATED SLUDGE WHICH IS THICKENED.
Soviet Patent SU-548-574. Issued March 14, 1977. Derwent Soviet Inventions Illustrated, Vol. 8, No. 1, p 3, February, 1978. 1 fig.

Descriptors: *Activated sludge, *Patents, *Aeration, *Flotation, *Sludge treatment, Design data, Sludge digestion, Biological treatment, Separation techniques, Waste water treatment, Municipal wastes.

A patent for a biological treatment unit with an activated sludge removal and thickening system is presented. Effluent is drawn through an intake pipe into the activated sludge tank where it is mixed by automatic intake aerators. Flotators, located in the bottom of the tank, separate the activated sludge by injecting it with air bubbles which rise to the surface as the liquid passes through the distribution system. The clarified liquid is transferred to a trough where it overflows into an intermediate collection tank. Partial recirculation of the clarified liquid is accomplished by a pump; the remainder of the water passes through outlets for further processing. A scraper mechanism removes the excess activated sludge and thickens it before transferring the sludge into gulleys for removal to additional treatment processes. The activated sludge is thickened by hollow, cylindrical elements located above the flotators. (Lisk-FIRL)
W78-05841

WASTE WATER FLAME DECONTAMINATION--BY DIVIDING HIGH TEMPERATURE COMBUSTION PRODUCTS INTO NUMBER OF STREAMS CORRESPONDING TO NUMBER OF CONTROL STAGES.
For primary bibliographic entry see Field 5E.
W78-05842

WASTEWATER PLANT HAS AN EYE ON THE FUTURE,
Raleigh Pollution Control Office, NC.
W. P. Cannon.
Water and Wastes Engineering, Vol 14, No 12, p 20-26, December, 1977. 1 fig.

Descriptors: *Waste water treatment, *Treatment facilities, *Sludge treatment, *Aeration, *North Carolina, Sewage treatment, Tertiary treatment, Carbon filters, Chlorination, Municipal wastes, Sanitary engineering, Settling basins, Filtration, Pumps.

The operation of the recently completed waste water treatment facility in Raleigh, North Carolina, is examined. The 30 mgd operation was designed to provide waste water treatment for Raleigh's increasing population through the year 2020 with provisions for expansion to a capacity of 100 mgd. During primary treatment the raw waste water is pumped through coarse bar screens where solids are removed for transport to a sanitary landfill. The first part of secondary treatment includes aeration, followed by secondary settling in earthen basins equipped with drains for transfer of influent to other treatment units. Settled waste water then flows to the return sludge screw pump station and onto secondary clarifiers. A Parshall flume at the return sludge metering station monitors the return flow. Sludge treatment is accomplished by aerobic digesters, sludge thickeners, dewatering, sludge treatment is accomplished by aerobic degesters, sludge thickeners, dewatering, and sludge oxidation. Secondary effluent is processed through automatically backwashed tertiary filters at a rate of 3-7.5 gal/sq ft/min. The backwash rate is 5-22.5 gal/sq ft/min. Effluent is polished by filtration through layers of anthracite coal, sand, and gravel. Chlorination is accomplished by: three chlorinators, each with a capacity of 8000 lbs chlorine gas/24 hrs; three electrical chlorine evaporators; and a chlorine residual analyzer. The plant consists of an administration and laboratory building, a filter building, and a sludge dewatering building. (Lisk-FIRL)
W78-05843

PERFORMANCE OF THE ACTIVATED SLUDGE PLANT,
Bombay Municipal Corp. (India). Dadar Sewage Purification Plant.
D. S. Joshi.
Indian Journal of Environmental Health, Vol 19, No 3, p 238-243, 1977. 1 fig, 3 tab, 3 ref, 2 append.

Descriptors: *Activated sludge, *Aeration, *Biochemical oxygen demand, *Suspended solids, *Treatment facilities, Sludge treatment, Sanitary engineering, Sewage treatment, Municipal wastes, Waste water disposal.

Dadar Sewage Treatment Works in Bombay, India, has a total capacity of 20 mgd using the activated sludge process and trickling filters. Sewage receives primary treartment only. Suspended solids, BOD, and oxygen absorption in treated effluent were measured over a two-year period after a renovation of the sewage treatment plant. The aeration system, site of the renovation, was changed by the replacement of 36 aeration cones by 24 cones installed in four rows. Each aeration cone runs on a six horsepower motor and the 24 cones have the same flow capacity as the original 36 cones. Return sludge pump capacities were increased to 60-65% from 30-35%. Suspended solids levels after primary treatment were reduced by 64.6%, BOD was reduced by 32.4%, and four-hour potassium permanganate absorption by 41.4%. (Lisk-FIRL)
W78-05844

THIS PLANT MARRIES TWO WASTES,
Wiley and Wilson, Inc., Lynchburg, VA.
W. H. Clingenpeel.
Water and Wastes Engineering, Vol 14, No 12, p 36-39, December, 1977. 2 fig.

Descriptors: *Pulp wastes, Pulp and paper industry, *Municipal wastes, *Industrial wastes, *Treatment facilities, *Virginia, Biochemical oxygen demand, Sludge treatment, Nitrogen, Chlorination, Waste water treatment.

A Virginia waste treatment plant has been redesigned to treat both municipal and industrial wastes. Mead Corporation's Paperboard Mill in Virginia underwent processing modifications that included elimination of pulping, recycling of paper, and recycling of process water. Lynchburg, Virginia's waste treatment facility was upgraded from an 11-mgd primary capacity to a 22-mgd secondary treatment capacity plant. The Mead waste water flow was estimated at 3.0 mgd with a BOD of 14,000 lbs/day. Because treatment of the combined primary sludges was found to be ineffective, primary settling and disposal of the domestic and industrial sludges were conducted separately. Two variable speed pumps and two constant speed pumps, each with a 15 mgd capacity, convey the raw sewage through a Parshall flume to the primary clarifiers. The sludge removal clarifiers were installed to supplement the two existing clarifiers. A second chlorine tank, a wet air oxidation system, and two sludge dewatering centrifuges were also added to the treatment plant. An ammoniator was added to compensate for the nitrogen deficiency of the industrial flow. The chlorinators and evaporators, with a 16,000 lbs/day capacity, supply high-pressure process water to the plant via a non-potable water pumping station. (Lisk-FIRL)
W78-05845

AEROBIC SLUDGE DIGESTION AT COLD TEMPERATURES,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
D. S. Mavinic, and D. A. Koers.
Canadian Journal of Civil Engineering, Vol 4, No 4, p 445-454, December, 1977. 8 fig, 1 tab, 17 ref.

Descriptors: *Aerobic treatment, *Activated sludge, *Suspended solids, *Temperature, *Biochemical oxygen demand, Sludge digestion, Sludge treatment, Municipal waste, Waste water treatment.

The effects of low temperature on the aerobic digestion of activated sludge were examined. Three digester operations, continuous feed, daily fill, and batch aeration, were compared using six sludge ages. Lower temperatures and decreased sludge age were observed to decrease the volatile suspended solids removal rates. A similar reduction in volatile suspended solids removal occurred in the continuous and semi-continuous feed digesters operated at 20C and 10C. At 5C, the volatile suspended solids reduction was greater under semi-continuous operation than in the continuous flow mode for all sludge ages tested. Batch aeration exhibited a high degree of volatile suspended solids removal at 20C when compared to continuous flow operation at the same temperature, although the reverse proved true at 10C. Batch aeration and semi-continuous flow operations at 5C showed similar reduction rates. Volatile suspended solids removal was significantly decreased in laboratory experiments and studies at two treatment plants when the value of the product of sludge age and temperature exceeded 250. Oxygen uptake rates and BOD levels were also significantly affected by sludge age and temperature. (Lisk-FIRL)
W78-05846

CHLORINE AND ACID CONDITIONING OF SLUDGE,
California State Water Resources Control Board, Sacramento.
W. H. Sukenik, P. H. King, and J. W. Olver.
Journal of the Environmental Engineering Division, Proceeding of ASCE, Vol 103, No EE6, p 1013-1020, December, 1977. 10 fig, 1 tab, 8 ref.

Descriptors: *Chlorine, *Chlorination, *Acidity, *Filtration, *Chemical oxygen demand, Metals, Chromium, Copper, Zinc, Sodium compounds, Waste water treatment, Anaerobic digestion, Aerobic treatment, Municipal wastes.

The effects of chlorine and acidity on the filterability and release of organic matter and metals from primary sludge after chlorination were analyzed. Samples of raw primary, anaerobically-digested, and aerobically-digested sludge were treated with 500, 700, and 1,000 mg/liter sodium hypochlorite. The pH was varied from 3 to 7 with applications of sulfuric acid or sodium hydroxide. Observations were made on the specific resistence to filtration, COD levels, and the release of chromium, copper, and zinc after chlorine and acid treatment. Filterability of raw primary sludge improved slightly with the addition of 500 mg/liter chlorine at pH 3 and 700 mg/liter chlorine at pH 4. A significant decrease in filterability was observed at pH 5-7 with low chlorine additions, while the lowest sludge filterability occurred with the 100 mg/liter chlorine treatment. A decrease in pH slightly improved the filterability of anerobically digested sludge, although overall filterability was unaffected by chlorine or acid treatment. Aerobically treated sludge demonstrated substantial increases in filterability after acid treatment alone. Filtrate COD after chlorine oxdiation increased in raw sludge at pH 4, increased in anaerobic sludge as the pH was lowered, and increased in aerobic sludge with higher chlorine doses. The release of zinc, copper, and chromium increased for raw and anaerobic sludge after chloride treatment at low pH. (Lisk-FIRL)
W78-05847

EFFECTIVE PHOSPHORUS REMOVAL BY ADDING ALUM TO SEPTIC TANK,
Ontario Ministry of the Environment, Toronto.
M. Brandes.
Journal Water Pollution Control Federation, Vol 49, No 11, p 2285-2296, November, 1977. 6 fig, 4 tab, 29 ref.

Descriptors: *Phosphorus, *Biochemical oxygen demand, *Aluminum, *Septic tanks, *Domestic wastes, Sewage treatment, Separation techniques, Waste disposal, Iron, Sulfates, Sewage effluents, Waste water treatment.

Significant removal of phosphorus and other contaminants from septic tank effluent was achieved by the addition of aluminum sulfate to septic wastes. Additions of 430 mg/liter of alum were made for each toilet flush in a three-person residence in Ontario, Canada. Samples of septic tank effluent and sludge were taken before and after alum application. The amount of soluble phosphorus contained in the effluent was reduced by 99.2%. The addition of 246.8 mg/liter of alum to the waste resulted in 84.9% phosphorus retention in the sludge with 15.1% released in the effluent. With the same alum application, total coliform levels in the effluent were reduced by 35% and fecal coliforms were reduced by 80%. Further total coliform and fecal coliform removal was achieved with the addition of 430 mg/liter of alum. Ninety per cent of the aluminum content was retained in the sludge while a 19% increase in iron in the sludge was realized with the alum treatment. Sludge retention of sodium, potassium, chlorides, and sulfates increased, while sulfate concentrations in septic effluent also increased with alum addition. The average 53.3% BOD removal with 246.8 mg/liter of alum did not significantly improve with greater alum doses. The alum treatment resulted in a higher sludge precipitation rate. (Lisk-FIRL)
W78-05849

SEWAGE PLANT SHOWS OFF FANCY FORMWORK.
Engineering News-Record, Vol 200, No 3, p 52-53, January, 1978.

Descriptors: *Activated sludge, *Aeration, *Biochemical oxygen demand, *Oxygenation, *Storm water, Overflow, Food processing industry, Municipal wastes, Treatment facilities, California, Waste water treatment, Sludge treatment.

A new 300-mgd activated sludge treatment is currently being constructed for the Sacramento County, California area to replace the present 25-mgd plant. The completed treatment system, costing an estimated $395 million, will consist of seven pumping stations, 75 miles of interceptor sewers, and the advanced secondary treatment plant. Five existing digesters will be modified for incorporation into facility; aeration and settlement facilities will be converted to chemical handling facilities. Storm water overflow will be controlled by the present treatment plant which will be converted to a 60-mgd capacity and backed up by a 21,000,000-gal holding lagoon for excess flow. Aeration will be accomplished by a submerged, revolving, conical agitator using high purity oxygen. This type of activated sludge process is considered more effective in controlling BOD of food processing wastes and other organic industrial discharges. Aeration tanks up to 32 feet deep can be used in this system; all facilities will be enclosed to prevent odor emissions. The treatment facility is expected to reduce BOD by 92% and suspended solids by 88%. (Lisk-FIRL)
W78-05850

FROM WASTEWATER TO RESOURCE IN ST. PETERSBURG, FLORIDA,
L. A. Dove.
Resource Recovery and Conservation, Vol 2, No 4, p 329-336, November, 1977. 9 fig, 3 tab, 8 ref.

Descriptors: *Return flow, *Filtration, *Recirculated water, *Tertiary treatment, *Chlorination, Sewage treatment, Potable water, Reclaimed water, Water purification, Irrigation, Injection wells, Municipal wastes, Waste water treatment, Treatment facilities, Florida.

A zero-discharge waste water treatment system currently under construction in St. Petersburg, Florida, is described. The system was designed to furnish irrigation and drinking water to an area surrounded by polluted salt-water bays and with a limited fresh water supply. Designs for the system, the first regional recycling operation of its kind in the country, involve the expansion of the four existing secondary treatment plants in St. Petersburg to an increased combined capacity of 340,000 cu m/day. One plant that has undergone modification and expansion has been able to remove 90% of the BOD and suspended solids from the effluent. A tertiary treatment plant provides multi-media filtration, alum feed at 6.0-7.5 mg/liter as a filter aid, flash chlorination, and chlorine injection in a 38,000-cu m retention pond. The effluent produced is of potable quality at 1-2 JTU with 1.0-1.5 mg/liter of residual chlorine after 30 minutes, and 0.2/100 ml or less coliform count. Treated water is transported via a master pumping station to a 22.5-km distribution system for irrigation. During rainy seasons and other periods when irrigation is unnecessary, the treated water is pumped to a deep injection well system with a capacity of 76,000 cu m/day. Nutrients useful in irrigation are retained in the treated effluent. The treatment process will provide 40% of the potable water demand for area irrigation. (Lisk-FIRL)
W78-05851

INFLUENCE OF TEMPERATURE ON THE PERFORMANCE OF SEPTIC TANK SYSTEMS,
ADI Ltd., Fredericton (New Brunswick).
T. Viraraghavan.
Water, Air, and Soil Pollution, Vol 7, No 1, p 103-110, January, 1977. 2 fig, 1 tab, 13 ref.

Descriptors: *Septic tanks, *Tile drainage, *Domestic wastes, *Biochemical oxygen demand, *Phosphate, Temperature, Drainage systems, Sewers, Waste water disposal, Treatment facilities.

The impact of air, liquid, and soil temperatures on the efficiency of septic tank and subsurface tile field operations was studied. Temperature readings were recorded at a northern Canadian site over the period of more than a year in a tile field and three soil depths, in the septic tank and the surrounding soil, and in the air. Mean monthly air temperatures ranged -11.7-23.7C; the temperature of the sewage in the septic tank never dropped below 15.8C and never exceeded 21.5C. Temperatures inside the tile field ranged 3.3-18.7C; the nearby soil temperatures usually exceeded those of the air. Physical adsorption, especially of phosphates, increased as the temperature decreased. Reduction of BOD at a depth of 1.37 m ranged from a high of approximately 90% at less than 5C to a low of 50% between 10-15C. The sewage effluent temperature was maintained above freezing by hot water discharged into the system. System efficiences during the summer months were higher, ranging 75-85%. (Lisk-FIRL)
W78-05852

MOBILE DIESELS STAND-BY AT SEWAGE PUMPING STATIONS.
For primary bibliographic entry see Field 8C.
W78-05855

LONG-TERM PERFORMANCE OF A COUPLED TRICKLING FILTER-ACTIVATED SLUDGE PLANT,
Brown and Caldwell, Walnut Creek, CA.
R. J. Stenquist, D. S. Parker, W. E. Loftin, and R. C. Brenner.
Journal Water Pollution Control Federation, Vol. 49, No. 1, p 2265-2284, November, 1977. 15 fig, 10 tab, 8 ref.

Descriptors: *Activated sludge, *Trickling filters, *Operation and maintenance, *Treatment facilities, *Design data, Municipal wastes, Sewage treatment, Waste water treatment.

The upgrading of the Livermore Water Reclamation Plant in Livermore, California, and its operation and performance from its startup in early 1967 through its seventh full year of operation in 1974 are reviewed. The expansion involved increased influent and primary effluent pumping capacity, addition of a secondary trickling filter, conversion of the existing secondary sedimentation tank to a primary tank, and increased disinfection capacity. Use of the coupled trickling filter-activated sludge process has resulted in the consistent production of an effluent low in BOD, suspended solids, ammonia, and coliform bacteria. Operational problems appeared to be correctable through newer design techniques. Plants of similar design have either been or are now being constructed in San Pablo and Lompoc, California, and in Corvallis, Oregon. (Baker-FIRL)
W78-05856

TREATMENT OF THERMALLY-CONDITIONED SLUDGE LIQUORS,
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
U. Loll.
Water Research, Vol. 11, No. 10, p 869-872, 1977. 3 fig, 2 tab, 12 ref.

Descriptors: *Heat treatment, *Sludge treatment, *Biological treatment, *Dewatering, *Aeration, Sewage treatment, Chemical oxygen demand, Biochemical oxygen demand, Filtration, Design data, Waste water treatment.

Studies on the aerobic-thermophilic purification of undiluted filter effluents are described. The highly concentrated substrates from the dewatering of

thermally-conditioned sludges were biologically treated with aerobic-thermophilic processes in batch and continuous systems. Process performance was assessed according to reductions in COD, BOD, total organic carbon, and volatile solids. Temperature, pH, total phosphorus, and ammonia-nitrogen were also measured. The studies indicated that reductions in COD of up to 71% and in BOD of up to 96% were possible. Exothermal processes in the reactor resulted in an effluent temperature of about 25 C, compared to an influent temperature of about 17-18 C. (Baker-FIRL)
W78-05857

HYACINTHS FOR WASTEWATER TREATMENT,
J. Joseph.
Plumbing Engineer, Vol. 5, No. 6, p 14-16, November-December, 1977.

Descriptors: *Water hyacinth, *Biological treatment, *Absorption, *Treatment facilities, *Sewerage, Sewage treatment, Lagoons, Installation costs, Operating costs, Municipal wastes, Waste water treatment.

The use of water hyacinths has been proposed as a low-cost means of waste water treatment. Water hyacinths absorb contaminants from water which can be recovered upon harvesting. The harvested plants can be used as supplemental animal feed or converted into methane and fertilizer by composting. Results from a test facility in Orange Grove, Mississippi, using hyacinths to treat raw sewage from a community of 5000 residents indicate that water hyacinths can be used for final polishing to produce effluent of a quality which complies with advanced waste water treatment standards. A treatment facility designed to use water hyacinths generally consists of treatment lagoons and aeration, filtration, and plumbing equipment. Costs for operation and maintenance are generally low. Waste water is first held in an aerated basin for a two-week period to allow bacterial consumption of the waste water organics. The final filtration lagoon, planted with water hyacinths, can usually be smaller than the aeration basin because of its higher efficiency. The water hyacinth lagoon at Orange Grove, Mississippi, effectively reduces the concentration of suspended solids in effluent by 63-80% and nitrogen by about 60%. (Snyder-FIRL)
W78-05858

LOW-FLOW WASTEWATER TREATMENT.
Rain, Vol. 4, No. 3, p 6-7, December, 1977. 7 fig.

Descriptors: *Domestic wastes, *Treatment facilities, *Low flow, *Sewage treatment, *Ultimate disposal, Volume, Filters, Fertilization, Sewerage, Suspended solids, Seepage, Municipal wastes, Waste water treatment, Waste water disposal.

A simple treatment system for low volumes of waste water with few suspended solids is based on the use of a 30-gal garbage can as a settling tank to trap floatables which would clog the seepage pit. When floatables and grease appear in a 5-gal plastic bucket used as a check tank, the settling tank should be emptied and the contents buried. A sand filter made from a 55-gal drum can be used to treat 25-50 gal of greywater per day. Because sand filters may fail if continually saturated, the alternate use of two filters is recommended. One direct surface application system is designed to retain urine and greywater in a 55-gal drum for use as irrigation water with a fertilizer value. The end of the hose carrying the waste water to the garden is covered by a cloth bag for retention of large particles. Systems have been designed for treating 20-50 gal to greywater daily using tar-covered, 55-gal drums. The leach line for one such system uses a 'V' made of redwood or cedar instead of plastic or tile pipe. A system for reusing greywater is designed to send all sewage directly to the sewer when a valve is closed and to a holding tank when the valve is open. (Snyder-FIRL)
W78-05859

WASTING WATER.
Rain, Vol. 4, No. 3, p 4-5, December, 1977. 1 fig.

Descriptors: *Domestic wastes, *Treatment facilities, *Water conservation, *Organic wastes, *Sewage treatment, Water consumption, Standards, Sewerage, Installation, Municipal wastes, Waste water treatment, Waste water disposal.

Separate treatment of toilet wastes and kitchen garbage of composting can reduce the extent of treatment required for the remaining greywater. Separate treatment and water-conserving measures can reduce domestic waste water treatment needs sufficiently to allow the use of simple treatment systems installed and maintained by the homeowner. These simple systems can cost much less than central septic-leach systems. They typically return water to the water table in small doses. Their disadvantages are generally related to the lack of experience and inadequate standards. Because construction standards vary widely and have a poor compliance record, regulatory agencies are usually reluctant to accept these systems. Treatment requirements for greywater are generally dependent upon the waste water volume, its strength, and the intent for reuse. It is very difficult to determine the nature of health hazards associated with greywater treatment. (Snyder-FIRL)
W78-05860

TRENDS EMERGE, BUT SOLAR DESIGN OPTIONS STILL OPEN,
Modern Metals, Chicago, IL.
For primary bibliographic entry see Field 8C.
W78-05861

SANITARY DISTRICT SOLVES SLUDGE REMOVAL PROBLEM.
For primary bibliographic entry see Field 5G.
W78-05862

DOMESTIC WASTEWATER RECYCLING.
Engineering News-Record, Vol. 199, No. 20, p 54, November, 1977.

Descriptors: *Domestic wastes, *Treatment facilities, *Recycling, Equipment, *Water purification, Water reuse, Biological treatment, Analytical techniques, Demineralization, Filtration, Oxidation, Adsorption, Waste water(Pollution), Waste water treatment, Waste water disposal.

Purecycle, of Boulder, Colorado, has developed a 5-step process for purifying domestic waste water for recycling. The recycling module is controlled and monitored by sensors connected to a microprocessor. The recycling module would be installed outside the house and connected with existing plumbing. It's size is approximately that of a compact car, and its costs will be comparable to those of conventional systems. Household waste water enters a biological reactor for the oxidation of organics; solids are removed by settling. The water then enters a filtration system and an organic adsorption unit, followed by a demineralizer and sterilizer. The microprocessor monitors the system for malfunctions. According to the manufacturer, tests have indicated that the system can produce a constant and safe recycled water supply at reasonable cost. (Snyder-FIRL)
W78-05864

CHEMICAL INTERACTION IN PARTICAL SEPARATION,
Eidgenoessische Technische Hochschule, Zurich (Switzerland).
W. Stumm.
Environmental Science and Technology, Vol. 11, No. 12, p 1066-1070, 1977. 8 fig, 8 ref.

Descriptors: *Separation techniques, *Chemical precipitation, *Coagulation, *Adsorption, *Zeta potential, Colloids, Water treatment, Waste water treatment, Suspended solids, Phosphorus, Phosphates.

Chemical interaction in particle separation is discussed with respect to solution variables which may influence the charge of colloidal surfaces. The specific adsorption of Mg(++), H(+), heavy metals, and anions such as SO4(--), HPO4(--), SiO, OH3(-), and OH(-) onto hydrous oxides of Si, Al(+3), and Fe(+3) is examined with respect to the resultant electric charge on the particle surface. The relative efficiencies of particle aggregation in coagulation and particle removal in filtration are compared for natural systems and waste water treatment processes. Mechanisms of phosphate removal during sewage treatment by precipitation with Fe(+3) or Al(+3) salts are discussed. (Baker-FIRL)
W78-05865

FILTER TOWERS AND DISTRIBUTORS FOR LLANDYRNOG SEWAGE TREATMENT WORKS.
Industrial and Metallurgical Equipment Ltd., Croydon (England).
Water Service, Vol. 81, No. 979, p 565, September, 1977. 1 fig.

Descriptors: *Treatment facilities, *Filters, *Biochemical oxygen demand, *Porous media, Equipment, Municipal wastes, Industrial wastes, Waste water treatment.

The use of two filter towers and four motorized Carlton distributors at the Llandyrnog sewage treatment works in Scotland is described. The distributors were designed to provide a 60% reduction in BOD by ADF treatment over Flocor filter media. Two thirds of the influent BOD is contributed by creamery waste and one third by domestic sewage. The initial raw sewage inflow is screened to remove extraneous matter and grit. Pumps are then employed to feed the liquor to the filter tower distributors. The liquor percolates through Flocor media prior to sedimentation. Corrosion-ressitant stainless steel distributing arms are design features fo the machines. The motorized Carlton distributors are used for secondary filtration operations on a 19.5-m diam and a 23.35-m diam filter bed. An important feature in the design is the frictionless liquid seal, achieved by immersing the open ends of the pending siphons in the liquid remaining at the bottom of the revolving tank. (Baker-FIRL)
W78-05866

CHLORINATION AND OZONATION IN WATER AND WASTEWATER TREATMENT,
Pennsylvania Univ., Philadelphia. Dept. of Civil and Urban Engineering.
For primary bibliographic entry see Field 5F.
W78-05867

SLUDGE DEHYDRATION BY MEANS OF CHAMBER FILTER PRESS (SLAMAVVANNING MED KAMMERFILTER-PRESSER),
J. O. From.
Teknisk Ukeblad, Vol. 124, No. 5, p 42-44, October, 1977. 2 fig.

Descriptors: *Dewatering, *Sludge treatment, *Filters, *Filtration, *Flocculation, Equipment, Design data, Polyelectrolytes, Lime, Sewage treatment, Waste water treatment.

Principles, advantages, and experimental results on the use of chamber filter presses for dewatering sewage sludge are presented. Chamber filter presses have the advantage of being sturdy, simple to operate, and dependable. They do not require the use of synthetic polyelectrolytes for sludge

conditioning, although ferric chlroide and lime nay be used in pretreatment. Sludge from hysico-chemical waste water treatment plants an be dewatered in chamber filter presses without iming. The filter cake, with a solids content of 30-0%, can be incinerated directly without further reatment. Experiments in Norway with chamber ilter presses operated at a specific load ranging 0-150 liters/sq m/hr produced a filter cake with a olids content ranging 26-35%. Residual solids on he filter cloth could be removed by treatment with ydrochloric acid. (Takacs-FIRL)
V78-05868

ILTERS FOR SCOTTISH SEWAGE PURIFICA-ION PLANT.
Vater Services, Vol. 81, No. 979, p 558, Sep-mber, 1977.

Descriptors: *Filters, *Dewatering, *Sludge treat-nent, Equipment, *Municipal wastes, Industrial vastes, Treatment facilities, Filtration, Separation echniques, Sewage treatment, Waste water treat-nent.

Two rotary drum vacuum filters, manufactured by tockdale Engineering Ltd of Rockbank, Mac-lesfield, Cheshire, England, are being used in cotland to dewater a mixture of primary and econdary sludge at a waste water treatment plant hich handles municipal wastes in addition to ef-uents from a distillery and a vegetable cannery. he sludge, which varies in pH from 4.0 to 11.0, is onditioned by the addition of a slurry of lime and luminum chlorohydrate. After conditioning, the udge is fed by gravity to two 300 sq ft Stockdale lters. The resulting filter cake containing about 0% solids is discharged into skips for transport to landfill. (Schulz-FIRL)
V78-05869

AYLE VALLEY STW--BIGGEST IN CORN-VALL.
Vater Services, Vol 81, No 979, p 570-572, Sep-mber, 1977. 7 fig.

escriptors: Treatment facilities, *Design data, Sewage treatment, *Filters, *Sludge treatment, quipment, Sludge treatment, Municipal wastes, Vaste water treatment.

he Hayle valley sewage treatment plant in the Vest Cornwall area of England was designed to rve a summer population of 37,500 and a winter opulation of 19,000. Raw sewage is first screened nd grit is removed by two 5 m-diam Pista grit aps. The sludge then undergoes primary settling three 27 m-diam, 3.5 m-deep basins. Effluent om a local creamery, which the plant also treats, pumped to a 230 cu m holding tank and then to a imary tower filter containing 1200 cu m of ocor E. Two screw pumps transport the flow to imary humus tanks, secondary biological filters ntaining granite media, and secondary humus nks. Sludges are treated with a polyelectrolyte d dewatered by two Manor-Guva tower presses. chulz-FIRL)
78-05870

HE APPLICABILITY OF TRACER ECHNIQUES FOR STUDIES ON SEWAGE REATMENT PROCESS DYNAMICS,
chnical Research Center of Finland, Esbo.
Kuoppamaeki.
ternational Journal of Applied Radiation and otopes, Vol 28, No 10-11, p 833-837, 1977. 2 fig, ref.

escriptors: *Tracers, *Radioisotopes, *Tracking chniques, *Sewage treatment, Hydraulic proper-s, Analytical techniques, Aeration, Settling sins, Sludge treatment, Treatment facilities, unicipal wastes.

Radioactive isotopic tracers have been used to label particular elements, solid particles, and sludge for the examination of physical and chemical processes occurring during waste water treatment. The dilution method, the total count method, and the total sample method have been used to measure flow rates in channels or conduits having unknown flow cross-sections. When the flow volume and the degree of mixing between two designated points can be determined, the trace pulse victory method is favored for measuring tube flows. Tracer techniques have been used to study sedimentation basin dynamics, to detect severe hydraulic malfunctions, and to compare sedimentation basin design efficiencies. Radioactive isotopic tracers have been used in the activated sludge process to determine the sludge recycling ratio, circulation time, and mixing requirements. Tracer methods have been developed for measuring the aeration capacity of an aeration basin under actual process conditions. (Lisk-FIRL)
W78-05872

PARAMETER ESTIMATION FOR THE FIRST-ORDER BOD EQUATION USING NONLINEAR TECHNIQUES,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
T. W. Constable, and E. A. McBean.
Canadian Journal of Civil Engineering, Vol 4, No 4, p 462-470, December, 1977. 7 fig, 5 tab, 14 ref.

Descriptors: *Biochemical oxygen demand, *Waste water treatment, *Decomposing organic matter, *Oxygen demand, *Aerobic treatment, Treatment facilities, Municipal wastes, Bacteria, Waste water disposal.

BOD parameters in waste water were calculated using two nonlinear techniques. The techniques were compared to other estimation methods by application of the techniques to raw sewage and primary effluent from the Waterloo Pollution Control Plant in Ontario, Canada. The first technique used in estimating the parameters in first-order BOD equations was the Reilly discrete Bayesian technique. This method was preferred for calculating BOD parameters in situations where there was a considerable amount of operating data and a relatively small amount of experimental data. The Reilly discrete Bayesian technique, which successfully incorporated prior data into the BOD parameter estimation method, was shown to be satisfactory when other simpler techniques produced inadequate results. The second method of estimating first-order BOD parameters was Marquardt's nonlinear least-squares technique. This algorithm was found to produce results comparable to the Bayesian method and to require less time for computer calculations. While Marquardt's method was considered simpler and less expensive than the Bayesian technique, various problems, such as slow convergence, wide oscillations, and failure to converge, did occur. Two nonlinear techniques tested were considered better than the other techniques which had incorrect error structures. (Lisk-FIRL)
W78-05873

FACTORS AFFECTING EFFLUENT QUALITY FROM FILL-AND-DRAW ACTIVATED SLUDGE REACTORS,
Purdue Univ., Lafayette, IN. Environmental Engineering Lab.
G. T. Daigger, and C. P. L. Grady, Jr.
Journal Water Pollution Control Federation, Vol 49, No 12, p 2390-2396, December, 1977. 1 fig, 4 tab, 12 ref.

Descriptors: *Activated sludge, *Chemical oxygen demand, *Suspended solids, *Hydraulic systems, *Influent streams, Effluent streams, Biological treatment, Microbial degradation, Waste water treatment, Municipal wastes.

The concentration of soluble organic matter in effluent treated by the activated sludge process was compared with the concentration of organic matter in waste water before treatment. The influence of hydraulic residence time on the quality of the effluent was also observed. Experiments were conducted using plug-flow activated sludge reactors with influent lactose concentrations ranging from 600-3,600 mg/liter. Hydraulic residence times were held constant at 46 hours with the fill-and-draw cycle occurring every 24 hours. Daily samples were analyzed for suspended solids, volatile suspended solids, pH, COD, and lactose. Soluble COD concentrations in the effluent were found to be directly related to the soluble COD content of the influent. This proportional influence of influent concentration on effluent quality in a plug flow activated sludge system was found to be the same result as obtained in experiments with completely-mixed processes. Soluble COD in the effluent was produced by microbial action during the activated sludge process. It was concluded that the COD concentration of the influent determined the effluent quality, regardless of the hydraulic process, and that the activated sludge method not only used organic matter, but produced it as well. The effect of the hydraulic residence time on effluent quality could not be determined. (Lisk-FIRL)
W78-05875

MEMBRANE SEPARATION PROCESS--PRINCIPLES, PRACTICE, A iD PROSPECTS,
Aberdeen Univ. (Scotland). Dept. of Chemistry.
P. Meares.
Interdisciplinary Science Reviews, Vol 2, No 4, p 327-336, 1977. 2 fig, 6 tab, 21 ref.

Descriptors: *Membrane processes, *Separation techniques, *Electrodialysis, *Reverse osmosis, *Desalination processes, Ion exchange, Permselective membranes, Cation exchange, Anion exchange, Bonding, Gases, Membranes, Waste water treatment, Polymers, Pores, Permeability.

Various membrane processes for separation at the molecular level and for desalination, hyperfiltration, waste water treatment, and gas separation are discussed. Some polymers and rubber-like elastomers have varying molecular chain configurations which allow the pore size to change. Rigid polymers with crystalline molecular chains and pores less than five nanometers in diameter are formed by the combination of a cationic and an anionic polyelectrolyte or by combined solvent and non-solvent casting. These rigid polymers, which can become plasticized by large quantities of permeants, allow small molecules to penetrate the pores but exclude the macromolecules, making these membranes useful in dialysis and ultrafiltration. The primary processes of desalination are reverse osmosis and filtration with gel membranes used in electrodialysis and piezodialysis. Hyperfiltration with cellulose acetate membranes is effective in desalination but could be improved by the development of less bulky polymer chains and hydrogen-bonding groups. Desalination through electrodialysis utilized cationic and anionic exchange resins and electric generation. Polarization and organic fouling of the membranes inhibit the effectiveness of electrodialysis. Piezodialysis, regarded as the best method for desalination, utilizes ion and water flow coupling, and allows salt to permeate the membrane under pressure while water is absorbed. The most permeable polymer in use for separation of nitrogen and oxygen from gaseous products was found to be a dimethyl silicone membrane. While permeability was high in comparison with other membranes, selectivity was low. (Lisk-FIRL)
W78-05877

A MICRO-KJELDAHL TECHNIQUE FOR NITROGEN DETERMINATION IN WATER, WASTEWATER, AND SLUDGE,
Butler, Fairman and Seufert, Inc., Carmel, IN.
For primary bibliographic entry see Field 5A.

W78-05878

INFLUENCE OF ARTIFICIAL DRAINAGE ON PENETRATION OF COLIFORM BACTERIA FROM SEPTIC TANK EFFLUENTS INTO WET TILE DRAINED SOILS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-05881

PHOTOTROPHIC PURPLE AND GREEN BACTERIA IN A SEWAGE TREATMENT PLANT,
Institut fuer Mikrobiologie der Gesellschaft fuer Strahlenund Umweltforschung mbH, Goettingen, West Germany.
E. Siefert, R. L. Irgens, and N. Pfenning.
Applied and Environmental Microbiology, Vol. 35, No. 1, p 38-44, January, 1978. 2 fig, 5 tab, 19 ref.

Descriptors: *Activated sludge, *Phototropism, *Sulfur bacteria, *Sewage bacteria, *Metabolism, Aerobic conditions, Anaerobic conditions, Light penetration, Anaerobic bacteria, Waste water treatment, Sampling, Analytical techniques, Municipal wastes.

The content and metabolism of phototrophic bacteria in waste water purification processes were investigated in laboratory experiments with effluent from the Goettingen, West Germany, sewage treatment plant. Phototrophic bacteria were evident in every stage of the treatment process; the bacteria count was highest in sludge-bearing waste water. Colony counts of purple nonsulfur bacteria in all stages of waste treatment ranged 100-650,000 colonies/ml of waste. Purple and green sulfur bacteria colony counts ranged 0-1,300/ml. The quantity of bacteriochlorophyll, synthesized by the purple nonsulfur bacteria, in activated sludge samples was found to be 5-10 times higher than the calculated production for the bacteria colony count. It was concluded that phototrophic bacteria continue to grow in a reduced oxygen environment. The reduction of light in activated sludge layers was not a growth-limiting factor for phototrophic bacteria. It was assumed that the bacteria continue to grow through respiratory energy at low oxygen concentrations. Phototrophic bacterial growth was limited, but not eliminated under anaerobic and dark conditions. Growth continued by fermentative energy metabolism, but not efficiently enough to allow competition with chemotrophic anaerobes. Although not considered as efficient as chemotrophic bacteria in waste water treatment, phototrophic bacteria had the advantage of assimilating inorganic minerals and producing cell protein as a byproduct. An example of waste water treatment with phototrophic bacteria in Japan was cited. (Lisk-FIRL)
W78-05883

DETERMINATION OF CHLORINE DIOXIDE IN SEWAGE EFFLUENTS,
Wastewater Technology Center, Burlington (Ontario).
For primary bibliographic entry see Field 5A.
W78-05884

DISPOSAL OF INDUSTRIAL EFFLUENT CONTG. SALTS AND ORGANIC MATTER ARISING PARTIC. FROM MFG. WEEDKILLER AND INSECTICIDES.
Netherlands Patent NL 7704-214. Issued November 21, 1977. Derwent Netherlands Patents Report, Vol. Y, No. 49, p 3, January, 1978.

Descriptors: *Salts, *Organic matter, *Insecticides, *Chemical industry, *Patents, Incineration, Evaporation, Separation techniques, Chemical wastes, Desalination, Waste water treatment, Industrial wastes, Herbicides.

A patent has been issued for a process for the removal of salts and organic materials from weedkiller and insecticide manufacturing effluents. The waste water is connected through evaporation and introduced into a directly fired combustion chamber. Organic materials in the waste are decomposed and the physical state of the salts is transformed. The concentrate is converted to a powder by spray drying with hot gas; the powder is pneumatically transferred to a combustion chamber. The powdered salts ae vaporized and removed by the hot gases produced during the incineration of the organic matter. Salt is separated from the hot gases by rapid cooling; the waste gas, containing volatile organic matter, is incinerated with an additional fuel source. Energy produced during combustion is supplied to the spray drier as a source of heat and to a boiler which produces steam for the evaporation process. Salt corrosion of heat transfer surfaces was reduced by elimination of the combustion chamber gases exhausted to the waste heat boiler. (Lisk-FIRL)
W78-05885

A STUDY OF THE POSSIBLE USE OF ION-EXCHANGE RESINS IN TEXTILE WASTE-WATER TREATMENT, (IN RUSSIAN),
Gruzinskii Politekhincheskii Inst., Tiflis (USSR).
V. D. Eristavi, G. S. Mamatsashvili, Ts. S. Kurtskhaliya, and A. V. Shvangiradze.
Soobshch Akad Nauk Gruz Ssr 85(2), p 385-388, 1977.

Descriptors: *Waste water treatment, *Ion exchange, Resins, Sewage effluents, Domestic wastes, *Textiles, Industrial wastes.

In order to study the reduction of water resources pollution from domestic and industrial effluents, the sorption abilities of some home-produced anionites in Cl-form and the determination of the optimal conditions of azodye ion sorption are discussed. The optimal concentration of the azodye operating solution was 0.005 g/l and the filtration rates was 2 l/h, the total exchange capacity of the ionites being 2.5-3 mg/eq/g. Under optimum conditions 1 g of dry ionite purifies 100 l of waste water, with the optical density of purified water being d = 0.--Copyright 1978, Biological Abstracts, Inc.
W78-05886

PARTICIPATION OF MICROORGANISMS IN THE PURIFICATION OF SEWAGE FROM CYANIDES, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Ama-Ata. Inst. of Microbiology and Virology.
A. N. Ilyaletdinov, P. B. Enker, and Z. G. Vlasova.
Mikrobiologiya 46(2), p 358-362, 1977.

Descriptors: *Microorganisms, *Cyanides, Water purification, Industrial wastes, *Waste water treatment, *Oxidation-reduction potential.

Microorganisms can decrease in the concentration of cyanides in water in the presence of organic C in the medium without additional N sources. N inhibits assimilation of cyanide N by microorganisms. The concentration of cyanides decreases faster in aerobic conditions at higher values of the redox potential of the medium. The process may be used for purifying industrial sewage from cyanides.--Copyright 1978, Biological Abstracts, Inc.
W78-05889

SALMONELLA AND BACTERIAL INDICATORS IN OZONATED AND CHLORINE DIOXIDE-DISINFECTED EFFLUENT,
Ontario Ministry of Health, Toronto.
For primary bibliographic entry see Field 5A.
W78-05890

MASS TRANSFER IN THE LIQUID PHASE WITH TUBULAR WASTE-WATER TREATMENT CONTRACTOR,
Tokyo Inst. of Tech. (Japan). Research Lab. of Resources Utilization.
K. Fujie, T. Sekizawa, and H. Kubota.
Journal of Fermentation Technology, Vol 55, No 5, p 532-543, 1977. 11 fig, 3 tab, 5 ref, 1 append.

Descriptors: *Mass transfer, *Dissolved oxygen, *Microorganisms, *Waste water treatment, *Organic substances, Model studies, Separation techniques, Treatment facilities, Waste disposal, Municipal wastes.

The effect of mass transfer on the removal of organic substances from waste liquid by a biological filter was examined in laboratory experiments employing a microbial film attached to a tubular contactor. Honeycomb and parallel plate supporters were used as tubular contractors. The microbial film was established by the circulation of a nutrient solution containing a high percentage of glucose through the supporters for several days. Simulated waste water, also containing glucose, was passed through the supporters on which microbes had grown. Rate controlling factors were determined through observation of liquid flow rates, the mass transfer resistance of organic substances or dissolved oxygen removal by the microbial film, and resistances of organic or dissolved oxygen diffusion. Honeycomb and parallel plate supporters with more complicated liquid flow routes produced higher glucose removal rates through the elimination of the effects of the liquid flow velocity. The effect of mass transfer was eliminated for the liquid phase as it was based on the liquid flow rates; the reaction rate controlling step was transferred to the microbial film. The dissolved oxygen concentration was shown to directly affect the reaction in the microbial film. (Lisk-FIRL)
W78-05892

THE DEVELOPMENT OF HETEROTROPHIC BACTERIA IN CIRCULATING WATER SYSTEMS, (IN RUSSIAN),
Vsesoyuznyi-Nauchnyi Planovii Otdel Tsellyulozno-Bumazhnoi Promyshlennost, Leningrad (USSR).
For primary bibliographic entry see Field 5C.
W78-05893

NEW APPROACH TO BACTERIAL KINETICS IN WASTEWATER,
Syracuse Univ., NY. Dept. of Chemical Engineering and Materials Science.
For primary bibliographic entry see Field 5C.
W78-05894

THE USE AND INTEGRATION OF GROUND AND SURFACE WATER MODELS IN THE 208 PLANNING PROCESS,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W78-05895

CONVERTING WASTES TO ENERGY--A CONCEPTUAL APPROACH,
Nihon Suido Consultants Co. Ltd., Tokyo.
Y. Chiu, and W. Guey-Lee.
Water and Sewage Works, Vol. 125, No. 2, p 44-47, February, 1978. 2 fig, 1 tab, 15 ref.

Descriptors: *Thermal power, *Model studies, *Sludge digestion, *Methane, *Hydraulic structures, Electric power production, Electric power-plants, Electric power demand, Water demand, Recirculated water, Waste water treatment, Municipal wastes, Treatment facilities.

A mathematical model was developed for thermal energy recovery, water reuse, steam generation, and methane gas production during sludge

digestion of municipal wastes. The study was performed for a municipal area with a population of one million, producing 6 lb sewage/capita/day. The electric energy production rate from the municipal wastes in a high rate digester was calculated as 180,000 kw/day with a waste heat production of 960 Btu/hr. The total daily energy requirement for a population of one million was calculated to be 880,000 kw, indicating the need for an additional 6,000 tons of coal daily to supply the demand. The required digester capacity for a digestion temperature of 90F, based on the total available waste heat, was calculated to be 100,000,000 cu ft. Based on a per capita water requirement of 160 gal/day, a water reuse loop system would provide 60% of the daily water demand by the municipality. Controlling factors in the production of fuel gas include: detention time; the percentage of methane in the digester gas; and the digestion temperature, which decreases detention time and methane percentage when it is increased but also increases heat requirements. (Lisk-FIRL)
W78-05896

PURIFICATION OF SECONDARY EFFLUENT IN A NATURAL SAND FILTER,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
D. B. Aulenbach, R. R. Harris, and R. C. Reach.
Journal Water Pollution Control Federation, Vol. 50, No. 1, p 86-94, January, 1978. 4 fig, 3 tab, 9 ref.

Descriptors: *Sand aquifers, *Nitrates, *Phosphorus, *Copper, *Coliforms, Biochemical oxygen demand, Chemical oxygen demand, Chlorides, Seepage, Filtration, Lysimeters, New York, Waste water treatment, Municipal wastes, Tertiary treatment.

Depths at which secondary effluent contaminants are removed by a natural sand bed filter were determined with seepage samples from observation wells and lysimeters installed at the rapid infiltration sites used by the Lake George Village, New York, Sewage Treatment Plant. Secondary effluent from trickling filters was applied to 21 sand filtration beds covering a total area of 5.4 acres. Samples in the 20-meter sand filter were collected with lysimeters at depths of 3, 7, 11, and 18 meters. Analyses of the samples indicated that coliforms, BOD, COD, orthophosphate, ammonia nitrogen, and organic nitrogen were completely removed and nitrate-nitrogen levels were reduced to approximately 8 mg/liter. Chlorides and other soluble substances passed through the sand filter unchanged. Nitrate removal increased with depth of passage through the filter and almost complete nitrate removal was achieved by a depth of 18 meters. Orthophosphate was reduced to less than 0.1 mg/liter within the first 10 meters; total phosphate reductions decreased with depth. Phosphate levels decreased to less than 0.1 mg/liter during the spring. Copper concentrations were below 0.05 mg/liter for all samples analyzed. Levels of calcium, magnesium, alkalinity, iron, sodium, and potassium were also monitored. (Lisk-FIRL)
W78-05902

THE IMPACT OF WATER SAVING WATER CLOSETS ON BUILDING DRAINS AND SEWERS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 3D.
W78-05904

CANNING GROUP EXPANSIONS.
Water Services, Vol 81, No 980, p 598-599, October, 1977.

Descriptors: Organizations, *Chemicals, Laboratories, *Pumps, *Treatment facilities, Europe, Chemical industry, Flocculation, Analytical techniques, Sewage treatment, Water treatment, Municipal wastes, Industrial wastes, Waste water treatment.

In October 1976 when Water Management Limited became part of the Canning Group, it became apparent that larger premises would be needed for construction of water treatment facilities and production of Water Management speciality chemicals for water conditioning. Larger manufacturing operations were established in Kidderminster, together with laboratories for their water treatment and conditioning consulting service. A complete analytical laboratory was made available, along with flocculents for water and sewage treatment and Vortex Oil Drinkers to remove floating oil from water. All products of the Canning Group will be available in France, including treatment equipment for industrial effluents and public water supplies. The European marketing activities will be controlled through Canning International BV, Amsterdam. Penguin Pumps Limited jointed the Canning Group in 1970 as a subsidiary of Canning effluent treatment specialists, Pollution Control Limited. The present move brings together the group's pump manufacturing activities. In the near future the group will manufacture some pumps made entirely of plastic for handling chemicals over a wide temperature range. (Snyder-FIRL)
W78-05908

POLLUTION CONTROL PLANT STATISTICS.
For primary bibliographic entry see Field 5G.
W78-05909

COST-EFFECTIVENESS OF ON-SITE AND COMMUNITY SEWERAGE ALTERNATIVES,
Brown and Caldwell, Eugene, OR.
J. J. Troyan, and D. P. Norris.
Civil Engineering-ASCE, Vol 47, No 12, p 84-89, December, 1977. 3 tab.

Descriptors: *Cost-benefit analysis, Economics, *Sewerage, *Feasibility studies, *Project planning, Sewage treatment, Cost comparisons, Septic tanks, Sewers, Sewage disposal, Environmental effects, Soil analysis, Municipal wastes, Waste water treatment.

Information pertinent to the cost-effectiveness analysis of sewerage systems for small communities and rural residential areas is presented. Selection criteria are established for eight alternative systems for on-site disposal and community collection, including: septic tank-soil absorption system, septic tank-mound system, septic tank-evaporation-transpiration system, conventional gravity sewers, small-diameter gravity sewers, pressure sewers, and vacuum sewers. The feasibility analyses are based upon results of an inventory of soils, site characteristics, geology-hydrology, and climate. The inventory results are evaluated in conjunction with data on technical feasibility, environmental regulations, and unit costs. Advantages, disadvantages, and limitations of the on-site disposal and community collection systems are described. (Schulz-FIRL)
W78-05910

PHOSPHORUS DYNAMICS IN SOILS IRRIGATED WITH MUNICIPAL WASTEWATER,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
L. E. Sommers, D. W. Nelson, L. B. Owens, and M. Floyd.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 609, Price codes: A04 in paper copy, A01 in microfiche. Technical Report No 99, December 1977. 64 p, 25 fig, 23 tab, 50 ref. OWRT B-075-IND(2).

Descriptors: *Wastewater disposal, *Irrigation, *Phosphorus, Waste water treatment, Soil disposal field, *Irrigated wastewater, Phosphatase enzymes, Equilibrium.

A cooperative study was conducted with Pennsylvania State University to assess the effects of wastewater irrigation on soil P. relations. The major objectives were to evaluate the influence of wastewater irrigation on (1) changes in soil C, N, and P; (2) sorption of inorganic P by soils; and (3) properties of phosphatase enzymes in soil. Soil samples were obtained from Hublersburg silty clay loam cropped to corn, Reid Canarygrass and a mixed forest and from a Morrison sandy loam with a mixed forest stand. The sites had been irrigated with secondary effluent for 11-12 years. Soil analyses indicated that the majority of P added to the soils remained in the upper 30 cm of the Hublersburg soil, while appreciable amounts of P leached to 30-60 cm in the Morrison. The equilibrium P. concentration increased as a result of the wastewater irrigation and the P sorption capacity decreased. A comparison of soluble P levels in leachate collected at a 120 cm depth with soluble P predicted by EPC measurements indicated laboratory measurements overestimated the ability of a soil to remove P from wastewater. (Wiersma-Purdue)
W78-05937

METHODOLOGY FOR ANALYZING EFFECTS OF URBANIZATION ON WATER RESOURCE SYSTEMS,
Texas Univ. at Austin. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W78-05938

A MODIFIED PERCHLORINATION PROCEDURE FOR THE DETERMINATION OF POLYCHLORINATED BIPHENYLS,
Wisconsin Univ.-Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5A.
W78-05939

INFECTIOUS HOSPITAL WASTES: THEIR TREATMENT AND SANITARY DISPOSAL,
Florida Univ., Gainesville. Dept. of Chemical Engineering.
S. S. Block, and J. C. Netherton.
p 723-739, 3 fig, 3 tab, 44 ref. In: Disinfection, Sterilization, and Preservation, Block, S. S. (ed.), Lea and Febiger, Philadelphia, Pennsylvania, 1977.

Descriptors: *Waste water treatment, *Municipal wastes, *Hospitals, *Sewage treatment, *Pollutant identification, Sewerage, Biochemical oxygen demand, Chemical oxygen demand, Treatment facilities, Solid wastes.

The increased use of disposable items has increased the quantity of solid waste generated by hospitals. Hospital waste may be finely ground and discharged to a sewage treatment plant, incinerated, or landfilled. Wet grinding before discharge to the municipal sewage system is being considered for total hospital solid wastes. Tests for chloride, BOD, and COD revealed no significant changes in the sewage as a result. Most plastic and related materials should settle out or be removed during primary treatment. The waste should have little effect on the public health characteristics of the sewage, since material from bioscience laboratories is disposed of by grinding. Hospitals that use landfilling for most wastes generally use an incinerator for pathogenic wastes. Complete sterilization of incinerated wastes requires a proper combination of air temperature, firebrick temperature, and retention time. Land disposal may expose the community to hospital waste contaminants, with the greatest potential of exposure arising from a disposal site where water pollution by runoff or leaching may occur. Wastes should be ground and sterilized before land disposal. High fecal coliform densities sampled from a landfill (2000 to 4,900,000 organisms per 100 ml) indicate potential health effects during the first 2-month leaching period. The absence of pathogens in the leachate confirms that pathogens are inactivated by heat in the landfill. (Snyder-FIRL)
W78-05949

EVALUATION OF NEW REVERSE OSMOSIS MEMBRANES FOR THE SEPARATION OF TOXIC COMPOUNDS FROM WASTEWATER,
Illinois Univ. at Urbana-Champaign. Dept. of Environmental Engineering.
E. S. K. Chian, M. N. Aschauer, and H. H. P. Fang.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 884, Price codes: A14 in paper copy, A01 in microfiche. Army Medical Research and Development Command, Washington, D.C., Final Report UILU-ENG-75-2028, June 1976. 323 p, 69 fig, 56 tab, 122 ref, 5 append.

Studies with NS-100 and aromatic polyamide membranes were conducted in an attempt to select reverse osmosis membrane materials for use in the treatment of waste water from army field hospitals. Mathematical models were formulated for optimizing the casting conditions for flat sheet NS-100 membranes. Membrane performance was predicted under various operating conditions. NS-100's surface structure was related to its capacity to retain organic compounds using a simple test with a sodium chloride solution. The potential application of both NS-100 and aromatic polyamide membranes, including B-9 and B-10 permeators, was examined for other waste water types. An additional objective was to evaluate the engineering parameters involved in applying NS-100 membranes to the treatment of waste water. Casting techniques for tubular NS-100 membranes were also refined. NS-100's chemical resistance to oxidants and the effects of additives on membrane performance were evaluated. A computer program was developed for use in the design of large treatment plants using the results from tests on single tubes or tubular membrane modules. (Snyder-FIRL)
W78-05950

USE OF A NATURAL MARSH FOR WASTEWATER POLISHING,
Wisconsin Univ.-Oshkosh.
C. W. Fetter, Jr, W. E. Sloey, and F. L. Spangler.
Journal Water Pollution Control Federation, Vol. 50, No. 2, 1978, p 290-307, 13 fig, 10 tab, 22 ref. EPA S-801042 and R-803794.

Descriptors: *Water quality, Water pollution, *Waste water disposal, Waste water treatment, *Marshes, Pollutants, Waste disposal.

The water quality response of a highly polluted stream flowing through a natural marsh is investigated. The stream was studied for a 15-month period. During low-flow periods as much as 50% of the monthly streamflow is discharge from a waste-water treatment plant. The stream receives mixed urban-agricultural runoff and even above the treatment plant outfall contains significant amounts of pollutants. During passage through the marsh there is significant improvement in water quality. There are reductions in concentrations of BOD (80.1%), coliform bacteria (86.2%), nitrite (51.3%), COD (43.7%), SS (29.1%), total phosphorus (13.4%), and orthophosphate (6.4%). It was concluded that natural marshes offer an opportunity to polish wastewater through physical, chemical, and biological reactions in the marsh. (Chilton-ORNL)
W78-05960

PROCEDURES FOR ESTIMATING DRY WEATHER POLLUTANT DEPOSITION IN SEWERAGE SYSTEMS,
Energy and Environmental Analysis, Inc., Boston, MA.
For primary bibliographic entry see Field 5B.
W78-05984

MUSKEGON, MICHIGAN INDUSTRIAL-MUNICIPAL WASTEWATER STORAGE LAGOONS: BIOTA AND ENVIRONMENT,
Northeast Michigan Council of Governments, Gaylord.
W. R. Frykberg, C. Goodnight, and P. G. Meier.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 496, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA - 600/3-77-039, April, 1977. 78 p, 9 fig, 10 tab, 88 ref. 04J1P01534.

Descriptors: Lagoons, Liminology, *Waste treatment, *Municipal wastes, *Oxidation lagoons, Industrial wastes, Waste storage, *Succession, Plankton, Zooplankton, Phytoplankton, Protozoa, Waste disposal, Sewage disposal, Biological communities, Pollutant identification, *Municipal wastes, *Waste water storage lagoons, Ecological succession, Stabilization ponds, Transparency.

Results of a 2-year limnological study which began shortly after construction of the largest U.S. industrial-municipal wastewater storage lagoon are reported. The biological community was critically examined to document ecological succession; physical and chemical parameters were monitored during the initial filling period. Generally, the lagoons remained aerobic (except for a few weeks during ice-cover), well-mixed vertically, and slightly alkaline pH about 7.7. Phytoplankton-protozoan assemblage was extreamely variable in terms of total abundance and distribution; populations ranged from less than 20 to more than 22,000 units/ml. Chlorophyta were dominant algae except for several weeks each summer when Cyanophyta reached bloom proportions. The zooplankton community was composed of 14 species of free living crustaceans and 4 species of rotifers. Three species of Daphnia (the dominant zooplankton) were routinely collected. Cyclops vernalis was the most common cyclopoid copepod while Daiptomus was the only calanoid copepod recovered. Transparency, measured by a secchi disk, was shallow and averaged about 20 cm, limiting the photoplankton population and excluding rooted aquatics and benthic algae. Benthic fauna was very limited and remained below 100 organisms/0.1 cu m in 95% of the samples. Midges (Chironomidae) accounted for virtually all of the sparse population; Procladius culiciformis and Glyptotendipes barbipes were the most common benthic forms. Sparcity of this population can be attributed to stressed lagoon environment where cncentrations of several metals, notably zinc, were relatively high. BOD 5, chlorophyl a, and primary productivity are reported (Seip - IPA)
W78-05986

HANDLING AND DISPOSAL OF SLUDGES FROM COMBINED SEWER OVERFLOW TREATMENT, PHASE I - CHARACTERIZATION,
Envirex, Inc., Milwaukee, WI. Environmental Sciences Div.
For primary bibliographic entry see Field 5E.
W78-05987

THE COST OF REMOVING CHLOROFORM AND OTHER TRIHALOMETHANES FROM DRINKING WATER SUPPLIES,
Environmental Protection Agency, Cincinnati, OH. Office of Research and Development.
For primary bibliographic entry see Field 5F.
W78-05988

RECOVERY OF LIME AND MAGNESIUM IN POTABLE WATER TREATMENT,
Black, Crow and Eisdness, Inc., Montgomery, AL.
For primary bibliographic entry see Field 5F.
W78-05990

VIRUS PARTICLE AGGREGATION AND HALOGEN DISINFECTION OF WATER SUPPLIES,
North Carolina Univ. at Chapel Hill
For primary bibliographic entry see Field 5F
W78-05991

EXPERIMENTAL EVALUATION OF OXYGEN AND AIR ACTIVATED SLUDGE NITRIFICATION SYSTEMS WITH AND WITHOUT PH CONTROL,
District of Columbia Dept. of Environmental Services, Washington. EPA-DC Pilot Plant.
J. A. Heidman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 197, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA - 600/2-76-180, October, 1976. 57 p, 14 fig, 22 tab, 13 ref. 68-03-0349.

Descriptors: Waste water treatment, Municipal wastes, *Activated sludge, *Nitrification, *Oxygenation, *Hydrogen ion concentration, *Ammonia, *Sewage treatment, *Sludge treatment, Effluents, Lime, Oxygen, Oxygen activated sludge systems, Air nitrification, Oxygen nitrification, pH control, Secondary sludge treatment, Mixed liquor suspended solids, Mixed liquor volatile suspended solids, Sludge retention time, Lime dosage, Settling velocity.

The ammonia nitrification capabilities of 2 oxygen activated sludge systems receiving District of Columbia secondary effluent at a steady state flow of 190 cu m/day (50,000 gal/day) were evaluated. The pH of one system was controlled to maintain a pH of 7.0 in the last reactor pass of the 4-pass system. The pH of the second system was uncontrolled and reactor pH values of 5.5-6.0 were common. The effluent quality of the oxygen nitrification system with pH control was excellent; effluent NH4-N concentration averaged about 0.2 mg/l. Effluent NH4-N for the same system without pH control was 1 mg/l or less; however, this system did not show the stability that was achieved with pH control. Parallel air and oxygen nitrification systems, both with pH control to 7.0 in the last reactor pass of each system, were compared under similar operating conditions. Comparison parameters included effluent quality, sludge settling rates, lime dosage, sludge production, and nitrification kinetic rates. The carbonaceous and nitrogenous effluent quality of the air and oxygen systems was identical; but three times the lime disage was required in the oxygen system, resulting in a larger percentage of inert material and increased sludge production. The oxygen system also required maintenance of higher mixed liquor suspended solids (MLSS) levels to achieve the same mixed characteristics of the oxygen sludge compensated for the increased solids loading to the clarifier. Both systems produced excellent effluent quality. (Seip-IPA)
W78-05992

MANUAL OF TREATMENT TECHNIQUES FOR MEETING THE INTERIM PRIMARY DRINKING WATER REGULATIONS.
Environmental Protection Agency, Cincinnati, OH. Office of Research and Development.
For primary bibliographic entry see Field 5F.
W78-05994

STUDIES ON THE PURIFICATION OF WASTES FROM THE NITROGEN FERTILIZER INDUSTRY BY INTENSIVE ALGAL CULTURES. IV. GROWTH OF CHLORELLA VULGARIS IN WASTES WITH HIGH NITROGEN CONTENT IN CONTINUOUS AND INTERMITTENT LIGHT,
Warsaw Univ. (Poland). Dept. of Environmental Microbiology.
K. Matusiak, R. Mycielski, M. Blaszacvk, and A. Bisz-Konarzewska.
Acta Microbiologica Polonica, Vol. 26, No. 1, p 79-93, 1977. 12 fig, 4 tab, 8 ref.

Descriptors: *Water purification, *Nitrogen compounds, *Chlorella, *Algal nitrogen control, Ureas, Nitrogen fertilizer industry, Fertilizers, Ammonification, Nitrogen cycle, Waste treatment.

Growth of Chlorella vulgaris in wastes resultant from urea production was studied. Purification of nitrogen wastes by intensive algal cultures can, besides removing nitrogen, also yield considerable amounts of biomass with up to 50% protein content. In urea waste containing 1260 mg ammonia nitrogen/l, 6240 mg urea nitrogen/l, and 31 mg phosphorus/l only Chlorella vulgaris strain AA could grow. Exposure to wastes containing 1380 mg ammonia nitrogen/l and 6270 mg urea nitrogen/l for 19 days followed by exposure to wastes containing 1750 mg ammonia nitrogen/l and 4340 mg urea nitrogen/l resulted in a constant drop of Chlorella vulgaris cell numbers. Viabil ity of the culture decreased after 15 days and again after 28 days of exposure to the solution. In contrast, the number of Chlorella vulgaris strain AA cells stabilized at a level that was inversely proportional to ammionia nitrogen concentration in the introduced waste. In wastes with lower nitrogen concentrations (820-1250 mg ammonia nitrogen/l) in which Chlorella vulgaris AA culture was placed, ammonia nitrogen was not removed at all or was removed in very small amounts, and only 380-750 mg/l urea nitrogen was removed, depending on the series of wastes. Experiments using various ratios of light and darkness to measure their effect on the cell number and dry weight of the culture showed that best growth was obtained by alternate one hour periods of light and darkness. (Harris-Wisconsin)
W78-05997

NITROGEN OXIDATION AND REMOVAL EFFICIENCY USING ACTIVATED ALGAE,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
R. W. Regan, and R. E. McKinney.
Progress in Water Technology, Vol. 8, No. 4/5, p 451-466, 1977. 9 fig, 4 tab, 12 ref.

Descriptors: *Activated algae, *Waste water treatment, *Nutrient removal, *Nitrogen, *Algae, Oxidation lagoons, Flocculation, Aerobic bacteria, Bacteria, Light, Organic loading, Solid wastes, Sewage treatment.

The use of activated algae for waste treatment, in which flocculated algae are separated from the effluent and returned to the process vessel, has been under study at Kansas University since 1965. This paper investigates the operating limits of the process in treating domestic wastewater with activated algae in stabilization ponds. Control parameters included light availability, organic loading rate, and solids residence time for various treatment objectives including nitrogen oxidation and removal efficiency. The basic condition for using activated algae as a secondary-tertiary treatment process is establishment of a symbiotic relationship between algae and aerobic bacteria. In this study it was found that, under high rate conditions, nitrogen levels were controlled by autotrophic oxidation, and photosynthetic and heterotrophic assimilation kinetics. Conclusions were that: (1) Light availability controls algal growth and limited organic load for effective operation; activated algae apparently must be grown in a shallow system with daylight controlling basic reactions. Maximum growth occurred at 43 cm with a COD loading rate of 1600-1800 mg/l/day. (2) Nitrogen removal rates for synthesis, ranging from 0.34-0.112 g N/g VSS, appeared to be limited to assimilative requirements. Organic nitrogen of the mixed liquor solids averaged 13.3%. (3) The growth rate of activated algae microbes and autotrophic nitrifers became limited at SRT values of one and two days respectively. (4) Nitrification decreased alkalinity at 7.1 g as CaCO3 mg/l of ammonia nitrogen metabolized. (Lynch-Wisconsin)
W78-06001

DYNAMICS OF WATER-SOLUBLE SALTS IN SOIL IRRIGATED WITH SEWAGE WATER,
I. A. Vlasyuk, and T. L. Salo.
Pochvovedenie 4, 132-135, 1977.

Descriptors: *Irrigation practices, Water reuse, Sewage, *Waste water disposal, Crop production, Salt tolerance, *Toxic salts, *Grasses, Perennial grasses, Salts, *Toxicity.

Irrigation with sewage water considerably increases yields of perennial grasses (100-250 hkg/ha), but a tendency toward solonetization and accumulation of toxic salts was observed. To prevent salinization, optimal regimes of irrigation and complex farming practices must be used.--Copyright 1978, Biological Abstracts, Inc.
W78-06010

TURBINE ASPIRATION FOR OXYGEN SUPPLEMENTATION,
Alabama Univ., University. Dept. of Engineering Mechanics.
For primary bibliographic entry see Field 5G.
W78-06017

A PROPOSED MODIFICATION TO THE CLASSICAL METHOD OF CALCULATING ALKALINITY OF NATURAL WATERS,
Auburn Univ., AL.
For primary bibliographic entry see Field 5A.
W78-06019

HYGIENIC ASSESSMENT OF BIOLOGICAL FISH PONDS USED FOR PURIFICATION OF SEWAGE FROM LIVESTOCK FARMS, (IN RUSSIAN),
All Union Research Inst. of Animal Husbandry, Dubrovitsy (USSR).
A. N. Ivanov, Yu. A. Koltypin, and E. A. Tarasov.
Gig Sanit 7, p 99-100, 1976.

Descriptors: *Public health, *Biological treatment, *Farm wastes, Sewage, Waste water treatment, Coliforms, Helminths, Swine wastes.

An experimental 4-stage biological pruification system for liquid manure sewage was implemented. Changes in indices from initial input to final outflow were noted for odor, transparency, pH, alkalinity, suspended particles, acidity, biochemical O2 demand, soluble O2, N-compounds, phosphates, coliform titer and helminth eggs. Results indicated that swine sewage can be effectively purified by this system which can also be used for commercial fish production.--Copyright 1978, Biological Abstracts, Inc.
W78-06032

A FIELD STUDY OF THE AGRICULTURAL USE OF SEWAGE SLUDGE: III. EFFECT ON UPTAKE AND EXTRACTABILITY OF SLUDGE-BORNE METALS,
Ball State Univ., Muncie, IN. Dept. of Natural Resources.
K. A. Kelling, D. R. Keeney, L. M. Walsh, and J. A. Ryan.
Journal of Environmental Quality, Vol. 6, No. 4, p 352-358, October-December, 1977. 7 tab, 27 ref.

Descriptors: *Pollutant identification, *Cultivated lands, *Sewage sludge, *Sludge disposal, *Fertilization, Absorption, Nutrient removal, Copper, Zinc, Cadmium, Nickel, Chromium, Municipal wastes, Waste water treatment.

The uptake of Cu, Zn, Cd, Ni, and Cr by rye, corn, stover, and sorghum-sudan plant tissue was evaluated in studies on the effects of the application of anaerobically-digested sewage sludge to croplands. Cu, Zn, Ni, and Cr were measured in the plant tissue and the DPTA-extractable fraction of the sludge-amended soil. Liquid sludge was applied to a sandy loam and a silt loam at rates up to 60 metric tons/ha on a dry solids basis. Although sludge additions had little effect on the heavy metal content of corn grain, elevated concentrations of Zn, Cd, and Ni were detected in plant tissue. Cr was not detected in either tissue or grain. The concentrations of the metals were under levels considered harmful to crops in all cases. The total recovery of the applied metals by all four crops was under 1% for Cu, Cd, Ni, and Cr; 1-3% of the applied Zn as recovered. The addition of metal-bearing sludge increased the DTPA-extractable fractions of Cu, Zn, Cd, and Ni, but not Cr. Regression analyses suggested that the quantity of heavy metal in the DTPA-extractable of soil may be a useful indicator of the heavy metal content of plant tissue from sludge-amended soils. (See also W78-04609 and W78-06059) (Snyder-FIRL)
W78-06060

RECENT ADVANCES IN SEWAGE EFFLUENT DENITRIFICATION: PART II,
Water Pollution Research Lab., Stevenage (England).
P. F. Cooper, B. Collinson, and M. K. Green.
Journal of the Institute of Water Pollution Control, Vol. 76, No. 4, p 389-401, 1977. 8 fig, 7 tab, 3 ref.

Descriptors: *Denitrification, *Aeration, *Anaerobic conditions, *Activated sludge, *Treatment facilities, Biodegradation, Organic substances, Waste water treatment, Municipal wastes, Sludge treatment, Sewage disposal.

Studies were conducted at a 9.1 million cu m/day sewage treatment plant in England to evaluate process modifications to remove all the nitrate present in recycled activated sludge. Anaerobic conditions were created by modification of two of the aeration units in the first part of a four-pass system. Two anaerobic areas were created in the third passes to the two other aeration units. Equal parts of recycled sludge and settled sludge were passed through the anaerobic zone. A 50% nitrate reduction was realized with the modifications in the first two units. Laboratory experiments were conducted to test units with two anaerobic areas under varying conditions of incremental sludge feed recycled sludge proportion. Tests indicated that nitrate removal increased to 69% when 40% of the settled sludge was retained in the second anaerobic zone for 30 minutes. Further studies showed that increasing retention time to 40 minutes resulted in a maximum 76% denitrification of the effluent. (See also W78-03541) (Lisk-FIRL)
W78-06061

A BLEACH SYSTEM FOR COLOR POSITIVE AND NEGATIVE FILM THAT REDUCES WASTE TREATMENT REQUIREMENTS,
Color Film Corp., Stamford, CT.
C. R. Dupree.
Society of Motion Picture and Television Engineers Journal, Vol. 87, No. 2, p 84-88, February, 1978. 7 fig, 2 tab, 7 ref.

Descriptors: *Bleaching wastes, *Photography, *Films, *Copper compounds, *Sodium chloride, Sodium compounds, Biochemical oxygen demand, Chemical oxygen demand, Chlorine, Waste water treatment, Industrial wastes, Halides, Chromium.

The efficiency and cost-effectiveness of substituting cupric chloride for dichromate bleach used in the photographic industry were assessed with respect to upgrading waste water effluent quality. A cupric chloride concentration of 21 g/liter provided the same bleaching capacity as the dichromate SR27 bleach. Comparative tests of the two bleaching agents indicated similar values for densitometry, physical effect on film, emulsion hardness, dye stability, drying characteristics, and washout properties. Cuprous chloride, formed by contact with silver, was regenerated to cupric chloride for reuse by dissolution in hydrochloric acid. A replenisher, controlled by a pH monitor,

maintained the levels of cupric chloride and hydrochloric acid in the processing chamber. The copper content of the waste water was reduced with the addition of an alkali metal hydroxide, sodium hypochlorite, forming an insoluble cupric hydroxide gel and an alkali metal chloride. The cupric hydroxide gel was filtered and regenerated with hydrochloric acid for reuse. The cost of producing 100 liters of cupric chloride, using scrap copper, proved to be at least $6 less than the cost of 100 liters of SR27 bleach. Other measures taken by Color Film Corporation of Stamford, Connecticut, to upgrade its waste for discharge into the municipal waste treatment facility included reduction of COD, BOD, and chlorine demand through careful control of replenishment rates, improved squeegees, and sodium hypochlorite treatment. (Lisk-FIRL)
W78-06066

WATER RECYCLING FLOW SCHEME FOR TOMATO PROCESSING PLANT CONTROLS SOIL ACCUMULATIONS,
G. E. Wilson, and J. Y. C. Huang.
Industrial Wastes, Vol. 24, No. 1, p 12-16, January-February, 1978. 1 fig, 7 tab, 5 ref.

Descriptors: *Food processing industry, *Tomatoes, *Flocculation, *Suspended load, *Coagulation, Colloids, Separation techniques, Suspended solids, Soil aggregates, Waste water treatment, Recirculated water, Industrial wastes, Recycling, Water reuse.

A process for the removal of accumulated soil in a tomato processing bin dump combines disc cleaning with water recycling and chemical coagulation of colloidal solids. Rubber discs with jet spray nozzles supply a vigorous washing action as the tomatoes pass through the unit. The soil-bearing wash water is collected in a tray and passed through a gravity screen for solids separation and then to a tube flocculator where chemical coagulation is accomplished. A comparison of this process with three other conventional methods revealed a possible 26% increase in the tonnage of tomatoes processed. Water consumption with this process was reduced to 164 gal/ton of tomatoes processed, compared to 278 gal/ton for conventional cleaning methods, 245 gal/ton for conventional cleaning with water recycle, and 156 gal/ton for disc cleaning with recycle but without flocculation. The quantity of soil removed with the disc unit and flocculation averaged 5,038 lb/day, compared to 3,827 lb/day with the disc cleaning without flocculation, and 1,628 lb/day with conventional methods with water recycle. The estimated cost of the disc cleaning system with recycle and flocculation was $0.933/ton of tomatoes, including capital expenses and electricity costs. The cost of the conventional method was calculated at $1.503/ton, while conventional washing with recycle and disc cleaning without flocculation were estimated to cost $1.216/ton and $0.918/ton, respectively. A potential net savings with the disc cleaning-flocculation system was estimated at $20,520/year. (Lisk-FIRL)
W78-06067

SPRAY DRYING TECHNIQUES FOR BY-PRODUCT RECOVERY,
Niro Atomizer, Soeborg (Denmark).
K. Masters, and I. Vestergaard.
Process Biochemistry, Vol. 13, No. 1, p 3-6, January, 1978. 7 fig, 2 tab.

Descriptors: *Food processing industry, *Drying, *Solid wastes, *Byproducts, *Separation techniques, Fermentation, Yeasts, Waste water treatment, Freeze drying, Industrial wastes.

Spray drying techniques are evaluated for the conversion of blood, fermentation products, protein wastes, glands, tissues, and other food processing wastes into usable dried solids. The spray drying processes described are either closed, semi-closed, or open and involve atomization, spray-air contact, evaporation, and separation of the dry product from the air. Byproducts having a low solids content, such as blood plasma, require pretreatment with a rotary thin-film concentrator prior to spray drying to decrease the heat requirements during the drying process. Fresh blood can be dessicated to 18% solids or to a powder with a moisture content of 5% by open cycle direct drying at inlet and outlet temperatures of 150C and 75C, respectively. 'Dirty' blood, used as adhesion agents or fodder stock, requires higher drying temperatures; blood for edible use can be separated into plasma and red albumin before spray drying. Plasma concentrations of 35-40% can be achieved with rotary film concentration prior to drying. Hormones and enzymes in glands and tissues are recovered by freezing to -30C for removal to the spray drying process. An 80% weight reduction is accomplished by open or semi-closed cycle drying with no loss of activity of the byproduct. Concentration of mycelium-fermentation broths prior to low temperature spray drying and incineration is required. An oxygen content of 5% is maintained during the semi-closed cycle spray dryer processing of the odorous broths. Residual odors and particle activity are destroyed by three second contact at 700-800C. (Lisk-FIRL)
W78-06068

PROTEIN RECOVERY FROM WASTE EFFLUENTS OF POTATO PROCESSING PLANTS,
Cornell Univ., Ithaca, NY. Dept. of Food Science.
D. Knorr.
Journal of Food Technology, Vol. 12, No. 6, p 563-580, December, 1977. 5 fig, 7 tab, 59 ref.

Descriptors: *Food processing industry, *Potatoes, *Proteins, *Separation techniques, Filtration, Amino acids, Organic compounds, Dewatering, Nitrogen, Waste water treatment, Industrial wastes, *Chemical precipitation.

Methods of recovery of potato protein from food processing wastes and the uses of the protein are reviewed. The volume of waste water from potato processing generally ranges 0.7-7.0 cu m/ton of potatoes. A series of processes which include protein precipitation, dewatering, drying, and sometimes concentration is generally used to treat the waste water. Heating of the protein water to 80-90C at pH 4.0-4.5 produced the most effective protein precipitation. Chemical treatment, especially with hydrogen chloride or polyphosphoric acid at pH 2.0, was also effective for protein removal. Settling of the protein precipitate was faster within the first 60 minutes for heat-treated samples than for samples at room temperature. Acidification to pH 5.0-2.0 and increased solids concentration also raised the protein settling rate. Methods for recovering protein and byproducts, such as amino acids, organic acids, and potassium phosphates, from the water after precipitation included: ion exchange, reverse osmosis, ultrafiltration, and hyperfiltration. Available separation techniques for precipitated protein include: continuous rotary filtration, plate and frame type filter pressing, gravity settling, or centrifugation. Plate frame filter pressing, followed by dewatering, drum or freeze drying, centrifugation, and spray drying, is recommended on the basis of comparative testing as the most efficient method of protein recovery from potato processing waste water. Uses suggested for the final protein product include additives in human food, substitutes in animal feed, and industrial applications. (Lisk-FIRL)
W78-06069

RECOVERY OF YEAST FROM CONFECTIONERY EFFLUENT,
Reading Univ., (England). Philip Lyle Memorial Research Lab.
A. J. Forage.
Process Biochemistry, Vol. 13, No. 1, p 8, 11, 30, January, 1978. 1 fig, 6 tab, 3 ref.

Descriptors: *Yeasts, *Food processing industry, *Carbohydrates, *Microorganisms, *Salts, Fermentation, Aeration, Chemical oxygen demand, Biochemical oxygen demand, Waste water treatment, Industrial wastes.

A pilot plant study was conducted to examine the fermentation of carbohydrate-bearing confectionery effluent as a source of Candida utilis feed yeast. Because of effluent from confectionery production plants often contains more than 10,000 mg/liter BOD and 30,000-40,000 mg/liter COD treatment measures must be taken to reduce BOD levels to standard levels of 20 mg/liter before discharge into a water course. The effluent, containing high concentrations of sucrose and glucose, was divided into streams of the high COD concentrations and the lower 1,000 mg/liter COD levels. Inorganic salts were introduced into the high COD-bearing effluent and the liquor was transferred to an aerated fermentation tank containing C. utilis under controlled pH and temperature conditions. Over a three-month period, COD removal averaged 74% with continuous fermentation and 11.18 g of yeast and filterable solids were produced per liter of effluent. The amino acid content of the yeast product was comparable to that of soybean meal. A cost comparison of COD removal by the yeast fermentation process and the trickling filter method was presented. (Lisk-FIRL)
W78-06070

ALUMINUM MANUFACTURER REMOVES CHROMIUM.
Industrial Wastes, Vol. 24, No. 1, p 24, 34, January-February, 1978.

Descriptors: *Chromium, *Heavy metals, *Separation techniques, *Aluminum, *Chemical precipitation, Sodium compounds, Colorimetry, Chemical analysis, Industrial wastes, Waste water treatment, Peat moss.

A treatment system for the removal of chrome and other chemicals produced by the manufacture of aluminum products has been developed by Hussong/Couplan. A series of three treatment tanks with a combined capacity of 6,000 gal/day effectively reduces the chromium content of the waste water by precipitation. The first tank serves as a receiving and holding tank for incoming waste which is pumped to the second stage once a predetermined level has been reached. Waste in the second tank is neutralized to pH 5.5-6.0 with the addition of sodium hydroxide. The addition of ferric chloride, followed by sodium sulfide, causes precipitation after a slow mixing of the solution. Full precipitation requires about four hours; the supernatant is then pumped to a third holding tank for eventual discharge. The precipitate is transferred to a sludge retention tank and then filtered through a plate and frame press. The resulting filter cake is stored in a 50-dal drum and the filtrate is turned to the initial holding tank. The Hussong/Couplan Chrome Removal System may be expanded by the addition of a sphagnum peat moss purification system to remove heavy metal pollutants. (Lisk-FIRL)
W78-06071

SODIUM BICARBONATE HELPS METAL PLANT MEET FEDERAL STANDARDS,
N. R. Barber.
Industrial Wastes, Vol. 24, No. 1, p 26, 29, January-February, 1978. 2 fig.

Descriptors: *Treatment facilities, *Toxins, *Metals, *Chemical precipitation, *Sodium compounds, *Hydrogen sulfide, Bicarbonates, Alkalis(Bases), Lime, Calcium carbonate, Carbonates, Waste water treatment, Industrial wastes.

Theoretical models were developed for the precipitation of toxic metals from metal processing effluent and other metal-bearing

wastes using sodium bicarbonate. Efficient toxic metal precipitation is achieved over a pH range of 8.0-9.0. Because sodium bicarbonate can only raise the pH of the effluent to 8.3, optimum pH levels can be established by the addition of a carbonate; total carbonate alkalinity can then be maintained for any pH level. The advantages of sodium bicarbonate precipitation in 200,000-500,000 gal/day industrial treatment plants were compared to those of other toxic metal precipitation processes. Lime precipitation, requiring precise additions and pH monitoring, yields large volumes of residual sludge due to incomplete dissolution and reaction with calcium and sulfates in the effluent. Both hydrogen sulfide and sodium sulfide treatment processes are activated by the pH of the effluent and bring about the precipitation metallic sulfide and hydroxide salts. Sulfide precipitation yields toxic residual sulfide ions. Sodium hydroxide can be easily handled and provides low sludge volume and precise pH control, although it is considered expensive. Calcium carbonate is better suited to batch processing systems as it dissolves slowly. (Lisk-FIRL)
W78-06073

PRESSURE DRIVEN MEMBRANE PROCESSES IN THE TREATMENT OF INDUSTRIAL EFFLUENTS,
Israel Desalination Engineering Ltd. Tel Baruch.
R. Matz, E. Zisner, and G. Herscovici.
Desalination, Vol 24, No 1/2/3, p 113-128, January, 1978. 5 fig, 10 tab, 7 ref.

Descriptors: *Membrane processes, *Membranes, *Reverse osmosis, *Separation techniques, *Oil industry, Food processing industry, *Filtration, Industrial wastes, Suspended solids, Waste water treatment, Pilot plants, *Ultrafiltration.

Reverse osmosis and ultrafiltration membrane processes were evaluated in pilot plant studies for the treatment of oil emulsion, citrus wash, and kerosene acid-wash wastes. Suspended solids removal from these industrial wastes was effectively accomplished by the ultrafiltration separation techniques; dissolved solids were removed by the reverse osmosis membrane process. Ultrafiltration of a 20% oil emulsion produced a nearly oil-free permeate, indicating that the flux decreased as the concentration of the waste increased. Ultrafiltration of citrus wash wastes produced a sugar removal of 90%, a clear effluent, and a pulp concentrate that had potential as a marketable byproduct. Ultrafiltration removed all suspended solids; reverse osmosis produced a product with 800 ppm COD. Reverse osmosis treatment of sulfuric acid-rinsed kerosene wastes produced an increase in total solids rejection of up to 98%, with decreasing flux and increasing contact time. Both membrane processes were found to perform effectively under increased temperatures, although feed conditions for each application had a proportional effect on the separation performance. (Lisk-FIRL)
W78-06075

COLOR REMOVAL FROM SOFTWOOD KRAFT PULP BLEACH PLANT EFFLUENT BY POLYAMINES,
Institute of Paper Chemistry, Appleton, WI.
T. C. Kisla, and R. D. McKelvey.
Environmental Science and Technology, Vol 12, No 2, p 207-211, February, 1978. 6 fig, 3 tab, 15 ref.

Descriptors: *Polyamines, Pulp and paper industry, *Pulp wastes, *Softwood, *Bleaching wastes, *Color, Chemical precipitation, Polymers, Analytical techniques, Conductivity, Zeta potential, Separation techniques, Waste water treatment, Industrial wastes.

Polyamine precipitation of color bodies was tested in laboratory experiments with freeze-dried, softwood kraft caustic effluent and the partially purified acid-precipitated color body fraction. Polyamines evaluated as precipitants were: PEI 18, 12, and 6, branched polymers of ethyleneamine; tetraethylene-pentamine; triethylenetetramine; diethylenetriamine; ethylenediamine; 1,3-diaminopropane; 1,4-diaminobutane; 1,12-diaminododecane; and ehtylamine. The PEI 18 polymer removed 89-96% of the color from caustic extract effluent at pH 7.0 and 85-90% from the freeze dried caustic extract standard in an optimum pH range of 7.0-8.5 with PEI 18 concentrations of 550-800 ppm. Color removal from a caustic extract standard was achieved by the low molecular weight polyamines, although not as effectively as PEI 18. Only two diamines displayed any capacity for color removal. Precipitation of color bodies from a partially purified, acid-precipitated fraction by polyamines was dependent upon pH levels. Precipitation of color bodies from caustic extract standard by protonated polyamines indicated that color removal was more effective with triprotonated species. Polyamine concentration in the precipitates were proportional to the cationic polyamines in solution and the anionic characteristics of the color bodies. The conductivity and zeta potential of the precipitated particles were also measured. (Lisk-FIRL)
W78-06076

THE FLUOROMETRIC BEHAVIOR OF PULPING WASTE LIQUORS, A VALUABLE TOOL FOR LIGNIN AND PULPING RESEARCH,
Oregon State Univ., Corvallis. School of Forestry.
For primary bibliographic entry see Field 5A.
W78-06077

YEAST PRODUCTION ON SPENT SULPHITE LIQUOR,
Wilson Rowntree (Pty) Ltd., London (England).
L. A. McKee, and G. V. Quicke.
South African Journal of Science, Vol 73, No 12, p 379-381, December, 1977. 5 tab, 25 ref.

Descriptors: *Yeasts, *Sulfite liquors, Pulp and paper industry, *Pulp wastes, *Laboratory tests, Chemical oxygen demand, Biomass, Fermentation, Waste water treatment, Industrial wastes.

The production of Candida utilis food yeast from pulping mill spent sulfite liquor was tested in laboratory experiments. C. utilis was grown in diluted and undiluted steam-stripped spent sulfite liquor at concentrations of 26, 33, 44, and 52 ml/100 ml in media containing urea, potassium ihydrogen phosphate, and magnesium sulfate heptahydrate. The culture had an initial pH of 4.1-4.5 and was continuously agitated at 29C over periods from 41.3-72.3 hrs. Similar experiments were conducted with diluted steam-stripped spend sulfite liquor concentrations of 13, 26, and 39 ml/100 ml of medium with stationary phase times of 22.3, 38.7, 40.3, and 56.7 hrs. The lowest steam-stripped spent sulfite liquor concentrations produced efficient conversion of sugar to biomass. The most efficient growth of C. utilis, 15.21 kg of yeast/cu m of liquor/week, occurred in a medium cncentration of spent sulfite liquor after six hours. An annual yield of 8,507 tons of freeze dried yeast cells by batch culture or 9.358 tons by continuous culture was calculated from experimental data for the pulp mill liquor. The COD reduction in these experiments ranged 1.7-67.2%. Yeast growth on spent sulfite liquor was found economically viable only for yeast production at a rate of 100,000 tons/year. (Lisk-FIRL)
W78-06078

ELECTRON-BEAM OXIDATION TREATMENT OF A COMMERCIAL DYE BY USE OF A DUAL-TUBE BUBBLING COLUMN REACTOR,
Japan Atomic Energy Research Inst., Tasasaki. Tasasaki Radiation Chemistry Research Establishment.
W. Kawakami, S. Hoshimoto, K. Nishimura, T. Miyata, and N. Suzuki.
Environmental Science and Technology, Vol 12, No 2, p 189-194, February, 1978. 12 fig, 2 tab, 7 ref, 1 append.

Descriptors: *Irradiation, *Oxidation, *Dyes, *Dissolved oxygen, *Nitrogen, Aeration, Degradation(Decomposition), Radiation, Waste water treatment, Industrial wastes.

Electron-beam oxidation using a dual-tube bubbling column reactor was evaluated for the treatment of Acid Red 265 dye in laboratory experiments. Aqueous solutions of commercial azo dye at concentrations of 50-400 ppm were fed into the five-stage, dual-tube bubbling column after one hour of oxidation and agitation in a solution tank. Oxygen was bubbled through the solution in each column at a rate of 0.5-3.0 liters/minute at ambient temperatures. The solution was subjected to a 20-minute irradiation period with beam currents of 1.0-3.0 mA and tested for pH, dissolved oxygen, and absorption spectra. Electron-beam oxidation of the dye solution resulted in a color reduction of 95% after 0.2 Mrad irradiation of a 100 ppm aqueous dye solution. Conversion of the solution was greater at higher flow rates; dissolved oxygen concentrations increased gradually in later stages after a sharp initial decrease. Similar tests conducted with nitrogen as the bubbling agent produced less decoloration of the aqueous solution. (Lisk-FIRL)
W78-06079

NATURE AND TREATABILITY OF DYEING WASTEWATERS,
Hawaii Univ. at Manoa. Dept. of Agricultural Engineering.
P. Y. Yang, and M. B. Pescod.
American Dyestuff Reporter, Vol. 66, No. 12, p 47-52, 54, 71, December, 1977. 13 fig, 7 tab, 1 ref.

Descriptors: *Textiles, *Dyes, *Polymers, *Lime, *Chemical degradation, Activated sludge, Dewatering, Chemical oxygen demand, Biochemical oxygen demand, Sampling, Waste water treatment, Industrial wastes.

Polymerization and dyeing waste waters produced by the Asia Fiber Co., Ltd., in Thailand were biologically and chemically treated. Flow rates of the waste water in the dyeing and the polymerization plants were monitored over a 25-day period; waste water samples were taken over a nine-day period. Flow-proportioned composite samples were analyzed for COD, BOD, nitrogen, phosphorus, solids, pH, and temperature. The temperature and pH of the polymer samples averaged 42.2C and pH 8.35; the dyeing waste water averaged 39.3C with a pH 7.66. Chemical treatment of polymerization waste water with alum and lime proved ineffective in reducing COD levels, removing less than 15% of the COD at high chemical doses. Treatment of the dyeing waste with alum and lime not only achieved significant removal of COD levels, but also substantially reduced the color content and improved the sludge dewatering properties. Biological treatment of the dyeing waste after alum treatment produced a reduction of 73.2% in COD content. A COD removal of 82.7% was achieved by mixing the polumerization waste with the alum-treated dyeing waste supernatant. The use of extended aeration and aeration basin processes yielded a COD removal of more than 92%. (Lisk-FIRL)
W78-06080

DYEBATH REUSE IN BATCH DYEING,
George Inst. of Tech. Atlanta. School of Textile Engineering.
F. L. Cook, and W. C. Tincher.
Textile Chemist and Colorist, Vol. 10, No. 1, p 21-25, January, 1978. 10 tab, 7 ref.

Descriptors: *Dyes, *Dye dispersion, *Color, *Water analysis, *Recirculated water, Plastics, Industrial wastes, Textiles, Waste water treatment, On-site data collections, Water reuse.

Dyebath reuse was evaluated for batch dyeing of nylon carpet, nylon panty-hose, and polyester yarn. After an initial, standard dyeing of a batch of nylon carpet, water removed during the dyeing process was replaced and dyes were replenished. Carpet was then dyed using the recycled bath; end-to-end color differences of the carpet ranged 0.40-5.16 MacAdam units. The estimated savings in water and energy were 65% and 15%, respectively. Similar tests on the dyeing of pantyhose yielded a color difference ranging 2.53-6.35 MacAdam units from a control. Pantyhose samples dyed by conventional methods and considered 'just passable as first quality' exhibited a color difference of 7.78 MacAdams units for the medium limit and 2.89 MacAdam units for the dark limit. Savings of 90% in water and 35% in energy were realized in the dyebath reuse process. After polyester yarn was dyed in seven different color series, lot-to-lot and through-package color differences were analyzed. Single shade pressure dyeing with dyebath reuse resulted in acceptable coloration, as did multicolor dyeing when dyes were overlapped. Dyebath reuse for polyester yarn resulted in an 81% water and 41% energy savings. Carpet and pantyhose dyed with the reused dyebaths were considered acceptable as first-quality merchandise. (Lisk-FIRL)
W78-06081

MEMBRANE PROCESSES USED FOR THE TREATMENT OF INDUSTRIAL EFFLUENTS,
Istituto di Ricerca sulle Acque, Rome (Italy).
P. Mappelli, M. Santori, A. Chiolle, and G. Gianotti.
Desalination, Vol. 24, No. 1/2/3, p 155-173, January, 1978. 4 fig, 12 tab, 14 ref.

Descriptors: *Textiles, *Membrane processes, *Reverse osmosis, *Membranes, *Separation techniques, Pilot plants, Fibers(Plant), Oxidation, Activated carbon, Ion exchange, Waste water treatment, Industrial wastes.

Pilot plant studies were conducted on the treatment of synthetic and acrylic fiber production waste water by ultrafiltration and reverse osmosis membrane processes. A mobile unit equipped with three ultrafiltration modules and three reverse osmosis membrane processes was used to test the recovery rates of the membranes in the treatment of nondegradable effluents from a fiber finishing plant and an acrylic fiber plant. Laboratory tests were also conducted to determine suitable operating pressures and rejection factors for treatment of the two types of effluent. The effluent from the fiber finishing plant, which contained a high concentration of non-ionic surfactants of low biodegradability, was acidified to pH 5.1 with sulfuric acid before treatment. Recovery rates, ranging from 88.5-98.6%, as well as flow rate, pH, COD, total organic carbon, and non-ionic surfactants concentrations were measured after filtration through a DDs 995 cellulose acetate membrane. The adsorption capacity of activated carbon for the fiber finishing effluent was also tested. The treatment of effluent from the production of acrylic fibers, containing high concentrations of sulfites and other organic substances, with activated carbon, ion-exchange resins, distillation, or chemical or biological treatment was not economically feasible. Three different oxidizing agents were tested before reverse osmosis was conducted at a recovery factor of 80-90%. Recovery rates of 78.0-97.3% were obtained with a feed pressure of 42 kg/sq cm at 20C. Operating and capital costs were calculated for treatment of 200 cu m/hr of acrylic fiber effluent. (Lisk-FIRL)
W78-06082

OPTIMIZATION OF DESIGN AND OPERATIONS OF ACTIVATED SLUDGE WASTEWATER TREATMENT SYSTEMS,
State Univ. of New York at Buffalo.
E. W. Craig.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-32-646. PhD Thesis, 1977, 220 p.

Descriptors: *Activated sludge, *Optimization, *Analytical techniques, *Computer programs, *Flow rates, Treatment plants, Phosphorus, Mathematical models, Forecasting, Data collections, Waste water treatment, Municipal wastes.

A Box-Complex algorithm was employed to optimize the design and operation of an activated sludge waste water treatment process with a sludge reuse capability. The use of a nonlinear objective function and nonlinear, noncontinuous constraints with the Box technique permitted realistic models for unit processes. Predicted flow rates and a discrete time series definition were used in a plant performance technique developed for higher effluent quality at the lowest cost. A procedure for the optimization of an existing activated sludge plant with phosphorus reduction was designed to incorporate flow prediction data. A digital computer program was devised for plant optimization using the Box Search technique. Solids retention time and the recycle ratio were used as the control variables. According to the results of the computer program, substantial savings could be realized wih flow rate predictions and other data. (Lisk-FIRL)
W78-06094

AEROBIC DIGESTION OF SEWAGE LIME SLUDGE,
Missouri Univ.-Rolla.
K-C. Tsai.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-23,686. PhD Thesis, 1977, 263 p.

Descriptors: *Sludge digestion, *Aerobic treatment, *Phosphorus, *Sludge treatment, *Lime, Dewatering, Biological treatment, Hydrogen ion concentration, Design criteria, Operation and maintenance, Chemical oxygen demand, Dissolved oxygen, Sewage treatment, Waste water treatment.

Laboratory studies were conducted to establish design and operational criteria for aerobic digestion of lime sewage sludge generated during phosphorus precipitation in a primary clarifier. Batch and semi-continuous flow reactors were operated at temperatures, of 10, 20, and 30C. Parameters used in the evaluation of optimal process design and control included: detention time, oxygen uptake rate, volatile suspended solids destruction, liquid sludge COD reduction, supernatant COD and phosphorus contents, sludge settleability and dewaterability, and potential phosphorus release. The studies indicated that lime sludges having an initial pH as high as 11.0 are aerobically digestible in the presence of appropriate microorganisms. An optimal sludge retention time of 10 days and an air flow of 60 scfm/1000 cu ft of digester volume were suggested for a semi-continuous flow unit operating at 20C. A dissolved oxygen concentration of 1-2 mg/liter and a pH above 7.0 are recommended to minimize potential phosphorus release from the sludge to the liquid phase. The sludge was easily settled and dewaterability was improved significantly by digestion. (Schulz-FIRL)
W78-06095

TEMPERATURE EFFECTS ON THE ACTIVATED SLUDGE PROCESS,
Texas Univ. at Austin.
B. A. Sayigh.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-23,030. PhD Thesis, 1977, 196 p.

Descriptors: *Activated sludge, *Mathematical models, *Temperature, *Suspended solids, *Microorganisms, Biological treatment, Oxygen requirements, Aerobic treatment, Sludge treatment, Municipal wastes, Industrial wastes, Waste water treatment.

Since the completely-mixed, continuous-flow activated sludge process is currently one of the most commonly used aerobic modes of biological waste water treatment, studies were conducted to study the effects of temperature variations on the kinetics and performance of the process. Domestic waste water, an organic chemicals industrial waste water, and the mixed waste water from several industries were used in laboratory experiments at 4, 10, 15, 20, and 30C. The control parameter used in the laboratory-scale experiments was sludge age. Filtered COD, filtered TOC, and/or filtered BOD were used as measures to influent and effluent substrate concentrations. Mixed liquor volatile suspended solids (MLVSS) levels were used as an indication of microorganism concentration. The experiments examined the effect of temperature on kinetic coefficients governing cell synthesis, microorganism decay, soluble substrate utilization, and dissolved oxygen utilization. A mathematical model was presented for the interrelationship between steady state MLVSS concentrations, the net rate of MLVSS production, and sludge age. (Schulz-FIRL)
W78-06115

THE TREATABILITY OF LEACHATES FROM SANITARY LANDFILLS,
Drexel Univ., Philadelphia, PA. Coll. of Business Administration.
R. J. Buchanan, Jr.
Available from University Microfilm International, Ann Arbor, Michigan 48106; Order No. 77-22,526. PhD Thesis, 1977, 253 p.

Descriptors: *Leachate, *Landfills, *Thiobacillus ferrooxidans, *Sulfur bacteria, *Mine acids, Chemical precipitation, Coagulation, Activated sludge, Biological treatment, Activated carbon, Hydrogen ion concentration, Waste water treatment.

Physicochemical and biological treatment processes applicable to leachates from sanitary landfills were investigated in bench-scale and full-scale experiments. Laboratory experiments examined the effects of precipitants, coagulants, activated carbon, low pH biological treatment, and conventional activated sludge processes on landfill leachates. Treatment with the ferrous oxidizing bacterium, Thiobacillus ferrooxidans, in the low pH treatment scheme was demonstrated as feasible for leachates. (Schulz-FIRL)
W78-06148

SUMMARY OF DRAFT 201 FACILITY PLAN FOR UPGRADING METRO PUGET SOUND PLANTS,
Metropolitan Engineers, Seattle, WA.
For primary bibliographic entry see Field 5G.
W78-06149

5E. Ultimate Disposal Of Wastes

AN EVALUATION OF ALTERNATIVE SLUDGE TECHNOLOGIES: A SURROGATE WORTH TRADEOFF APPROACH,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
B. E. Lindsay.
Water Resources Bulletin, Vol 14, No 1, p 55-62, February 1978. 1 fig, 1 tab, 4 ref.

Descriptors: *Sewage sludge, *Disposal systems, *Multiobjective programming, *Surrogate worth tradeoff method, Methodology, Least squares, Decision making, Evaluation, Environmental impact, Benefit maximization, Economic efficiency, Optimization, Constraints, Equations, Mathematical models, Systems analysis, *Boston(Mass), Massachusetts.

Problems with current modes of sewage disposal have caused researchers to seek new methods. The selection among alternative disposal methods must be made with explicit recognition of the tradeoffs involved. This paper develops a multiple objective decision making framework based upon alternative disposal systems, incorporating two objectives: economic benefit maximization and optimal level of environmental impact. Utilized is the surrogate worth tradeoff method, which directly involves decision makers in determining optimum levels in objective space. Evaluated are alternative sewage disposal systems for the Boston Massachusetts area. (Bell-Cornell)
W78-05707

A MODEL FOR PLANNING AND LOCATION OF ON-SITE WASTE DISPOSAL SYSTEMS,
Wisconsin Univ., Madison. Coll. of Agricultural and Life Sciences.
F. G. Baker.
Water Resources Bulletin, Vol 14, No 1, p 144-156, February 1978. 3 fig, 2 tab, 18 ref.

Descriptors: *Waste disposal, *Waste water(Pollution), *Management, *Planning, *System performance, *Probability, *Regional analysis, Home waste disposal, Soil characteristics, Behavior, Land use, Evaluation, Waste water treatment, Decision making, Forecasting, Equations, Operations research, Mathematical models.

A probabilistic model that incorporates performance data about several wastewater management systems is discussed. From these data, the expected behavior of an individual wastewater system or group of systems can be predicted within limits. To illustrate how the selection of a management system for a particular site is based on the site's limiting factors, an example problem is considered: a humid location in central Wisconsin where bedrock is greater than six feet below the surface but groundwater is only two feet below the soil surface for most of the year. Also, the behavior of a wastewater system can be treated as the product of the performance probabilities of its individual components. The model can be used on a regional scale facilitating land use planning by allowing accurate estimates of performance for a prospective wastewater management system. At this scale, it can allow the impact evaluation of new wastewater technology on land use in a region. (Bell-Cornell)
W78-05713

THE ENVIRONMENTAL COSTS OF LANDFILLS AND INCINERATORS,
Chicago Univ., IL. Center for Urban Studies.
O. Hockman, E. Hwang, and G. Rudzitis.
Available from the National Technical Information Service, Springfield, VA 22161 as ANL 76-XX-15, Price codes: A02 in paper copy, A01 in microfiche. Energy Research and Development Administration, ANL-76-XX-15, July 1976. 10 p, 1 fig, 1 tab, NSF-RANN AG-352 and GI 32989A2.

Descriptors: *Landfills, *Incinerators, *Costs, Municipal wastes, *Waste disposal, *Environmental effects, *Cities, Solid wastes, Chicago, Illinois, Alternative costs, Economics, Model studies, Cost analysis, Cost-benefit analysis.

A study of economic and environmental costs of sanitary landfills and incineration for nonhazardous municipal solid wastes in the Chicago metropolitan area concludes that total social costs of landfills are only 25% as large as incineration costs. Landfill costs are lower both for (1) investment and operating costs alone, and (2) total social costs, including environmental costs. The total cost for incineration was calculated at $16.35/ton of refuse, compared with $4.32/ton for landfills. While the data pertain to the Chicago area, these conclusions may apply to other large cities. At a properly operated sanitary landfill, solid waste is compacted and covered by at least six inches of earth; refuse is not burned. Neither groundwater nor surface water pollution should result. Capital costs are low, and no sorting of waste is needed. Upon completion, the land usually can be reclaimed for golf courses, playgrounds, or parking lots. Drawbacks include the need for large land tracts, political jurisdiction problems, and transportation costs increasing with distance from the landfill. Incineration (including residue disposal) requires much less land and can be located nearer the area served, but capital and operating costs are considerably higher. Skilled personnel and dust and ash control devices are required. For environmental and economic cost comparisons in this study, 55 landfill sites and eight incinerators were analyzed. Air dispersion and damage models were employed. (Lynch-Wisconsin)
W78-05738

COMBATING RIVER POLLUTION.
For primary bibliographic entry see Field 5G.
W78-05744

BIOLOGICAL TREATMENT OF SPENT VEGETABLE TANNINS WITH FUNGAL DOMINANT SYSTEM,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 5D.
W78-05807

DESIGN OF AN OUTFALL,
Montgomery (James M.), Inc., Pasadena, CA.
For primary bibliographic entry see Field 8B.
W78-05828

USE OF MIXING PIPES TO IMPROVE THE FLOW OF WASTE WATER INTO LAKES (EINSATZ VON MISCHROHREN ZUR VERBESSERUNG DER EINLEITUNG VON ABWASSER IN SEEN),
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie.
K. Hofer, K. Hutter, and D. Vischer.
Gas-Wasser-Abwasser, Vol. 57, No. 12, p 846-852, 1977. 9 fig, 1 tab, 11 ref.

Descriptors: *Outfall sewers, *Waste water disposal, Lakes, *Design criteria, *Sewage disposal, *Waste dilution, Sewers, Phosphorus, Nutrient removal, Surface waters, Waste assimilative capacity, Waste water treatment.

Methods of reducing the height of rise and increasing the overall dilution of purified waste water discharged into lakes are evaluated. The reduction in the height of rise is considered necessary to prevent the acceleration of biosynthetic processes by the high levels of phosphorus in the waste water. Diffusers based on the water jet pump principle are considered suitable, depending on the degeee of stratification of the lake water. For a nonstratified lake, diffusers having a diffuser diameter to nozzle diameter ratio greater than 1.86 are required to improve the degree of mixing. Advantages afforded by premixing are greater with lower Froude numbers and stratificaion parameters and with an increase in the diffuser to nozzle diameter ratior. Modifications in the nozzle design can be used to economically and efficiently adjust the discharge cross-section and the Froude number with respect to variations in the waste water discharge. (Takacs-FIRL)
W78-05829

WASTE WATER FLAME DECONTAMINATION--BY DIVIDING HIGH TEMPERATURE COMBUSTION PRODUCTS INTO NUMBER OF STREAMS CORRESPONDING TO NUMBER OF CONTROL STAGES.
Soviet Patent SU-548-749. Issued March 30, 1977.
Derwent Soviet Inventions Illustrated, Vol A, No. 1, p 3, February, 1978. 1 fig.

Descriptors: *Organic matter, *Incineration, *Gases, *Water vapor, *Patents, Oxidation, Control systems, Design data, Equipment, Waste water treatment, Municipal wastes.

A combustion system for the decontamination of organic and mineral-bearing waste water using steam, gas, and high-temperature combustion products of the treatment process has been patented. After incineration in a furnace, high temperature combustion products are separated into a number of streams equal to the number of control treatment stages. These high temperature streams are used in combustion chambers to oxidize steam and gas mixtures produced in the previous control stage. Thus, one stream of high temperature combustion material is combined with waste water in one control stage to produce a steam/gas mixture. This steam/gas mixture flows into a combustion chamber where it is oxidized by another stream of high temperature combustion products. The hot gases produced in this stage are passed onto the second stage which repeats the process. The process is repeated a total of three times, producing a final effluent containing non-volatile organic material and mineral impurities. This effluent is returned to the initial furnace for incineration and repetition of the entire process cycle. (Lisk-FIRL)
W78-05842

WASTEWATER PLANT HAS AN EYE ON THE FUTURE,
Raleigh Pollution Control Office, NC.
For primary bibliographic entry see Field 5D.
W78-05843

CHLORINE AND ACID CONDITIONING OF SLUDGE,
California State Water Resources Control Board, Sacramento.
For primary bibliographic entry see Field 5D.
W78-05847

DISSOLVED METALS IN AQUEOUS EFFLUENTS FROM MUNICIPAL INCINERATORS,
Bureau of Mines, College Park, MD. Coll. Park Metallurgy Research Center.
S. L. Law.
Journal Water Pollution Control Federation, Vol 49, No 12, p 2453-2466, December, 1977. 5 fig, 9 tab, 20 ref.

Descriptors: *Metals, *Dissolved solids, *Incineration, *Fly ash, *Potable water, Municipal wastes, Waste water treatment, Treatment facilities, Cadmium, Manganese, Zinc, Lead, Maryland, Virgina, District of Columbia.

The environmental impact of dissolved metal concentrations in the water systems of three municipal incineration operations was examined. Flyash scrubber water and quench water, utilized in separate processes by Alexandria, Virginia's municipal incinerator, were used as the basis for the study. The combined flyash and quench waters from incinerators in Washington, Distict of Columbia, and from Montgomery County, Maryland, were also analyzed for dissolved metal contents. Concentrations of 26 elements were measured in water samples taken from the plants during operation and just before discharge of waste water into municipal waste treatment facilities. Levels of dissolved metals in waste water from the three operations were found to be low enough so that biological treatment of wastes in the municipal plants would not be significantly hindered. Zinc concentrations in the Alexandria incineration wastes were considered to be detrimental to

biological treatment if discharge were made directly into the waste treatment facility. Comparison of metal concentrations with Environmental Protection Agency drinking water standards revealed consistent excessive concentrations of cadmium, manganese, lead, selenium, and zinc in Alexandria's recycled flyash waters. Further treatment of the water from the three incineration operations would be required before discharge into surface water or public water supplies. (Lisk-FIRL)
W78-05848

FROM WASTEWATER TO RESOURCE IN ST. PETERSBURG, FLORIDA,
For primary bibliographic entry see Field 5D.
W78-05851

NO METAL UPTAKE BY CORN OR GRASS.
Agricultural Research, Vol. 26, No. 7, p 10-11, January, 1978.

Descriptors: *Heavy metals, *Fertilization, *Corn(Field), *Grasses, *Agricultural watersheds, Demonstration watersheds, Chromium, Zinc, Copper, Lead, Nickel, Cadmium, Sewage sludge, Waste water treatment, Minnesota.

A study of sewage sludge application to corn and reed canarygrass crops was conducted over a 2-3 year period. A two-year application at a rate of 4 tons/acre/yr of digested sewage sludge was used to fertilize a reed canarygrass crop planted on a 40-acre terraced watershed in Minnesota. A higher annual production yield was obtained with sewage, 4.4 tons/acre canarygrass, than with conventional fertilizer, 3.5 tons/acre. Similar results were found with applications of 4.5 tons/acre-yr to corn and grass crops over a three-year period. Annual yields per acre averaged 108 bushels of corn and 6.5 tons of fodder with sludge as the fertilizer, compared to 102 bushels of corn and 6.1 tons of fodder with conventional fertilizer. The sewage sludge applied to the crops contained chromium, zinc, copper, lead, nickel, and cadmium. The heavy metal content in the sludge-treated corn grain and leaf tissue and in the reed canarygrass was not different from the content in the other crops. Surface and soil waters in the research watershed did not display higher concentrations of these heavy metals nor was there significant movement of pollutants through the groundwater. During snowmelt, spring runoff, and high rainfall, some movement of plant nutrients was detected in surface waters on the sludge-fertilized areas. (Lisk-FIRL)
W78-05853

EFFECTS OF INCUBATION AND LIMING ON YIELD AND HEAVY METAL UPTAKE BY RYE FROM SEWAGE-SLUDGED SOIL,
Agricultural Research Service, Beltsville, MD.
J. V. Lagerwerff, G. T. Biersdorf, R. P. Milberg, and D. L. Brower.
Journal of Environmental Quality, Vol. 6, No. 4, p 427-431, October-December, 1977. 3 fig, 4 tab, 12 ref.

Descriptors: *Sludge disposal, *Fertilization, *Heavy metals, *Vegetation effects, *Pollutant identification, Incubation, Lime, Zinc, Cadmium, Lead, Copper, Analytical techniques, Municipal wastes.

Rye (Secale cereale) was greenhouse-grown in sandy loam fertilized with digested secondary sludge in studies to evaluate the yield and uptake of Cd, Cu, Pb, and Zn as a function of sludge origin, pH, incubation time between mixing and planting, and plant age. Sludge appliction rates of 0-10% on a dry weight basis and incubation times ranging 0-7 weeks were used. The effects of sludge obtained from Baltimore, Maryland, and Washington, District of Columbia, were compared. Comparisons of three successive clippings revealed that plant yields decreased at higher sludge application rates. Metal uptake increased with sludge addition and with plant age, with the effect being greatest for Zn, followed by Pb and Cu. With the addition of lime, the uptake of Zn from sludge decreased, followed by Cd, Pb, and Cu. The uptake of Cu and Pb significantly decreased with incubation. The data suggested that the tendency to form organic complexes was greater for Cy than for Pb, Zn, and Cd. The relative uptake of HCL-extractable Cd from the soil was greater than that of Zn, especially upon liming. (Snyder-FIRL)
W78-05863

THE USE OF FAECAL BACTERIA AS A TRACER FOR SEWAGE SLUDGE DISPOSAL IN THE SEA,
Ministry of Agriculture, Fisheries and Food, Burnham-on-Crouch (England). Fisheries Lab.
For primary bibliographic entry see Field 5B.
W78-05876

A FAECAL STEROL SURVEY IN THE CLYDE ESTUARY,
Bristol Univ. (England). Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-05879

DISTRIBUTION OF VIRAL AND BACTERIAL PATHOGENS IN A COASTAL CANAL COMMUNITY,
Baylor Coll. of Medicine, Houston, TX. Dept. of Virology and Epidemiology.
For primary bibliographic entry see Field 5B.
W78-05880

NEARSHORE SEDIMENT POLLUTION IN ISRAEL BY TRACE METALS DERIVED FROM SEWAGE EFFLUENT,
Hebrew Univ. of Jerusalem, Rehovot (Israel). Dept. of Soil and Water Science.
For primary bibliographic entry see Field 5B.
W78-05887

CONVERTING WASTES TO ENERGY--A CONCEPTUAL APPROACH,
Nihon Suido Consultants Co. Ltd., Tokyo.
For primary bibliographic entry see Field 5D.
W78-05896

UNDERGROUND INJECTION OF LIQUID WASTE CAN BE ENVIRONMENTALLY SOUND,
Texas Water Quality Board, Austin.
J. W. Mullican.
Water and Sewage Works, Vol. 124, No 12, p 62-63, December, 1977.

Descriptors: *Waste disposal wells, *Underground waste disposal, *Injection, *Geologic control, *Environmental engineering, Liquid wastes, Texas, Administrative agencies, Analytical techniques, Legislation, Waste water disposal.

Subsurface injection can be an environmentally sound method of waste disposal. In Texas, the Disposal Well Act requires certification by the Texas Water Quality Board that wastes will not be injected into freshwater strata, protecting groundwater resources. Subsurface disposal of other wastes requires a thorough engineering and geological evaluation of the waste character, well design, construction, operation, and monitoring program. Injection is only permitted after other methods have been found less desirable with regard to environmental protection and dependability. A technical staff qualified to evaluate applications in light of current developments is required. Application for a permit requires an on-site inspection and a technical report including information on local topography and geology, chemical and physical characteristics of the waste, and average and maximum anticipated injection rates. Disposal wells are inspected routinely; routine measurements of surface injection pressures and water analyses are required. Safe abandonment of the injection well and the effect on improperly plugged wells in the vicinity must also be considered. Proper plugging confines the injected wastes to a specific area. Cement plugs must be properly placed at the top of the injection zone, across any formation producing oil or gas, and at the top and bottom of the surface casing. (Snyder-FIRL)
W78-05899

BEHAVIOR OF ANIONIC SURFACTANTS IN A SOIL-SEWAGE EFFLUENT SYSTEM,
Agricultural Research Organization, Bet Dagan (Israel). Inst. of Soils and Water.
For primary bibliographic entry see Field 5B.
W78-05900

IMPROVING SUBSURFACE DISPOSAL SYSTEM PERFORMANCE,
Agricultural Research Center, Beltsville, MD.
E. E. Jones, Jr.
Journal of Environmental Health, Vol. 40, No. 4, p 186-190, 1978.

Descriptors: *Subsurface drainage, *Septic tanks, *Domestic wastes, *Soil disposal fields, *Soil dynamics, Percolation, Soil classification, Hydraulic structures, Drainage engineering, Waste water treatment, Waste water disposal.

Factors influencing the longevity of domestic subsurface disposal systems, including oxidation potential, soil percolation, hydraulic loading, soil type, and weather, are discussed. Consideration of primary and secondary soil moisture is necessary in the construction of disposal systems. Increasing the soil moisture content reduces the oxidation potential of the soil to below the level required for the degradation of organic compounds. Excessive soil moisture content can lead to anaerobic conditions and early failure of the septic system. Time controlled, intermittent loading systems with manual override and overload alarm are recommended for hydraulic loading of sand over alternated systems, volume controlled intermittent systems, and direct gravity loading systems. The time-volume control system limits loading to 0.5 cm/hr with 4-10 doses daily. Intermittent uniform pressure distribution and alternated loading systems are recommended for silt and clay loam soils with percolation rates ranging 60-300 minutes/inch. Sandy loam soils have percolation rates ranging 1-12.9 minutes/inch. Soil disposal systems located in soils with percolation rates of 0-5 minutes/inch have an estimated life of 13-36 years for families of 1-6 members. Disposal system longevity is also calculated for fair and poorly percolated soils. (Lisk-FIRL)
W78-05901

PURIFICATION OF SECONDARY EFFLUENT IN A NATURAL SAND FILTER,
Rensselaer Polytechnic Inst., Troy, NY. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W78-05902

NITRATE LEACHING DURING LONG-TERM SPRAY IRRIGATION FOR TREATMENT OF SECONDARY SEWAGE EFFLUENT ON WOODLAND SITES,
Pennsylvania State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-05903

THE IMPACT OF WATER SAVING WATER CLOSETS ON BUILDING DRAINS AND SEWERS,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 3D.
W78-05904

DISCHARGE OF NITROGEN, PHOSPHORUS AND ORGANIC MATTER INTO THE GULF OF-BOTHNIA,
National Swedish Environment Protection Board, Uppsala. Limnological Survey.
For primary bibliographic entry see Field 5B.
W78-05905

COST-EFFECTIVENESS OF ON-SITE AND COMMUNITY SEWERAGE ALTERNATIVES,
Brown and Caldwell, Eugene, OR.
For primary bibliographic entry see Field 5D.
W78-05910

CHARACTERISTICS OF MUNICIPAL WASTE-WATER DISCHARGES, 1976,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-05912

METALS IN POWER PLANT COOLING WATER DISCHARGES,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-05913

IN SITU MEASUREMENTS OF INITIAL DILUTION,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-05915

COASTAL CURRENTS,
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-05916

PHOSPHORUS DYNAMICS IN SOILS IRRIGATED WITH MUNICIPAL WASTEWATER,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W78-05937

THE BACTERIAL POLLUTION OF THE COASTAL WATERS OF THE PROVINCE OF ROME, (IN ITALIAN),
Ufficio Medico Provincial di Rome (Italy).
For primary bibliographic entry see Field 5C.
W78-05948

INFECTIOUS HOSPITAL WASTES: THEIR TREATMENT AND SANITARY DISPOSAL,
Florida Univ., Gainesville. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W78-05949

USE OF A NATURAL MARSH FOR WASTE-WATER POLISHING,
Wisconsin Univ.-Oshkosh.
For primary bibliographic entry see Field 5D.
W78-05960

EUTROPHICATION AND WATER POLLUTION,
Federal Water Pollution Control Administration, Washington, DC.
For primary bibliographic entry see Field 5C.
W78-05982

EFFECT OF LAND DISPOSAL APPLICATIONS OF MUNICIPAL WASTES ON CROP YIELDS AND HEAVY METAL UPTAKE,
National Fertilizer Development Center, Muscle Shoals, AL.
For primary bibliographic entry see Field 5B.
W78-05985

HANDLING AND DISPOSAL OF SLUDGES FROM COMBINED SEWER OVERFLOW TREATMENT, PHASE I - CHARACTERIZATION,
Envirex, Inc., Milwaukee, WI. Environmental Sciences Div.
M. K. Gupta, E. Bollinger, S. Vanderah, C. Hansen, and M. Clark.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 212, Price codes: A10 in paper copy, A01 in microfiche. Report No. EPA - 600/2-77-053a, May, 1977. 188 p, 44 fig, 51 tab, 55 ref, 3 append. 68-03-0242.

Descriptors: *Combined sewers, *Overflow, *Pesticide residues, *Sludge disposal, *Sewage treatment, *Pesticides, *Heavy metals, Pollutant identification, Sludge, Solid wastes, Ultimate disposal, Solid wastes, Volumetric analysis, Volumes, Suspended solids, Sludge characterization, Combined sewer overflow, Sludge treatment(Physical physical/chemical biological), Pump/bleedback, *Dry-weather sludge, Residual quantity, Residues, Sludge, Drying, Characterization.

The results of a charcterization and treatment test program to develop optimum means of handling and disposing of residual sludges from combined sewer overflow (CSO) treatment systems are summarized. Desk top engineering reviews were conducted to gather, analyze, and evaluate pertinent information relating to pump/bleedback of treatment residuals to the dry-weather sludge handling/treatment and disposal facilities. The volumes and characteristics of the residual vary widely; volumes ranged from less than 1% to 6% of the raw volume treated and contained 0.12% to 11% suspended solids. Sludge volatile contents varied between 25% and 63% with biological treatment residuals showing the highest volatile content and fuel values. The heavy metal and pesticide concentrations of the various sludges were observed to be significant and are presented. Pump/bleedback of CSO treatment may be impractical for an entire city because of the possibility of hydraulic and/or solids overloading of the dry-weather treatment facilities. Controlled pump/bleedback of a selective basis may be feasible. For low solids content residuals (storage, screen backwash, waste activated sludge, etc.), gravity or flotation thickening are the optimum steps for the removal of the major water portion, while centrifugation and vacuum filtration are the optimum dewatering techniques for the high solids content residuals (settled storage treatment sludge, flotation scum, and other thickened sludges) prior to their disposal by incineration of landfill. Follow-up study recommendations are outlined. (Seip - IPA)
W78-05987

USE OF CLIMATIC DATA IN ESTIMATING STORAGE DAYS FOR SOILS TREATMENT SYSTEMS,
Environmental Data Service, Asheville, NC.
D. M. Whiting.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 597, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-250, November, 1976. 90 p, 47 fig, 4 tab, 35 ref, 3 append.

Descriptors: *Storage capacity, *Computer programs, *Climatology, *Climatic data, *Soil treatment, Soil properties, *Land application, Cold-weather operations, Wet-region operations.

Computer programs which estimate storage needs for Soil Treatment Systems are developed from analyses of daily climatological data; the number of days each year that the systems may be inoperative because of unfavorable weather conditions can be estimated. Cold region winter seasons are examined for a 20-25 year period. Each day is defined as favorable, partly favorable, or unfavorable using a set of thresholds for temperature, precipitation, and snow depth. A daily accounting procedure adjusts in-storage increases and decreases on the basis of day, type and drawdown rate. Maximum storage days (each year) are summarized in a table, including mean, standard deviation, unbiased third moment about the mean, coefficient of skewness, and storage days for recurrence intervals of 5, 10, 25, and 50 years. A second program designed for use in wet regions where the primary constraint to land application is saturated soil is developed. Daily mean temperature and precipitation are examined for the same peiod, using the modified Palmer program which estimates the condition of the underlying and surface soil layers in order to identify periods when saturation occurs and runoff would result from additional precipitation or application. The longest consecutive period of unfavorable days each year is summarized in a table which also shows estimated storage days at 5, 10, 25, and 50th percentiles. Chronological listings of the actual data and computations for the entire period of record can be furnished. Thresholds of most of the parameters can be changed to suit individual systems. With modification, the program can examine conditions of the surface layer during the growing season as an estimate of irrigation needs. (Seip-IPA)
W78-05993

STUDIES ON THE PURIFICATION OF WASTES FROM THE NITROGEN FERTILIZER INDUSTRY BY INTENSIVE ALGAL CULTURES. IV. GROWTH OF CHLORELLA VULGARIS IN WASTES WITH HIGH NITROGEN CONTENT IN CONTINUOUS AND INTERMITTENT LIGHT,
Warsaw Univ. (Poland). Dept. of Environmental Microbiology.
For primary bibliographic entry see Field 5D.
W78-05997

OCEAN DUMPING: PHILADELPHIA'S STORY.
Environmental Science and Technology, Vol. 9, No. 10, p 916-917, October 1975. 1 fig.

Descriptors: *Philadelphia(PA), *Sewage disposal, *Ocean dumping, *Recycling, *Beneficial use, *Land reclamation, Heavy metals, Pennsylvania, Oceans, Waste disposal, Sludge disposal, Middle Atlantic Bight, Permits, Regulation, Fertilizers, Landfills, Water pollution sources, Water pollution control, Food chains, Strip mines, Toxins, Environmental Protection Agency, Public health, Epidemics.

The new EPA ocean dumping permit for Philadelphia's sewage, which requires the city to end all dumping by 1981, could have many beneficial consequences. The permit specifies that 1975 dumping must be held to the 1974 level (150 million gallons), and reduced 50% by 1979. The most desirable alternative to the current disposal system lies in using the sewage sludge to reclaim and revegetate the thousands of acres of active and abandoned strip mines in Pennsylvania. Sludge would promote growth of grasses, the most resistant of all plants to uptake of the heavy metals present in the sludge. As fertilizer, the sludge would be use-

ful for revegetating highway medians, golf courses, and parks. Sludge could be mined for its nutrient and heavy metal content at a net operating cost less than one-third the present cost of barging it to the dumping site 40 miles east of Ocean City, Maryland, in the Middle Atlantic Bight. Pathogens and other toxic sludge components present far greater hazards at sea than in terrestrial systems. Shellfish and other edible marine invertebrates are very prone to accumulate pathogenic microorganisms. Whereas there has never been an epidemic traceable to land sludge application, since 1900 there have been some 600 epidemics in the U.S. directly attributable to sewage discharge into water. Other toxic substances are also less hazardous on land because of the multiple barriers to biological uptake in terrestrial plants and soils which have no counterpart in marine systems. (Lynch-Wisconsin)
W78-06021

EFFECTS OF POLLUTION ON WATER QUALITY, PERDIDO RIVER AND BAY, ALABAMA AND FLORIDA.
Federal Water Pollution Administration, Athens, GA. Southeast Water Lab.
For primary bibliographic entry see Field 5C.
W78-06044

WATER QUALITY FACTORS, NORTH PLATTE RIVER, WYOMING-NEBRASKA.
National Field Investigations Center, Denver, CO.
For primary bibliographic entry see Field 5G.
W78-06049

ANALYSIS OF OPERATION 'DEEP SIX' BENTHIC INVERTEBRATES.
Marine Research Inc., Falmouth, MA.
For primary bibliographic entry see Field 5C.
W78-06052

A FIELD STUDY OF THE AGRICULTURAL USE OF SEWAGE SLUDGE: II. EFFECT ON SOIL N AND P,
Ball State Univ., Muncie, IN. Dept. of Natural Resources.
K. A. Kelling, L. M. Walsh, D. R. Keeney, J. A. Ryan, and A. E. Peterson.
Journal of Environmental Quality, Vol 6, No 4, p 345-352, October-December, 1977. 3 fig, 5 tab, 25 ref.

Descriptors: *Sludge disposal, *Land use, *Pollutant identification, *Nitrogen compounds, *Phosphorus, Groundwater, Nitrification, Denitrification, Leaching, Impaired water quality, Municipal wastes, Waste water treatment.

Changes in concentrations of soil inorganic N, organic N, and available P with time were examined at field sites in Arlington and Janesville, Wisconsin, which had been treated with digested sludge. Liquid digested sludge applied at rates of 3.75-60 metric tons/ha increased the concentrations of inorganic N, organic N, and available P in the sandy loam and silt loam soils. Most of the inorganic N in the digested sludge was in the form of NH4-N and was rapidly nitrified. At application rates of 30 metric tons/ha or higher, substantial amounts of sludge-applied N were lost by leaching. Concentrations of NO3-N in the soil water were over 100 mg/liter at a depth of 120-150 cm within 10 weeks after sludge application on permeable sandy loam and within about 1 year after application on silt loam. The N balance indicated that considerable N might have been lost via denitrification or volatilization at application rates over 30 metric tons/ha. As much as 50% of the organic N in the sludge was mineralized by 3 weeks after application, more than previously reported. During the following 25 months, the mineralization rate essentially remained at about 250 mg of organic N/kg of soil/year where 60 metric ton/ha had been applied and at 180 mg of organic N/kg of soil/year where 30 metric ton/ha had been applied. Sludge applications immediately increased the quantity of available P. The quantity of available P subsequently decreased with time, probably due to P fixation. Where higher treatment rates had been used, significant amounts of available P remained in the soil after 2 years. (See also W78-04609 and W78-06060) (Snyder-FIRL)
W78-06059

PLANNING FOR CLEANING UP AN ESTUARY--PART II: PHYSICAL PLANNING FOR THE MERSEY,
For primary bibliographic entry see Field 5G.
W78-06062

RECOVERY OF YEAST FROM CONFECTIONERY EFFLUENT,
Reading Univ., (England). Philip Lyle Memorial Research Lab.
For primary bibliographic entry see Field 5D.
W78-06070

HEAT RECOVERING INCINERATION OF ORGANIC EMISSIONS SAVES $970/000/YR IN FUEL COSTS,
Amoco Chemicals Corp., Joliet, IL.
W. W. Twaddle, C. Olson, and K. L. Kramer.
Chemical Processing, Vol. 41, No. 1, p 116-117, January, 1978. 1 fig.

Descriptors: *Chemical industry, *Incineration, *Organic compounds, *Thermal conductivity, *Chemical wastes, Heat transfer, Boilers, Steam, Oxidation, Design data, Waste treatment, Industrial wastes.

A Cor-Pak direct-flame fume incinerator, designed by C-E Air Preheater, Combustion Engineering, Inc of Wellsville, New York, is being used to provide heat for operations at Amoco Chemical Company's maleic anhydride plantin Joliet, Illinois. Tail gases from the maleic anhydride plant are preheated to 700F in the primary heat exchanger of the thermal oxidizer unit. The hydrocarbon-bearing gases are transferred to a combustion chamber where they are oxidized to carbon dioxide and water vapor by direct flame combustion and raised to a temperature of 1,400F. More than 46% of the heat is transferred from the tail gases to tube-encased fumes as the gases pass over a recuperative heat exchanger. Additional heat is removed as the gases are passed through a waste heat recovery boiler for the removal of steam. Residual gas is incinerated at 500F in stakes. The recovery boiler steam and oxidation heat provide all the heat necessary to operate the maleic anhydride plant, as well as excess steam to power other operations. An annual savings of energy costs has been estimated at more than $970,000. (Lisk-FIRL)
W78-06072

DISPOSAL OF WASTE-OILS AND PCB'S IN CEMENT KILNS,
Dundee Cement Co., MI.
T. Patzias.
Pit and Quarry, Vol. 70, No. 8, p 88-90, February, 1978. 6 ref.

Descriptors: *Polychlorinated biphenyls, *Oil wastes, *Cements, *Incineration, *Construction materials, Zinc, Lead, Bromine, Phosphorus, Waste water treatment, Waste disposal, Industrial wastes.

The incineration of waste oils and polychlorinated biphenyls was evaluated as a fuel source for cement kiln operations. Pilot-scale studies with automative crank case drainings were conducted at the St. Lawrence Cement Co. Ltd., of Ontario, Canada. The waste oil, containing small concentrations of lead, zinc, phosphorus, and bromine, was fed into the cement kiln at a rate of 8-12 gal/min under a pressure of 150 lbs/square inch. Incineration in the kiln with the waste oil resulted in better combustion of the active components, a 9% fuel savings was realized when compared to 1974 coal prices. Incineration of chlorinated hydrocarbons and polychlorinated biphenyls in pilot-scale cement kilns revealed a 99.98% combustion efficienty of the wastes in the production of low alkali cement. Emission samples contained 50 ppb of low molecular weight volatile compounds and no high molecular weight compounds, hydrochloric acid, or free chlorine. An estimated Btu recovery of 65% was realized from the incineration of these wastes. (Lisk-FIRL)
W78-06074

YEAST PRODUCTION ON SPENT SULPHITE LIQUOR,
Wilson Rowntree (Pty) Ltd., London (England).
For primary bibliographic entry see Field 5D.
W78-06078

EVALUATION OF LEACHATE CHARACTERISTICS AND PHYSICAL PROPERTIES OF COMPACTED MIXTURES OF FLY ASH AND WASTEWATER SLUDGE,
West Virginia Univ., Morgantown.
For primary bibliographic entry see Field 5B.
W78-06118

IDENTIFICATION OF RELEVANT CRITERIA AND SURVEY OF POTENTIAL APPLICATION SITES FOR ARTIFICIAL HABITAT CREATION, VOLUME I, RELEVANT CRITERIA FOR MARSH-ISLAND SITE SELECTION AND THEIR APPLICATION.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 5G.
W78-06128

STUDIES ON THE CHARACTERISTICS AND DISPOSAL PROBLEMS OF INDUSTRIAL EFFLUENTS WITH REFERENCE TO ISI STANDARDS: (PART II),
D. A. V. Coll., Muzaffarnagar (India). Pollution Relevant Research Lab.
For primary bibliographic entry see Field 5G.
W78-06132

THE EFFECT OF THE SPRAY IRRIGATION OF SECONDARY TREATED EFFLUENT ON THE VEGETATION, SOILS AND GROUNDWATER QUALITY IN A NEW JERSEY PINE BARRENS HABITAT,
Rutgers - The State Univ., New Brunswick, NJ.
For primary bibliographic entry see Field 5B.
W78-06135

I. DYNAMICS OF MERCURY IN LAKE SEDIMENTS. II. STUDIES ON ORGANIC PHOSPHORUS IN SOILS IRRIGATED WITH MUNICIPAL WASTEWATERS,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 5C.
W78-06137

RESOURCES ALLOCATION TO OPTIMIZE MINING POLLUTION CONTROL,
Ohio State Univ. Research Foundation, Columbus.
For primary bibliographic entry see Field 5G.
W78-06138

SEWAGE SLUDGE-SOIL SYSTEMS: A STUDY OF METAL FORMS AND EFFECT OF METALS ON CARBON AND NITROGEN TRANSFORMATIONS,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 5C.
W78-06139

CHEMICAL ASPECTS OF GROUND WATER RECHARGE WITH WASTEWATERS,
California Univ., Berkeley.
For primary bibliographic entry see Field 5B.
W78-06141

EFFECTS OF ANAEROBICALLY DIGESTED MUNICIPAL SEWAGE SLUDGE APPLICATION ON CHEMICAL PROPERTIES OF SELECTED SOILS WITH EMPHASIS ON DISTRIBUTION OF ZINC AND CADMIUM FORMS,
Cornell Univ., Ithaca, NY.
For primary bibliographic entry see Field 5B.
W78-06173

SIMULATION OF WASTEWATER INJECTION INTO A COASTAL AQUIFER SYSTEM NEAR KAHULUI, MAUI, HAWAII,
Geological Survey, Reston, VA. Water Resources Div., and Geological Survey, Tallahassee, FL. Water Resources Div., and Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06186

5F. Water Treatment and Quality Alteration

INCIDENCE OF ESOPHAGEAL CANCER IN THE GURYEV OBLAST DEPENDING ON THE MINERAL COMPOSITION OF THE DRINKING WATER, (IN RUSSIAN),
Kazakh Research Inst. Oncology Radiology, Alma Ata (USSR).
For primary bibliographic entry see Field 5G.
W78-05740

WATER FOR THE WEALTHY,
For primary bibliographic entry see Field 5G.
W78-05750

THE PHYSIOLOGICAL-HYGIENIC IMPORTANCE OF FLUORINE CONTENT IN DRINKING WATER, (IN RUSSIAN),
Kievskii Meditsinskii Inst. (USSR).
For primary bibliographic entry see Field 5C.
W78-05806

CHLORINATION AND OZONATION IN WATER AND WASTEWATER TREATMENT,
Pennsylvania Univ., Philadelphia. Dept. of Civil and Urban Engineering.
J. D. Keenan, and D. A. Hegemann.
Chemosphere, Vol. 7, No. 1, p 9-28, 1978. 2 fig, 51 ref.

Descriptors: *Chlorination, *Ozone, *Coliforms, *Potable water, *Odor, Taste, Water purification, Disinfection, Hydrogen sulfide, Biochemical oxygen demand, Chemical oxygen demand, Waste water treatment, Water treatment.

An evaluation based on chemical and biological factors cited in previous studies of chlorine and ozone as disinfection agents of waste water and potable water was presented. Chlorination of potable water was effective for the removal of tastes, odors, color, iron, and manganese. Chlroine was also found to control algal growth, slime growth, and hydrogen sulfide, and to improve activated silica precipitation. Studies in which the use of chlorine in waste water treatment was shown to produce potentially toxic chlorinated organics were cited. The production of chlorinated organics in waste water considered more serious than in potable water because of the larger number and concentrations of organics in waste water. Dechlorination was considered an expensive remedy for the effects of chlorination. Ozonation of waste water was found effective in the reduction of fecal coliform counts, odor, color, turbidity, organic pesticides, and the conversion of cyanide to a biodegradable level. Treatment with 60 ppm of ozone was required to reduce BOD levels; COD was reduced with more conventional ozone concentrations. Costs for ozonation and chlorination of waste water appeared compatible. An analysis of the chemical reactions occurring during ozonation and chlorination was presented. (Lisk-FIRL)
W78-05867

A MICRO-KJELDAHL TECHNIQUE FOR NITROGEN DETERMINATION IN WATER, WASTEWATER, AND SLUDGE,
Butler, Fairman and Seufert, Inc., Carmel, IN.
For primary bibliographic entry see Field 5A.
W78-05878

CANNING GROUP EXPANSIONS.
For primary bibliographic entry see Field 5D.
W78-05908

A MODIFIED PERCHLORINATION PROCEDURE FOR THE DETERMINATION OF POLYCHLORINATED BIPHENYLS,
Wisconsin Univ.-Madison. Water Chemistry Lab.
For primary bibliographic entry see Field 5A.
W78-05939

LEAD CONTAMINATION IN DRINKING WATER IN LJUBLIJANA, (IN SLOVENIAN),
For primary bibliographic entry see Field 5A.
W78-05981

THE COST OF REMOVING CHLOROFORM AND OTHER TRIHALOMETHANES FROM DRINKING WATER SUPPLIES,
Environmental Protection Agency, Cincinnati, OH. Office of Research and Development.
R. M. Clark, D. L. Guttman, J. L. Crawford, and J. A. Machisko.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 283, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA - 600/1-77-008, March, 1977. 97 p, 58 fig, 21 tab, 12 ref.

Descriptors: *Water treatment, *Disinfection, *Potable water, *Capital costs, *Operational costs, *Cost analysis, *Chlorination, *Activated carbon, *Ozone, *Aeration, Organic compounds, Planning, *Chloroform, *Trihalomethanes, *Chlorine dioxide, Ozonation, Carcinogens, Granular activated carbon.

The cost of several alternatives to chlorine use in the disinfection of drinking water are analyzed. Costs are assessed for chlorine, chlorine dioxide, and ozone as direct disinfection agents. The cost of aeration as a means of removing chloroform and other trihalomethanes (the potentially carcinogenic by-products of chlorination) is examined. An in-depth analysis of the costs associated with the use of granular activated carbon as a general means of removing organics is prepared; costs both with and without separate contractor systems and an examination of the possible cost savings associated with regional regeneration are included. The costs presented are intended for the development of planning estimates only and not for the preparation of bid documents or detailed cost estimates. Exact capital and operating costs are location-dependent and highly variable. Costs are presented to facilitate adjustments to the reported costs when local information is available. Standardized levels for a selected set of design parameters are assumed and sensitivity analysis is performed for the majority of the parameters. The values for 1, , 10, 100, and 150 mgd plants for all treatment alternatives examined are given in a table. Chlorination was found to be the cheapest of all the treatment technologies. (Seip - IPA)
W78-05988

RECOVERY OF LIME AND MAGNESIUM IN POTABLE WATER TREATMENT,
Black, Crow and Eisdness, Inc., Montgomery, AL.
C. G. Thompson, and G. A. Mooney.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 276, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA - 600/2-76-285, December, 1976. 119 p, 20 fig, 18 tab, 33 ref, 4 append. 5803194-01-4.

Descriptors: *Potable water, *Water treatment, *Water softening, *Magnesium carbonate, *Calcium carbonate, *Recycling, *Lime, *Flotation, Beneficiation, Capital costs, Operating costs, Cost analysis, Pilot plants, *Froth flotation.

Treatment of hard, turbid surface water using a magnesium carbonate (MgC03) process in a 2 mgd pilot plant in Water District No. 1, of Johnson County, Kansas was investigated; water quality equalled or exceeded that obtained with conventional treatment. Froth flotation was used to separate calcium carbonate (CaC03) formed in the treatment process from water softening sludges. Bench-scale and pilot plant flotation tests have shown that sludges formed by softening turbid water can be processed to yield a relatively pure CaC03 which is suitable for lime recovery. Lime recovery will drastically reduce the amount of water plant sludge for ultimate disposal. Process variables affecting both MgC03 recovery and CaC03 beneficiation were studied. MgC03 was recovered from the saturated magnesium bicarbonate recycle liquor; the cost per ton to produce relatively pure Mg0 was estimated to range from $147 to $185. A comparison of capital and operating costs for MgC03 treatment, sludge flotation, and lime recovery with present operating costs (including waste disposal) indicated that annual costs would be lower with the new technology; it is recommended that magnesium recycle, froth flotation, and lime recalcination be adopted at this plant. (Seip - IPA)
W78-05990

VIRUS PARTICLE AGGREGATION AND HALOGEN DISINFECTION OF WATER SUPPLIES,
North Carolina Univ. at Chapel Hill.
D. G. Sharp.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 358, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-287, December, 1976. 49 p, 30 fig, 2 tab, 18 ref. R803771, DAMD17-17-A013.

Descriptors: *Aggregates, *Viruses, *Dispersion, *Disinfection, Chlorination, Bromine, *Halogens, Continuous flow, Sedimentation rates, Centrifugation, Pollutant identification, Water treatment, *Reovirus, *Poliovirus, Disinfection rates, Virus inactivation, 'Flash Flood' apparatus.

Bromine and chlorine disinfection of reovirus and poliovirus suspensions in water is investigated. When reovirus aggregates are present in water suspensions containing bromine, disinfection proceeds at a constantly de creasing rate which is determined by the frequency of the different aggregate sizes in the mixture. Both reoviruses and polioviruses in aggregated form are much more resistant to bromine and chlorine disinfection than single particles. The basic reaction rates for single virions can accurately be determined and compared by removing aggregates from the suspension; this is accomplished by sedimentation of the particles by centrifugation, taking advantage of aggregates' difference in sedimentation velocity. Poliovirus suspensions of single particles are about 25 times more resistant to bromine than similar suspensions of reovirus. Bromine destroys poliovirus a little faster than chlorine but both are very fast acting on single virions. The 'Flash Flood' apparatus allows the very short time expo-

sures required to determine the kinetics of single virion disinfection rates. Dilution of laboratory stock virus in water tends to aggregate it; special methods are described to detect aggregation at high dilutions. Problems inherent in the disinfection of natural and induced virus aggregate suspensions are identified. Specific recommendations for further research primarily address the problems of treating and/or dispersing virus aggregates effectively. (Scip - IPA)
W78-05991

EXPERIMENTAL EVALUATION OF OXYGEN AND AIR ACTIVATED SLUDGE NITRIFICATION SYSTEMS WITH AND WITHOUT PH CONTROL,
District of Columbia Dept. of Environmental Services, Washington. EPA-DC Pilot Plant.
For primary bibliographic entry see Field 5D.
W78-05992

MANUAL OF TREATMENT TECHNIQUES FOR MEETING THE INTERIM PRIMARY DRINKING WATER REGULATIONS.
Environmental Protection Agency, Cincinnati, OH. Office of Research and Development.
Report No. EPA - 600/8-77-005, May 19, 1977. 73 p, 55 fig, 17 tab, 108 ref.

Descriptors: *Potable water, *Water purification, *Water pollution treatment, *Cost analysis, *Disinfection, Turbidity, Radioactive wastes, Coliforms, Inorganic compounds, Organic pesticides, Monitoring, Diatomaceous earth, Filtration, Chlorination, Sludge disposal, Radium radioisotopes, Ion exchange, Arsenic compounds, Cadmium, Chromium, Fluorides, Lead, Mercury, 2,4-D, 2,4,5-T, Reverse osmosis, *Water quality standards, *Safe Drinking Water Act, National Interim Primary Drinking Water Regulations, Public Law 93-523, Barium, Selenium, Silver, Granular media filtration, Ion exchange softening, Lime-soda softening, Lime sludge disposal, Alpha emitters, Beta emitters, Photon emitters, Endrin, Lindane, Taxophene methoxyclor.

Treatment technologies for complying with maximum contaminant level (MCL) standards (as mandated by the 1974 Safe Drinking Water Act, National Interim Primary Drinking Water Regulations) for inorganic constituents, turbidity, coliform organisms, 6 pesticides, and radionuclides are presented. The descriptions are derived from literature and research conducted by the Water Supply Research Division and represent the technology that was known at the time the Interim Primary Drinking Water Regulations became effective. Cost estimations and references are included for each treatment category. The inorganic contaminants covered include: arsenic, barium, cadmium, chromium, fluoride, lead, mercury, nitrate, selenium, and silver. Granular media and diatomaceous earth filtration, used as techniques of turbidity removal, are discussed; filter plant sludge disposal procedures are outlined. The use of chlorine, ozone, and chlorine dioxide as disinfection agents in the removal of coliform organisms and turbidity and disinfection by-products are described. Pesticide (organic contaminant) removal methods for endrin, lindane, taxophene, 2,4-dichlorophenoxyacetic acid (2,4-D) 2,4,5-trichlorophenoxypropionic acid (2,4,5-TP (Silvex)), and methoxychlor are included. Radioactive contaminant removal procedures for alpha emitters (i.e., radium), and for beta and photon emitters are described. Radium removal methods (lime or lime-soda softening, ion exchange softening, and reverse osmosis), treatment water disposal processes (lime sludge, lime softening backwash, ion exchange brine, and reverse osmosis waste disposals), monitoring techniques and removal methods for manmade radioactivity are outlined. (Seip-IPA)
W78-05994

TEN YEARS OF WATER FLUORINATION IN IVANO-FRANKOVSK, (IN RUSSIAN),
Kievskii Meditsinskii Inst. (USSR).
R. D. Gabovich, G. A. Stepanenko, and P. M. Bur'yan.
Gig Sanit 11, p 22-26, 1976.

Descriptors: *Fluorination, Human diseases, Public health, *Dental caries, *Water treatment, Metab-Drug, *USSR(Ivano-Frankovsk).

Ten years of water fluorination in Ivano-Frankovsk (USSR) proved the high effectiveness of this measure against dental caries. The incidence of dental caries among children, who had used fluorinated water in the course of all their life, decreased by 73%. This is close to the fluorination effectiveness indices, previously described in using natural water with an optimum fluorine content.--Copyright 1978, Biological Abstracts, Inc.
W78-06024

PUBLIC WATER SUPPLIES OF NORTH CAROLINA, PART 5. SOUTHERN COASTAL PLAIN,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06178

5G. Water Quality Control

MEASUREMENT OF SEDIMENT CONTROL IMPACTS ON AGRICULTURE,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
J. C. Wade, and E. O. Heady.
Water Resources Research, Vol 14, No 1, p 1-8, February 1978. 2 fig, 5 tab, 13 ref.

Descriptors: *Sediment control, *Water pollution control, Impacts, *Agriculture, *Measurement, Parameter estimation, Soil loss, Optimization, Linear programming, Cost minimization, Policy, Land use, Mathematical models, Equations, Systems analysis.

Environmental policy has been explicitly expanded in order to consider nonpoint or dispersed sources of water pollutants. This study utilizes a national agricultural model to evaluate hypothetical policies of sediment control viewing the problem as primarily a national one of agricultural land use. A sediment sector is added to the basic Center for Agricultural and Rural Development-National Water Assessment model to test the impacts of sediment control policies on the agricultural production system. Costs of alternative control policies are analyzed; these costs are defined as the additional costs to agriculture of several alternative sediment control policies. Using linear programming, the minimum cost of the minimum feasible total sediment load is determined, a single restraint imposed at the national level. (Bell-Cornell)
W78-05701

THE TOXICITY OF CARBOPHOS FOR SOME HYDROBIONTS, (IN RUSSIAN),
Azovskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 5C.
W78-05711

A MODEL CRITERION FOR SITE SELECTION OF LARGER SCALE TECHNICAL FACILITIES IN THE UPPER RHINE REGION,
Nuclear Research Center, Karlsruhe (West Germany).
G. Halbritter.
In: Mathematical Models for Environmental Problems. Proceedings of the International Conference held at the University of Southampton, England, September 8-12, 1975. C.A. Brebbia (Ed.), Department of Civil Engineering, Southampton University. John Wiley & Sons, N.Y., N.Y., 1976, p 55-69. 7 fig, 8 ref.

Descriptors: *Sites, *Evaluation, *Model studies, *Optimization, Rivers, *Project planning, *Water pollution control, Regional analysis, Economic efficiency, Costs, Constraints, *Powerplants, Environment, Ecology, Equations, Systems analysis, *Upper Rhine region(West Germany), Cost minimization, Pollution minimization, Objective functions, *Vector-valued optimization.

In densely populated Central Europe, projects necessitate site planning which incorporates pollution control, considering the site's specific environments, e.g., the density of settlements and the ecological situation. Although there are numerous methods available for evaluating pollution levels and for obtaining optimal siting, there is scarce information on suitable objective functions which ideally should deliver any one optimum solution. An investigation has been made which incorporates two requirements (which become the two objective functions): (1) the siting must guarantee a pollutant concentration which is inversely proportional to the population density; and (2) investment and operating costs must be minimized. The simultaneous handling of both requirements to find one solution is accomplished using vector-valued optimization, which attempts to maximize the sum of the objective attainment values put forward by the two requirements. Two models are presented, one for pollutant minimization and the other for cost minimization. A calculation of possible power plant sites in the 'Upper Rhine Region' is made. The regarded pollutant is sulphur dioxide. Four objective functions are considered here: (1) impact dependent upon population density; (2) minimum costs for the plants; (3) maximum power to be installed in the region; and (4) maximization of the objective attainments. (See also W78-05721 thru W78-05727) (Bell-Cornell)
W78-05720

OPTIMIZATION METHODS FOR PLANNING WASTE WATER MANAGEMENT SYSTEMS,
Karlsruhe Univ. (West Germany). Inst. fuer Siedlungswasserwirtschaft.
H. Orth, and W. Ahrens.
In: Mathematical Models for Environmental Problems. Proceedings of the International Conference, University of Southampton, England, Sept. 8-12, 1975. C.A. Brebbia (Ed.), Southampton University. John Wiley & Sons, N.Y., N.Y., p 99-113, 1976. 5 fig, 10 ref.

Descriptors: *Waste water(Pollution), *Management, *Optimization, *Model studies, *Regionalization problem, Planning, Algorithms, Computers, Cost minimization, Decomposition methods, Constraints, Storm water, Pipes, Pumping stations, Treatment facilities, Equations, Operations research.

In planning regional waste water systems, the trend is toward the formulation and solution of mathematical problems. Extended algorithms for optimization and high speed computers allow the solution of large and realistic problems. A combination of different techniques aids in finding more accurate solutions. Given herein is an overview of mathematical solutions to the so-called regionalization problem. Selected algorithms are described and the applicability of the proposed methods to two example studies is demonstrated: (1) the economic feasibility of the urban drainage and sewerage system of the city of Abidjan/Ivory Coast; and waste water planning for an area containing 16 communities in Edenkoben, Germany. A regionalization problem is defined an an optimization problem wherein a waste water collection and treatment system with minimal costs is to be determined within a certain region or planning area. Basic models for the regionalization problem

are presented and then are extended with respect to the practical aspects of dimensioning plants and canals. (See also W78-05720) (Bell-Cornell)
W78-05723

THE RECREATIONAL RESPONSE TO CHANGES IN WATER QUALITY: A SURVEY AND CRITIQUE,
Leicester Univ. (England). Public Sector Economics Research Centre.
R. K. Turner.
International Journal of Environmental Studies, Vol. 11, No. 2, p 91-98, 1977. 1 fig, 42 ref.

Descriptors: *Recreation demand, *Reviews, *Water pollution effects, *Model studies, Water quality control, Clawson-Knetch recreation demand model, Social aspects, Water quality indices, Parameters, Social participation, Recreation, Recreation facilities.

A critical review of the literature on methods of estimating recreational demand response to changing water quality conditions cites three basic problems caused by a lack of empirical data: (1) Links between water quality parameters and pollution discharge rates are poorly understood. (2) The relationship between water quality indexes and various recreational water uses is unclear, making use of recreation demand models difficult. (3) Little is known of participant recreation to changes in water quality parameters. Most early attempts to measure recreational losses or benefits were based on the distance-oriented demand curve model typified by the Clawson-Knetch approach. This approach relates recreation demand to price, the latter being represented by distance from the water site. Few of these studies included water quality as a factor.The Clawson-Knetch model theoretically could measure effects of water quality changes on demand, but only after the fact. The U. S. National Commission on Water Quality developed a 'perceived water quality index', but details are lacking. Another source indicates that algae constitutes the primary pollution indicator in public perception. Other aspects of recreation demand analysis include private land values and the Q (water quality) variable, public recreation expenditure valuation and the Q variable, interview techniques, and participation-probability models. (Lynch-Wisconsin)
W78-05728

TOWARDS AN ECOLOGICALLY-BASED ECONOMIC PHILOSOPHY,
Oceanic Inst. Waimanalo, Hawaii.
For primary bibliographic entry see Field 6B.
W78-05734

EFFECTS OF HYDRAULIC DREDGING ON THE ECOLOGY OF NATIVE TROUT POPULATIONS IN WISCONSIN SPRING PONDS,
Wisconsin Dept. of Natural Resources, Waupaca. Bureau of Research.
For primary bibliographic entry see Field 5C.
W78-05739

INCIDENCE OF ESOPHAGEAL CANCER IN THE GURYEV OBLAST DEPENDING ON THE MINERAL COMPOSITION OF THE DRINKING WATER, (IN RUSSIAN),
Kazakh Research Inst. Oncology Radiology, Alma Ata (USSR).
B. A. Nemenko, M. M. Moldakulova, and S. N. Zorina.
Vopr Onkol (Leningr) 22(9), p75-76, 1976.

Descriptors: Calcium, Carcinogens, Chlorides, Esophageal cancer, Human diseases, Magnesium, Minerals, *Molybdenum, Salinization, Sodium, Soils, Strontium, Sulfates, Potable water, Guryev Oblast(USSR), Public health, Saline soils.

No deficiency in environment and water, and soil salination with sulfates, chlorides, Mg, Na, Ca and Sr, are regarded as factors contributing to high incidence of esophageal cancer among the population.--Copyright 1977, Biological Abstracts, Inc.
W78-05740

ENVIRONMENTAL PROTECTION GUIDELINES FOR CONSTRUCTING PROJECTS,
East Bay Municipal Utility District, Oakland, CA.
For primary bibliographic entry see Field 6G.
W78-05742

MOSQUITOES OF MIDDLE AMERICA,
California Univ., Los Angeles.
For primary bibliographic entry see Field 4A.
W78-05743

COMBATING RIVER POLLUTION.
Proceedings of the Institution of Civil Engineers, Vol. 62, p 187-189, February 1977.

Descriptors: *Rivers, *Water pollution control, *England, *Water pollution sources, *Planning, Decision-making, Thames River(England), London(England), Eutrophication, Sewage disposal, Waste disposal, Effluents, Regional development, Urban drainage, Storm runoff, Non-structural alternatives.

An informal discussion by the Institution of Civil Engineers (Great Britain) focusses on river pollution control. Planning for waste disposal should be unified and the number of decision-making bodies reduced. The advent of regional authorities is a step forward. Uses of rivers, including for water supply, agriculture, industry, fisheries, and recreation, must be defined and the quality requirement established. Not all rivers can be simultaneously maintained at a high quality level, and some may have to be allowed to deteriorate. In large urban settings, it was considered beneficial to begin a sewer where a 'main' river ended. A clarification lake or lakes with retention times of 4-5 days might solve the problem of storm sewage. Coordination of urban drainage systems is primarily a financial problem. The problems of divided responsibilities for river systems are illustrated by conflicts between the Thames Water Authority (TWA) and Greater London Council (GLC). For accidental spillages, a policy of safety first, pollution second was adopted for dealing with unknown substances. Eutrophication, not currently a problem in Britain, may become one in the future. (Lynch-Wisconsin)
W78-05744

HARVESTING A NUISANCE,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 4A.
W78-05745

WATER FOR THE WEALTHY,
J. Stein.
Environment, Vol. 19, No. 4, p 6-14, May 1977. 7 fig.

Descriptors: *Developing countries, *Human diseases, *Water supply, *Water pollution control, *Water quality control, Mosquitoes, Flies, Snails, Worms, Schistosomiasis, Filariasis, Malaria, Onchocerciasis, Typhoid, Cholera, Dysentery, Sanitary engineering, Waste treatment.

An assessment of the extent of waterborne human diseases in developing countries is followed by a discussion of water quality and disease control measures. Each year there are 250 million new cases of typhoid, cholera, amoebic dysentery, worm diseases, trachoma, sleeping sickness, schistosomiasis, filariasis, malaria, onchocerciasis, and other water-related diseases, and 25,000 people die from them each day. Causes are widespread and include pollution, water shortages, breeding of mosquitoes, flies, and snails. As many of these diseases are chronically debilitating rather than fatal, they often go untreated due to lack of public attention or money. Some 70% of the world population is without a safe and dependable water supply, particularly in rural areas. Many waterborne diseases could be controlled with safe water supplies; washing of hands and face could virtually eliminate the incidence of trachoma, and simple waste treatment could drastically reduce fecally-transmitted diseases. In rural areas a starting point should be a protected spring or well with a hand pump, followed as a next step by delivery of water to a public fountain or standpipe. While groundwater supplies are generally safe when properly located, surface water often needs treatment to make it safe; simple chlorination may be sufficient. Chemical, biological, and drug treatment measures are being used for disease control. (Lynch-Wisconsin)
W78-05750

GREAT LAKES FISH EGG AND LARVAE IDENTIFICATION: PROCEEDINGS OF A WORKSHOP, APRIL 19-21, 1976, ANN ARBOR, MICHIGAN.
National Power Plant Team, Ann Arbor, MI.
For primary bibliographic entry see Field 2H.
W78-05753

IDENTIFICATION OF LARVAL FISHES TAKEN FROM THE INSHORE WATERS OF SOUTHEASTERN LAKE MICHIGAN NEAR THE DONALD C. COOK NUCLEAR PLANT, 1973-1975,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 2H.
W78-05758

CHALLENGING EFFLUENT LIMITATIONS,
Morgan, Lewis and Bockius, Washington, DC.
K. A. Rubin.
Environmental Science and Technology, Vol. 11, No. 2, p 144-147, February 1977. 3 fig.

Descriptors: *Regulation, *Permits, Effluents, *Judicial decisions, *Water pollution control, *Legal aspects, Environmental Protection Agency, Industrial wastes, Federal Water Pollution Control Act Amendments of 1972, PL 92-500, Inorganic chemical industry, Chemical industry, Suspended solids.

Many effluent guidelines proposed by the U.S. Environmental Protection Agency (EPA) under provisions of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) are being revised as a result of litigation. This paper discusses: (1) EPA's statutory mandate and the technologies it utilizes to set effluent standards applicable to a variety of industrial point sources; (2) the legal procedures for challenging EPA determinations; and (3) the technical evidence needed to support or challenge EPA determinations. A chromological history of the development of effluent limitations for the inorganic chemical industry, currently under review by the U.S. Supreme Court, is given to illustrate EPA's decision-making process. With the reevaluation of many of EPA's regulations, there are important opportunities to present additional technical data on limitations achievable by various industrial point-source categories. Under PL 92-500 existing dischargers must apply the 'best practicable control technology currently available' (BPCTCA) by July 1, 1983. EPA was directed to 'identify, in terms of amounts of constituents and chemical, physical and biological characteristics of pollutants, the degree of effluent reduction attainable.' New discharges must apply the 'best available demonstrated control technology.' Industries involved in litigation have

challenged EPA's authority, methodology, data, and procedures. (Lynch-Wisconsin)
W78-05759

VERMONT'S WATER RESOURCE RESEARCH NEEDS,
Vermont Univ., Burlington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W78-05801

URBAN STORM WATER MANAGEMENT,
K. W. Moore.
Water and Pollution Control, Vol. 116, No. 2, p 18, 20, February, 1978. 1 fig.

Descriptors: *Storm water, *Runoff, *Urban drainage, *Urban runoff, *Rainfall-runoff relationships, Biochemical oxygen demand, Suspended solids, Storage tanks, Storm runoff, Storm drains, Waste water treatment, Municipal wastes.

The integration of storm water management into land use and urban sewerage planning is discussed. A study of a large drainage area indicated the need for more grassland and a storm water reservoir to bring about a 50% reduction in the quantity of runoff and a significant decrease in BOD and suspended solids. Assessment of drainage areas can result in a reduction of peak discharge and pollutant loading of receiving waters. Storm water management requires the identification of problems, a review of the existing system, and evaluation of the effects of storm drainage and runoff which might influence the development of rural property. The control of pollution sources, erosion, and flooding, and storm water treatment should be implemented. Data on storm water control and economic alternatives should be collected. Storm water treatment and flow control can be achieved by the use of ponds, settling and storage tanks, sewer inlet controls, gate and weir controls, and swirl concentrators. Computer programs are also available for the prediction of storm water levels. (Lisk-FIRL)
W78-05821

TOXIC WASTE DUMPING INCIDENT DEMONSTRATES SURVEILLANCE NEEDS.
Public Works, Vol. 108, No. 12, p 58-60, 82, 83, December, 1977. 1 fig, 1 tab.

Descriptors: *Chemical wastes, *Waste disposal, *Ohio River, *Treatment facilities, *Pollutant identification, Sewerage, Sewage treatment, Kentucky, Indiana, Analytical techniques, Municipal wastes, Waste water disposal, Waste water treatment.

Unauthorized dumping of highly toxic waste into a combined sewer by a Memphis, Tennessee, chemical manufacturing plant created serious problems for government entities in six states during March 1976. The chemical wastes, which had entered the collection system of the Louisville and Jefferson County Metropolitan Sewer District in Kentucky, resulted in the need for total by-passing to the Ohio River of sewage normally treated at the Morris Forman waste water treatment plant. The toxic compounds were identified as hexachlorocyclopentadiene and octachlorocyclopentadiene. Water treatment plants downstream at Evansville, Indiana, and at Henderson, Kentucky, were able to remove the toxins using Aqua Nuchar activated carbon obtained from the Chemical Division of Westvaco. Mount Vernon, Indiana, was forced, however, to ban usage of all drinking water. As a result of the dumping incident, some 24,000 ft of sewers in the northwestern Louisville area contained contaminated sludge. Preliminary tests had indicated that the wet air oxidation process developed by Zimpro Inc of Rothschild, Wisconsin, could effectively degrade the compounds into less toxic substances. Full-scale processing of the six million gallons of contaminated sludge was then initiated. Daily monitoring at waste water treatment plants with the use of on-site gas chromatograph scans to detect volatile organics was recommended to prevent reoccurrence of the dumping incident. (Snyder-FIRL)
W78-05825

SANITARY DISTRICT SOLVES SLUDGE REMOVAL PROBLEM.
Water and Sewage Works, Vol. 124, No. 12, p 54-55, December, 1977. 3 fig.

Descriptors: *Mechanical equipment, *Sludge, *Cleaning, *Vibrations, *Treatment facilities, Sewage treatment, Digestion tanks, Operation and maintenance, California, Municipal wastes, Waste water treatment.

The Los Angeles County Sanitary District has used flow aid devices to handle non-degradable wastes. The devices, usually used in industrial applications, included conveyor belt cleaners, pneumatic vibrators, and air cannons. The conveyor system, running at 100 ft/min, carries as much as nine tons of material per hour. The sticky material, which is removed periodically from the 31 digesters, is carried by 24-in wide rubber conveyors to hoppers for storage until it is hauled to a landfill. Three heavy-duty Clamp Mount Torsion Arm conveyor belt cleaners reduce manual cleanup requirements of the conveyor belts by 75%. The single blade counterbalance cleaners used previously had tended to bounce away from the moving belt when larger particles were encountered. Problems of waste buildup under the conveyor belt cleaners were solved with the installation of a small Martin Engineering Vibrolator ball-type vibrator on one of the dribble chutes. Six Martin Clamp Mount Torsion Arm belts cleaners have been ordered for the 36-in wide conveyor belts which handle centrifuge cakes. The installation of two Big Blaster air cannons on a waste loading hopper has made it possible to evacuate the hopper without prodding with a rod. The air cannons each expel 13.276 cu ft of air at 100 psig into the waste material through a 4-in diameter pipe. (Snyder-FIRL)
W78-05862

THE USE AND INTEGRATION OF GROUND AND SURFACE WATER MODELS IN THE 208 PLANNING PROCESS,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W78-05895

SEWAGE EFFLUENT ON PASTURE SHOWS LITTLE EFFECT.
Water and Wastes Engineering, Vol. 14, No. 12, p 14, December, 1977.

Descriptors: *Return flow, *Sewage effluents, *Sewage treatment, *Waste water disposal, *Nitrogen, Irrigation water, Phosphorus, Carbon, Coliforms, Florida, Waste water treatment.

Supplementary irrigation with secondary treated sewage effluent has been shown to have little adverse affect on pasture land. Irrigation with sewage effluent in Lakeland, Florida, began in 1969 and averaged 25,000 gal/d per 30 acres of grazed pasture. Analyses of samples collected from nine monitor wells near the irrigation sight yielded low bacteria and coliform counts. Tests at four other monitor wells revealed the presence of fecal related bacteria. The pasture's water table varied 1.0-3.3 ft below the land surface. Percolation to a depth of 8 ft yielded a nitrogen concentration of less than 20% of the effluent nitrogen. Negligible increases of nitrogen were found at a depth of 20 ft and in down-gradient groundwater. A geological survey conducted by the Water Resources Division of Tallahassee, Florida, produced no evidence of groundwater contamination by carbon or phosphorus. (Lisk-FIRL)
W78-05898

POLLUTION CONTROL PLANT STATISTICS.
Water and Pollution Control, Vol 115, No 11, p 78-96, 98, 101-102, November, 1977. 13 tab.

Descriptors: *Treatment facilities, *Sewage treatment, *Statistics, *Canada, *Sewerage, Biological treatment, Biochemical oxygen demand, Suspended solids, Sludge treatment, Lagoons, Aeration, Aerobic treatment, Activated sludge, Filtration, Municipal wastes, Industrial wastes, Water pollution control, Waste water treatment.

A comprehensive listing of Canadian municipal water pollution control facilities is provided in tabular form. The information given for each facility includes population size, whether the municipality was an industrial waste strength limiting by-law, average daily flow, and whether the system is separate or combined. Information on the degree of treatment, influent and effluent BOD and suspended solids, type of treatment, sludge processing, and cost of treatment per million gallons of waste water processed is also provided. Types of treatment covered include: algae lagoons, aerated lagoons, anerobic lagoons, primary sedimentation, conventional activated sludge, completely mixed systems, contact stabilization, biological filtration, extended aeration, and septic tanks. Sludge processing techniques include: heated digesters, drying beds, filtration, centrifuging, agricultural disposal, unheated digesters, incineration, liquid haulage, deep well disposal, and land-filling. Selected listings of key management and operating personnel responsible for pollution control at various locations in Canada are also provided. (Snyder-FIRL)
W78-05909

THE WHITE AMUR AS A BIOLOGICAL CONTROL FOR AQUATIC WEEDS IN INDIANA,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 4A.
W78-05936

OIL TANKER DISASTERS,
South Carolina Univ., Columbia. Div. of Coastal Research.
E. R. Gundlach.
Environment, Vol. 19, No. 9, December 1977, 16-20 and 25-27, 7 fig, 44 ref.

Descriptors: Environmental effects, *Water pollution control, *Oil pollution, Oil, Oil industry, *Oil spills.

Case histories of massive oil spills from tankers and offshore drilling operations and the environmental consequences of these spills are reviewed. The impact of oil spills on the environment is highly variable. The coastal zone with its striking biological productivity is most likely to be severely damaged during a spill, while offshore incidents seem to cause only minor environmental impairment. The season in which the spill occurs also is influential in determining the extent of biological damage. During the spring reproductive period, a spill can be particularly injurious. The toxicity of petroleum varies greatly among crude and processed oils, depending on the hydrocarbon components. Plans and equipment for implementation in future oil spills are discussed. (Chilton-ORNL)
W78-05965

EUTROPHICATION IN VERMONT,
Vermont Dept. of Water Resources, Montpelier. Water Quality Div.
For primary bibliographic entry see Field 5C.
W78-05977

EUTROPHICATION AND WATER POLLUTION,
Federal Water Pollution Control Administration, Washington, DC.
For primary bibliographic entry see Field 5C.
W78-05982

THE PERMISSIBLE CONCENTRATION OF LEAD IN WATER, (IN RUSSIAN),
Akademiya Nauk Turkmenskoi SSR, Ashkhabad. Inst. of Physiology and Experimental Pathology Arid Zone.
O. G. Charyev.
Izv Akad Nauk Turkm Ssr Ser Biol Nauk 6, p 78-83, 1976.

Descriptors: *Toxicity, *Lead, Rodents, *Lethal limit, *Water quality standards, Water pollution effects.

Administration of lead acetate to albino rates showed that the general toxic and the gonadotoxic effects occur at the same dose level. A concentration of 0.03 mg/l Pb in water is recommended.--Copyright 1978, Biological Abstracts, Inc.
W78-05989

MANUAL OF TREATMENT TECHNIQUES FOR MEETING THE INTERIM PRIMARY DRINKING WATER REGULATIONS.
Environmental Protection Agency, Cincinnati, OH. Office of Research and Development.
For primary bibliographic entry see Field 5F.
W78-05994

RELATIVE TOXICITY IN WATER QUALITY PLANNING,
Anglian Water Authority, Huntingdon (England). Directorate of Scientific Services.
P. J. Matthews.
Effluent and Water Treatment Journal, Vol. 17, No. 1, p 16-18, January 1977. 1 tab, 16 ref.

Descriptors: *Water pollution control, *Toxicity, Relative toxicity, *Water quality indices, *Planning, *Water quality control, *Water pollution sources, Water management(Applied), Pollutants, Effluents, Fish, Lethal limit, Hydrologic cycle, Mathematical models, Sewage treatment.

A technique is suggested for measuring the total effects of pollutant discharges to the water cycle; it involves summation of individual species concentrations expressed as ratios of such concentrations to the limiting concentration for a given quality function. Individual and summed ratios are termed relative toxicities; the relative toxicity for a given situation which would normally be one or less, could form the basis for an index system usable in mathematical models. By reducing summed toxicological effects to the same comparative index, water quality planning can be simplified and critical situations more easily identified. Interpretation of BOD, fish toxicity, and sewage treatment toxicity is also facilitated. Potential adverse effects of substances in the water cycle can be classified as follows: (1) sewers--atmospheric, corrosive, and blockages/scum formation; (2) sewage treatment works--overload, microorganism activity, and sludge disposal; (3) surface waters, rivers, groundwater--macroflora and microflora toxicity, macrofauna and microfauna toxicity, and reduced availability to other uses; and (4) potable water--treatability of raw water and reduction of potability. Discharge substances may act independently, additively, synergistically, or antagonistically. Several examples of useful relative toxicities are discussed: (1) relative atmospheric toxicity, (2) relative fish toxicity, (3) relative phytotoxicity in soils, and (4) relative anaerobic toxicity. (Lynch-Wisconsin)
W78-05996

ROLE OF AUTOCHTHONOUS BACTERIA IN THE REMOVAL OF SPILLED OIL FROM SEDIMENT,
Maryland Univ., College Park. Dept. of Microbiology.
J. D. Walker, and R. R. Colwell.
Environmental Pollution, Vol. 12, No. 1, p 51-56, January 1977. 1 fig, 1 tab, 17 ref. N00014-67-0237-0027-Office of Naval Research Contract.

Descriptors: *Bacteria, *Biodegradation, *Oil spills, *Sediments, *Colgate Creek(MD), Degradation(Decomposition), Streams, Maryland, Baltimore harbor(MD), Chesapeake Bay, Estuaries, Sediment-water interfaces, Oil pollution.

Microbial degradation by indigenous bacteria seems responsible for a reduction of spilled oil observed in water and sediment samples taken from Colgate Creek, in Baltimore Harbor of Chesapeake Bay. The creek is exposed to continuous oil pollution from tank washings, accidental spills, and storm sewer effluent discharges. The amount of oil extracted from the samples, collected between January-September 1974, varied from month to month and was influenced by periodic spills. Increases in benzene-extractable material in the sediments were noted in March (fuel oil spills), May (Bunker C oil spills), and August (crude oil spill). No corresponding increases were detected in the water in the March and August spills, suggesting adsorption of oil onto particulate matter, followed by sedimentation, or rapid degradation by bacteria present in the water column. The Bunker C spill, on the other hand, was contained by an oil boom, providing a continuous wash of oil from the spill. A 75% decrease in benzene-extractable material in sediment samples was observed one month after each of the spills, due to two possibilities: (1) the flushing action of the Chesapeake Bay estuarine system, and (2) microbiological degradation. Laboratory testing of bacteria extracted from Colgate Creek water and sediment and exposed to oil concentrations resulted in biodegradation of about 70% of benzene extractables. Complex ecological events, such as microbial succession and rates of biodegradation during removal of the oil, should be properly assessed. (Lynch-Wisconsin)
W78-06012

NITRIFICATION IN RUNNING WATERS: CASE STUDY GLATT, (IN GERMAN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 5B.
W78-06015

TURBINE ASPIRATION FOR OXYGEN SUPPLEMENTATION,
Alabama Univ., University. Dept. of Engineering Mechanics.
D. C. Raney.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. 2, p 341-352, April 1977. 12 fig, 2 tab, 4 ref.

Descriptors: *Turbines, *Hydraulic turbines, *Dissolved oxygen, *Aspiration, *Aeration, *Hydroelectric plants, Oxygen, Reservoirs, Thermal stratification, Model studies, Equations, Prototype tests, Costs, Alternative costs, Alabama.

Aspiration-flow aeration systems for hydroelectric turbines to increase dissolved oxygen levels in discharges are described. One type of system uses deflector plates to produce localized regions of negative gage pressure in the draft tube; a second type takes advantage of natural negative pressures in the draft tube to achieve the desired aspiration flow. The investigation involved three phases: (1) a model study to obtain basic design data; (2) design of prototype aspiration systems; (3) prototype data acquisition to verify predicted operation characteristics. Aeration systems introduce air or molecular oxygen inot the penstock or draft tube of the turbine, and in the systems described here turbine hydraulics are used to induce an aspiration flow from the atmosphere into the draft tube. The cost per ton of dissolved oxygen added to the water in the aspiration system compares favorably with costs for molecular oxygen injection, diffusion systems, and other techniques. The modelling parameter and calculation procedures for the deflector plate concept were verified by comparison with measured flow rates for prototype systems installed on 10 turbines of the Alabama Power Company system located on the Warrior and Coosa Rivers. Data obtained from the natural aspiration tests were consistent and appear to yield a logical modelling relationship, but the modelling procedure has not been verified due to a lack of prototype data. (Lynch-Wisconsin)
W78-06017

THE BIOGENIC CARBON BALANCE IN A GROUND WATER INFILTRATION ENRICHMENT SYSTEM, (IN RUSSIAN),
Academy of Municipal Economy, Moscow (USSR). Research Inst. of Public Water Supply, Water Purification.
For primary bibliographic entry see Field 5B.
W78-06030

HEAVY HANDS ON THE POLLUTION CONTROLS,
Harvard Univ., Boston, MA. Graduate School of Business Administration.
R. Leone.
The Wharton Magazine, Vol 1, No 1, p 26-30, 1976. 3 ref.

Descriptors: *Legal aspects, *Water pollution control, *Non-structural alternatives, Water policy, Institutional constraints, Pollution abatement, Law enforcement, Penalties(Legal), Pollution taxes(Charges), Economics, Economic efficiency, Social values.

Pollution laws do not establish standards that can be applied equally to all industries. In addition, they are not geared to specific socially desirable goals, but rather towards whatever focus happens to be technically and economical feasible at the time. Technical and economic feasibility as primary guidances in pollution control lawmaking create short-term solutions which in turn discourage radical technological innovations that would be more effective and less costly in the long run. Today's pollution laws adversely effect not only the rate and direction of technical advance but also the nature of industrial competition, financial conditioning of companies, and basic marketing strategies. Pollution control laws are beneficial where they cause re-evalution of processing techniques that were previously considered uneconomic, or cause marginal plants to remain profitable by reducing effective capacities of large companies. Five suggestions are offered for industries wanting to reduce burdens of complying with environmental legislation: (1) educate government and the public as to the dynamic and competitive consequences of environmental control; (2) exploit competitive advantages; (3) cut the cost of pollution control by modifying either the product or the manufacturing process; (4) make money on pollution control by creating a self-cleanup capability; (5) anticipate future environmental requirements. (Harris-Wisconsin)
W78-06031

HYGIENIC ASSESSMENT OF BIOLOGICAL FISH PONDS USED FOR PURIFICATION OF SEWAGE FROM LIVESTOCK FARMS, (IN RUSSIAN),
All Union Research Inst. of Animal Husbandry, Dubrovitsy (USSR).
For primary bibliographic entry see Field 5D.
W78-06032

FEDERAL LAKE ERIE WATER QUALITY STANDARDS PROPOSALS.
Environmental Protection Agency, Region V, Chicago, IL.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 608, Price codes: A03 in paper copy, A01 in microfiche. June 1972. 32 p, 3 fig, 7 tab, 14 ref.

Descriptors: *Lake Erie, *Water quality standards, *Effluents, *Waste disposal, Regulation, Environmental Protection Agency, Federal Water Pollution Control Act, Great Lakes, Michigan, Ohio, Pennsylvania, New York, Water pollution control, Pollutants, Nutrients, Coliforms, Dissolved oxygen, Chlorine, Chemical wastes, Water temperature, Radioactivity, Hydrogen ion concentration.

Proposed water quality standards for Lake Erie are presented by the U. S. Environmental Protection Agency for consideration and action by Michigan, Ohio, Pennsylvania, and New York. Section 10 of the Federal Water Pollution Control Act allows each such lake-side state to adopt water quality criteria subject to EPA approval. General criteria require that Lake Erie waters be free from substances entering the waters as a result of human activity in the form of: those which ettle to form putrescent or otherwise objectionable sludge deposits, or that adversely affect aquatic life or waterfowl; (2) floating debris, oil, scum, and other floating materials in amounts sufficient to be unsightly or deleterious; (3) substances producing color, odor, or other conditions in such a degree as to create a nuisance; (4) substances in concentrations toxic or harmful to human, animal, or aquatic life; and (5) nutrients in concentrations sufficient to create nuisance growths of aquatic weeds and algae. More specific criteria include: (1) Fecal coliform organisms shall not exceed 200/100 ml based upon not less than 5 samples/mo, nor shall any sample exceed 400/100 ml. (2) Dissolved oxygen shall not be below 80% saturation nor be less than 6 mg/l. (3) Chlorine concentrations shall not exceed 0.002 mg/l. (4) The range of pH shall be 6.7-8.5. Specifications are also given for radioactivity, mixing zones, chemical constituents, and temperature. (Lynch-Wisconsin)
W78-06048

WATER QUALITY FACTORS, NORTH PLATTE RIVER, WYOMING-NEBRASKA.
National Field Investigations Center, Denver, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 668, Price codes: A03 in paper copy, A01 in microfiche. October 1971. 29 p, 2 fig, 2 tab, 10 ref, 2 append.

Descriptors: *North Platte River(Wyo-Neb), *Water quality standards, *Water disposal, *Effluents, Sugar beets, *Wyoming, *Nebraska, Regulation, Holly Sugar Corporation, Legal aspects, Industrial wastes, Permits, Agricultural runoff, Municipal wastes, Irrigation effects, Federal Water Pollution Control Act, Waste treatment, Color, Turbidity.

Water quality, pollution sources, applicable regulations, and enforcement history of the North Platte River in Wyoming and Nebraska are described. Water quality was most severely degraded in 1960-61 during the sugar beet processing season, when river water was characterized by high basic oxygen demand (61 mg/l maximum), low dissolved oxygen levels (a minimum of 4.3 mg/l), high suspended solids and turbidity, and high bacterial counts (a maximum over 1 million total coliforms/100 ml). Water quality standards set in 1967 by Wyoming and Nebraska in accordance with the Federal Water Quality Act of 1965 were violated in 1970 by the Holly Sugar Corporation at Torrington, Wyoming. Stringent waste treatment requirements were established, with complete abatement to be achieved prior to the 1972-73 sugar beet processing season. Waste treatment facilities at four Great Western Sugar Company refineries located in Nebraska will not meet requirements set for Holly Sugar. A waste source and water quality survey of the river between Torrington and Broadwater, Nebraska is needed during the sugar beet processing season to define impact on water quality of waste discharges, to evaluate present disposal practices, and to define waste treatment needs. Agriculture is the dominant industry in the valley; important irrigation crops are sugar beets, alfalfa, corn, and other feed corps. Under provisions of the Refuse Act of 1899, a major program has been initiated to issue permits for all discharges of industrial wastes to navigable waters. (Lynch-Wisconsin)
W78-06049

PLANNING FOR CLEANING UP AN ESTUARY--PART II: PHYSICAL PLANNING FOR THE MERSEY,
R. L. Gouge, G. L. Symes, and A. D. Buckley.
Journal of the Institution of Water Engineers and Scientists, Vol. 31, No. 5, p 329-350, September, 1977. 8 fig, 2 tab, 11 ref.

Descriptors: *Dissolved oxygen, *Estuaries, *Rivers, *Sewage effluents, *Municipal wastes, Treatment facilities, Sewage treatment, Sedimentation, Industrial wastes, Waste water treatment, Sewage disposal, *Mersey estuary(England).

Proposals for alleviating the discharge of pollutants into rivers which flow into the Mersey estuary in England are presented. Pollution in the lower reaches of the Mersey estuary consists of the deposition of sewage solids, oils, and fats on the beaches and foreshore. This area also receives approximately 330 megaliters/day of untreated sewage during dry weather flow. Selection of a sewage treatment site to process the sewage from the municipality of Liverpool and the expansion of the existing treatment facilities is recommended. The construction of a treatment plant at Wirral, on the other side of the estuary, is suggested. More ecomonically feasible are the proposals for expanding the drainage area of the sea outfall or construction another 5-m outfall. Screening of the effluent discharged by the outfalls and digestion plants for the treatment of raw sludge are also recommended. Contributing streams and industrial plants are the major sources of pollution in the upper areas of the estuary. Effluent discharged into the upper estuary has received primary or full treatment but still has a low dissolved oxygen content. Provision for primary sewage treatment is recommended for Widness. The addition of secondary treatment for areas with only primary treatment facilities is suggested by either construction of facilities or transfer of sewage to a secondary plant. The addition of oxygen to upper estuary waters and the installation of a nitrifying plant are also considered. (Lisk-FIRL)
W78-06062

REVIEW AND APPRAISAL OF NUMERICAL CIRCULATION MODELS FOR LAKE MICHIGAN,
Argonne National Lab., IL. Energy and Environmental Systems Div.
For primary bibliographic entry see Field 2H.
W78-06122

THE EFFECT OF MILITARY TRANSPORTATION ACTIVITIES ON THE ENVIRONMENT,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 4C.
W78-06126

EROSION AND SEDIMENT CONTROL. SURFACE MINING IN THE EASTERN U.S. VOLUME I. PLANNING. VOLUME II. DESIGN,
Hittman Associates, Inc., Columbia, MD.
T. R. Mills, and M. L. Clar.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 343, Price codes: A12 in paper copy, A01 in microfiche. Report EPA-625/3-76-006, October 1976. 243 p, 124 fig, 39 tab, 34 ref. EPA 68-03-2213.

Descriptors: *Erosion control, *Strip mines, *Sediments, *Erosion, Bank protection, Bank stability, Check structures, Cover crops, Vegetation, Land forming, Riprap, Roadbanks, Slope protection, Soil stabilization, Vegetation establishment, Watershed management, Erosion rates, Mining, Coal mines, Water quality, Water pollution, *Eastern US.

An evaluation is presented of the effectiveness of sediment ponds in reducing suspended solids in the runoff from surface mining activities. Nine selected sedimentation ponds in the three eastern coal-mining states of Pennsylvania, West Virginia, and Kentucky were sampled under two different operating conditions, a baseline and rainfall event. The theoretical and actual efficiencies of removal of suspended solids were computed and compared. (Sims-ISWS)
W78-06127

IDENTIFICATION OF RELEVANT CRITERIA AND SURVEY OF POTENTIAL APPLICATION SITES FOR ARTIFICIAL HABITAT CREATION, VOLUME I, RELEVANT CRITERIA FOR MARSH-ISLAND SITE SELECTION AND THEIR APPLICATION.
Coastal Zone Resources Corp., Wilmington, NC.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-033 525, Price codes: A10 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station Contract Report D-76-2, Volume I, October 1976. 173 p, 26 fig, 9 tab, 130 ref. Army DACW 39-73-C-0116(Neg).

Descriptors: *Dredging, *Spoil banks, *Marshes, *Habitats, Wetlands, Shorelin cover, Vegetation, Vegetation establishment, Salt marshes, Coastal marshes, Islands, Sediments, Coasts, Estuaries, Artificial marsh construction, Dredged materials, Disposal site selection, Artificial habitats.

A process is developed for the selection of areas appropriate for artificial marsh construction using dredged material. By application of the methodology set forth, Engineer District personnel will be able to identify such areas efficiently. In Volume I of the report, the biophysical and socioeconomic information needed to evaluate potential marsh creation sites was described, and the rationale for the importance of such data was presented. A two-scaled approach to analyzing the information base typically available to the Engineer District was detailed. Specific kinds of problems that might arise and theoretical approaches to their solution also were discussed. The selection rational was tested in Volume II by the choice and description of 50 prime candidate project areas, 10 within each of 5 major coastal geographical regions. From this compilation, 10 optimum project areas, 2 in each geographical region, were selected and described further using data gathered in the project areas and from relevant Engineer Districts. (Sims-ISWS)
W78-06128

STUDIES ON THE CHARACTERISTICS AND DISPOSAL PROBLEMS OF INDUSTRIAL EFFLUENTS WITH REFERENCE TO ISI STANDARDS: (PART II),
D. A. V. Coll., Muzaffarnagar (India). Pollution Relevant Research Lab.
S. R. Verma, A. K. Tyagi, and R. C. Dalela.
Indian Journal of Environmental Health, Vol 19, No 3, p 165-175, 1977. 6 tab, 17 ref.

Descriptors: *Food processing industry, *Textiles, *Fertilizers, *Biochemical oxygen demand, *Suspended solids, Dissolved oxygen,

Nitrogen, Chemical oxygen demand, Phosphates, Chromium, Iron, Waste water disposal, Industrial wastes.

The Indian Standards Institute's industrial wastes discharge limitations were compared to the effluent characteristics of wastes discharged by various Indian industries. Samples of wastes from textile mills, fertilizer plants, antibiotic manufacturers, breweries, and slaughter houses were analyzed for a variety of parameters, including: odor, color, temperature, solids, pH, dissolved oxygen, BOD, COD, and nitrogen. Effluent parameters were found to exceed the Indian Standards Institute's tolerance levels in many instances. Untreated wastes from antibiotic production and slaughterhouse operations contained levels of BOD which exceeded standards. Textile wastes contained a high volume of suspended solids and were highly colored because of the presence of iron and chromium compounds. High concentrations of nitrogen, chloride, phosphate, and sulfate compounds were found in fertilizer wastes. Brewery effluent was acidic and contained high levels of suspended solids. Further biological or chemical treatment of the wastes was recommended before discharge into public water sources, land areas, or sewage treatment facilities. (Lisk-FIRL)
W78-06132

RESOURCES ALLOCATION TO OPTIMIZE MINING POLLUTION CONTROL,
Ohio State Univ. Research Foundation, Columbus.
K. S. Shumate, E. E. Smith, V. T. Ricca, and G. M. Clark.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 185, Price codes: A21 in paper copy, A01 in microfiche. Report No EPA-600/2-76-112, November 1976. 476 p, 69 fig, 40 tab, 7 ref, 4 append. EHE 623 05-01-08A-05. 68-01-0724.

Descriptors: *Resource allocation, *Acid mine water, *Mine drainage, *Coal mine wastes, *Model studies, *Optimization, Mine wastes, Water pollution control, Computer programs, Watersheds(Basins), Costs, Economics, Water pollution sources.

In determining cost-effective actions to eliminate or abate acid mine drainage from coal mining operations, a computer-based model was developed to describe or predict drainage acidity from deep and surface mines and from coal refuse piles. The model can: (1) produce a time trace of acid load and flow from acid drainage sources as a function of climatic conditions; (2) generate continuous receiving stream flow data from precipitation data; (3) predict acid load and flow from mine drainage sources using precipitation patterns and watershed status typical of worst-case conditions; and (4) predict optimum resource allocation using alternative treatment methods for worst-case conditions during both wet and dry periods of the hydrologic year. Knowing the acid load from each source as a function of time, costs of alternative mine drainage treatment techniques can be estimated, together with their effectiveness in reducing unabated acid loads. Alternative cost and effectiveness estimates for the individual acid sources are then used as input to an optimization model, which can be used to calculate the minimum cost for a given level of abatement in the watershed, or the maximum water quality attainable for a given cost. In most cases the field data required as input to the model are not currently available, and the model has not been fully tested or compared to real systems, nor has sensitivity to input data been determined. (Lynch-Wisconsin)
W78-06138

AERATION/CIRCULATION KEEPS ALGAL BLOOMS IN CHECK,
Tetra Tech, Inc., Lafayette, CA.
M. W. Lorenzen.
Water and Wastes Engineer, Vol. 14, No. 10, October 1977, p 69-74. 3 fig, 1 tab. EPA 68-03-2192.

Descriptors: *Lake rehabilitation, *Aeration, *Circulation, *Algal control, *Eutrophication, *Destratification, Lakes, Reservoirs, *Water pollution control, Water management(Applied), Mixing, Hydrogen ion concentration, Hypolimnion, Epilimnion, Thermocline, Stratification, Depth, Light penetration, Dominance.

Part 1 of a two-part series includes general considerations of aeration/circulation for algal control in lakes, reservoirs, and lagoons. Artificial mixing or destratification of a water body is used for aeration and for algal bloom control. Anoxic conditions develop in the hypolimnion under stratified conditions because the thermocline largely prevents downward transport of oxygen, and aeration may be necessary to safeguard fisheries and other biological communities, and to control odor and high iron and manganese buildups. Destratification for algal control requires high energy systems to redistribute algal cells throughout the water column. Algal blooms are controlled as the amount of sunlight available for photosynthesis is limited; depth available for mixing is a controlling factor in limiting algal biomass. Lowering the pH through mixing may favor non-cyanophyte species as well. The probable net long-term effect of maintaining oxic conditions would be reduction in sediment phosphorus release. Results of artificial mixing in 19 lakes using compressed air for mixing are presented in tabular form. Successful systems generally used 1 standard cu ft/min (SCFM) of air per million cu ft of lake volume, and 20 SCFM air/million sq ft of surface area. Mechanical systems discussed include jet discharges, gasoline pump, 42-in fan blade, and 16.5 ft propellor. A procedure is given for determining suitability of an impoundment for destratification. (Lynch-Wisconsin)
W78-06140

COOLING DISCONTINUOUS WATERS WITH A SINGLE REFRIGERATION UNIT,
Arizona Univ., Tucson. School of Renewable Natural Resources; and Arizona Cooperative Fishery Research Unit.
F. W. Robinson, J. C. Tash, and S. H. Holanov.
The Progressive Fish Culturist, Vol. 40, No. 1, p 15, 1978. 2 fig.

Descriptors: *Laboratory equipment, *Refrigeration, *Cooling, *Water cooling, *Temperature control, *Water temperature, *Pumps, *Aquaria, Design, Equipment, Bioassay, Methodology.

A method of cooling water in toxicity bioassay experiments that require discontinuous waters was presented. This type of refrigeration unit is desirable in experiments in which the prevention of an exchange of dissolved substances is essential. The materials for construction cost approximately $50. (Dael-EIS)
W78-06146

THE TREATABILITY OF LEACHATES FROM SANITARY LANDFILLS,
Drexel Univ., Philadelphia, PA. Coll. of Business Administration.
For primary bibliographic entry see Field 5D.
W78-06148

SUMMARY OF DRAFT 201 FACILITY PLAN FOR UPGRADING METRO PUGET SOUND PLANTS,
Metropolitan Engineers, Seattle, WA.
R. C. Bain, Jr.
Municipality of Metropolitan Seattle, Wash., (Sept. 1977). 60 p, 10 fig, 11 tab.

Descriptors: *Water Quality Standards, *Regulation, *Sewage treatment, *Sewage effluents, *Sewage sludge, *Sanitary engineering, *Waste water treatment, *Urban runoff, *Federal Water Pollution Control Act, *Municipal wastes, *Domestic wastes, *Washington, Puget Sound, Seattle, Marine waste disposal, Lake Washington.

The Metropolitan Seattle area is required by federal law to institute secondary sewage treatment by 1983. This report addresses the four major issues, viz, the specifications of the federal law, economic impact, environmental impact, and water quality. Eight alternative plans are then presented. (Dael-EIS)
W78-06149

MAINTENANCE OF A TROUT FISHERY BY AERATION IN A EUTROPHIC LAKE,
Adelphi Univ., Oakdale, NY. Inst. of Marine Science; and Adelphi Univ., Garden City, NY.
M. H. Garrell, A. M. Gibbs, and R. L. Miller.
New York Fish and Game Journal, Vol 25, No 1, p 79-82, 1978. 1 fig, 1 tab, 4 ref.

Descriptors: *Salmonids, *Rainbow trout, *Brown trout, *Brook trout, Fish stocking, *Trout, Fish establishment, Fish populations, *Eutrophication, *Hypolimnion, *Thermal stratification, *Aeration, *Oxygen requirements, Creel census, *New York, *Lake Waccabuc(NY).

A eutrophic lake was equipped with an aeration system and subsequently stocked with several salmonid species. An analysis of fish taken two years later demonstrated survival and successful growth in one of the salmonids (Rainbow trout). A resurgence in the numbers of white perch and yellow perch was also noted. It was concluded that aeration can maintain a cold-water fishery that would otherwise not survive in a eutrophic lake and can improve the environment for existing species. (Dael-EIS)
W78-06171

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE WELMM APPROACH TO ENERGY STRATEGIES AND OPTIONS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
M. Grenon, and B. Lapillonne.
IIASA Report RR-76-19, December 1976. 43 p, 8 fig, 11 tab, 18 ref, 4 append.

Descriptors: *Energy strategies, *Energy resources, *Evaluation, Land, Manpower, Materials, Economics, Data storage and retrieval, Multiattribute analysis.

The development of energy resources requires more and more natural or human resources, on the one hand because of the difficulty of 'harvesting' primary energy resources, and on the other because of the complexity of the sequence of processes necessary to convert these primary resources into useful resources for an economy (final energy). In this context, the WELMM approach has been designed to evaluate the resource requirements for the development of energy resources. WELMM focuses mainly on five limited resources: Water, Energy, Land, Materials, and Manpower. The WELMM evaluation is implemented at the level of the major facilities concerned in the harvesting and conversion of primary energy resources into final resources. All the WELMM data are stored in three different data bases (Resource Data Bass, Component Data Base, and Facility Data Base). They are meant to be used to enlarge and complete the traditional economic comparison of energy processes, energy strategies or energy options. (Bell-Cornell)
W78-05704

SUPPLEMENTAL COLORADO RIVER WATER FOR A DEVELOPED GROUNDWATER AGRICULTURE: A PROBLEM OF QUANTITIES, QUALITIES AND CONJUNCTIVE USE,
Fish and Wildlife Service, Washington, DC. Office of Biological Services.
For primary bibliographic entry see Field 4B.
W78-05705

CAPACITY EXPANSION FOR WATER RESOURCE FACILITIES: A CONTROL THEORETIC ALGORITHM FOR NONSTATIONARY UNCERTAIN DEMANDS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6D.
W78-05706

AN EVALUATION OF ALTERNATIVE SLUDGE TECHNOLOGIES: A SURROGATE WORTH TRADEOFF APPROACH,
New Hampshire Univ., Durham. Inst. of Natural and Environmental Resources.
For primary bibliographic entry see Field 5E.
W78-05707

REGIONAL WATER SUPPLY PLANNING BY INTERACTIVE SYSTEMS ANALYSIS,
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-05712

ECONOMIC ANALYSIS OF IRRIGATION PRODUCTION FUNCTIONS: AN APPLICATION OF LINEAR PROGRAMMING,
International Bank for Reconstruction and Development, Washington, DC. Development Research Center.
For primary bibliographic entry see Field 3F.
W78-05714

DECISION-MAKING IN THE DEVELOPMENT OF URBAN WATERFRONTS FOR PARK/BUSINESS USE,
Texas A and M Univ., College Station. Dept. of Recreation and Parks.
For primary bibliographic entry see Field 6B.
W78-05716

A MODEL CRITERION FOR SITE SELECTION OF LARGER SCALE TECHNICAL FACILITIES IN THE UPPER RHINE REGION,
Nuclear Research Center, Karlsruhe (West Germany).
For primary bibliographic entry see Field 5G.
W78-05720

A MATHEMATICAL MODEL FOR THE ANALYSIS OF MULTI-RESERVOIR FLOOD CONTROL SYSTEMS,
Natal Univ., Durban (South Africa).
For primary bibliographic entry see Field 4A.
W78-05721

DESIGN OF LARGE URBAN SEWER SYSTEMS WITH A WATER-FLOW SIMULATION PROGRAM,
Balzari Blaser Schudel, Bern (Switzerland).
For primary bibliographic entry see Field 5D.
W78-05722

OPTIMIZATION METHODS FOR PLANNING WASTE WATER MANAGEMENT SYSTEMS,
Karlsruhe Univ. (West Germany). Inst. fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 5G.
W78-05723

A STOCHASTIC MODEL OF LEVEE FAILURE,
Eotvos Lorand Univ., Budapest (Hungary). Dept. of Numerical Methods.
For primary bibliographic entry see Field 8D.
W78-05724

A WATER QUALITY OPTIMIZATION MODEL FOR NONSERIAL RIVER SYSTEMS,
Calgary Univ. (Alberta).
For primary bibliographic entry see Field 5B.
W78-05725

THE ANATOMY OF THE MODELLING PROCESS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-05726

RANDOM SEARCH OPTIMIZATION: STOPPING RULES,
Aalborg Universitetscenter (Denmark).
For primary bibliographic entry see Field 2A.
W78-05727

SELECTING ALTERNATIVES IN WATER RESOURCES PLANNING AND THE POLITICS OF AGENDAS,
Johns Hopkins Univ., Baltimore, MD.
For primary bibliographic entry see Field 6B.
W78-05736

THE ROLE OF SYSTEMS ANALYSIS IN WATER PROGRAM DEVELOPMENT,
Harvard Univ., Cambridge, MA. Dept. of Engineering and Applied Mathematics.
M. B. Fiering.
In: Natural Resources Journal, Vol. 16, No. 4, p 759-771, October 1976. 1 fig, 9 ref. Symposium on Water Resources Management in a Changing World.

Descriptors: *Systems analysis, *Water management(Applied), *Water resources development, *Model studies, *Planning, Optimization, Conflict, Resource allocation, Computers, Decision-making, Mathematics, Water resources planning.

Systems analysis can play a fundamental role in water resource planning and design only if the analyst recognizes that optimality is elusive when applied to problems of conflict of interest, resource allocation, human value judgements, and stochastic processes. Important concepts treated in this essay are: (1) the ubiquitous occurrence of conflict, without which much more systems theory would be applicable to water resource planning; (2) robustness, that is, given the existence of conflict, it is desirable to seek solutions which may be non-optimal but significantly less brittle than the optimum; robustness is distinguished from system sensitivity in being a total rather than partial derivative; (3) stability, which is thought of as an important property of resource systems, leads to directing environmental standards and policies at maintaining ecological stability without regard to biological facts; and (4) resilience, contrasted with stability, which specifies designing for prospects not foreseen at the time of design, and to which no probability of occurrence can be assigned. Applications of systems analysis to water resource planning should stress the use of mathematical models to represent conflicts because well-defined objectives and constraints can rarely be found. With increased reliance on big, complex models, however, responsible use weighs heavily on the engineering profession. (Lynch-Wisconsin)
W78-05748

ECONOMIC AND ENVIRONMENTAL IMPACTS OF FOREST RESOURCE DEVELOPMENT,
Purdue Univ., Lafayette, IN.
H. W. Everett, II.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 592, Price codes: A07 in paper copy, A01 in microfiche Master of Science Thesis, December, 1974. 125 p, 3 fig, 37 tab, 45 ref, 2 append. OWRT B-042-IND(5), 14-31-0001-3586.

Descriptors: Economic impact, Model studies, Economics, *Environmental effects, *Linear programming, Forest management, *Forest watersheds, Soil mechanics, Soil erosion, *Indiana, *Resource development, Discount rates, Mathematical studies, Lincoln Hills(IN), Environmental quality, Forest harvesting.

Direct economic and environmental impacts of a forest resource development project, Lincoln Hills region of Souther Indiana, were measured and their relationship illustrated; the indirect economic impact was measured at various levels of resource development. A linear programming model of the forest resource was developed to examine the effects of the resource development over a 50 year planning horizon, assessing alternative forest management practices, harvest methods, rates of harvest, and rates of discount upon economic output and soil losses. The sensitivity of the model was examined for changes in three harvesting programs used for establishing per period cuts of timber; for changes in the discount rate applied to net revenue coefficients; and for changes in level of soil loss. The allowable harvest program generates higher net revenue than the demand harvest program when soil losses are not or only slightly restrained. The method of harvest was also affected by the rate of harvest, so that as rates increased, either a select cutting and clear cutting combination or the latter along was more profitable than select cutting. Rate of discount changes reduced only net revenue figures. The model was also sensitive to changes in allowable soil loss level from the land, so that net revenue was reduced with reduced soil losses. Study of the indirect economic impact indicated that if the harvest could be further processed into secondary or final products in the region, a large increase in income, employment, and economic development could result. (Wares-IPA)
W78-05803

COST OPTIMIZATION OF RURAL WATER SYSTEMS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-05810

ESTIMATION OF BENEFITS AND ANALYSIS OF FACTORS INFLUENCING LAND USE CHANGE IN THE IOWA RIVER FLOOD PLAIN,
Iowa Univ., Iowa City. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-05811

TECHNOLOGICAL FORECASTING APPLIED TO WATER RESOURCE PLANNING,
Iowa State Univ., Ames.
A. M. Behrens.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 564, Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, Industrial Engineering, 1975. 86 p, 14 fig, 2 tab, 103 ref, 2 append. OWRT A-057-IA(1).

Descriptors: *Technology, *Forecasting, *Water resources, *Planning, Methodology, Water demands, *Technological forecasting.

Types of technological forecasting methodologies and their usefulness to water resource planning are identified. Emphasis is on incorporating appropriate forecasting methodologies and

procedures into a forecasting and planning system which explicitly takes into account future technological development and goals affecting water resources. The three best methods for long-range forecasting were Delphi, analogy, and trend extrapolation, with Delphi and trend extrapolation favored for accuracy; Delphi was also favored to find turning points. Three forecasting activities were planned: exploratory, normative, and interactive feedback for adjustments needed to anticipate future demands for water and to allocate resources to develop sources to meet demands. Both present and possible new technology must be included in the forecast program. A forecasting system utilizing trend extrapolation, intution by knowledgeable persons in a Delphi process, and cross-impact simulation is proposed. Areas of needed future research are also described, including forecasting system refinement, applications and testing of the system, and operation of the system. (Wares-IPA)
W78-05813

CONCEPTS AND TECHNIQUES FOR EVALUATION OF ENERGY-RELATED WATER PROBLEMS,
Florida Univ., Gainesville. Center for Wetlands.
F. C. Wang, H. T. Odum, and M. E. Lehman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 608, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, December 1977. 62 p, 14 fig, 5 tab, 31 ref, 2 append. OWRT C-7516 (6236)(1).

Descriptors: *Energy, *Planning, *System analysis, Water resources, *Water management(Applied), Computer simulation, Land-use planning, Linear programming, Water utilization, *Energy analysis, Energy quality, Energy value, Maximum power principle, Net productivity, Sensitivity analysis.

Research effort is described to apply the newly evolving theory of energy analysis and the classical operational research techniques (linear programming) to a procedure that may serve the resource manager in decision making. The theory investigated involves the concepts of net energy, energy quality, and energy amplifier value. Based on these concepts, an attempt was made to estimate energy values of water. One energy value of water is equal to the flow that it facilitates in a specific use. This is so because of its role as an amplifier which makes more energy available in different systems when used as a limiting factor. Another energy value is the embodied energy in forming water in processes of the biosphere or of man's activities. The energy effects may ultimately be related to embodied energy. The objective function in the linear programming analysis is structured in terms of net productivity of the subsystem measured at its boundary. The maximum power principle rather than profit maximization was used as a criterion because the system which gets the most energy and uses energy most effectively in competition with other systems will survive in the long run. Although the research effort should be further extended or modified to develop practical procedures for application, a simple hypothetical model considered representative of the major land-use subsystems is presented to illustrate such application. Sensitivity analysis was performed to test the stability of the model and its related problem solution to a resource plan.
W78-05940

INTEGRATING SCIENTIFIC DATA INTO ENVIRONMENTAL PLANNING AND IMPACT ANALYSIS, GENERAL METHODOLOGY AND A CASE STUDY,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 6G.
W78-06058

RESOURCES ALLOCATION TO OPTIMIZE MINING POLLUTION CONTROL,
Ohio State Univ. Research Foundation, Columbus.
For primary bibliographic entry see Field 5G.
W78-06138

6B. Evaluation Process

A WATER QUALITY PLANNING MODEL WITH MULTIPLE TIME, POLLUTANT, AND SOURCE CAPABILITIES,
Meta Systems Inc., Cambridge, MA.
For primary bibliographic entry see Field 5B.
W78-05702

MEASURING CONSUMER SURPLUS BENEFITS OF WATER SUPPLY EXTENSIONS IN DEVELOPING COUNTRIES,
Texas Univ. at Dallas, Richardson.
For primary bibliographic entry see Field 6D.
W78-05710

PLANNING METHODOLOGY FOR ANALYSIS AND MANAGEMENT ON LAKE EUTROPHICATION,
Yale Univ., New Haven, CT. School of Forestry and Environmental Studies.
For primary bibliographic entry see Field 5C.
W78-05715

DECISION-MAKING IN THE DEVELOPMENT OF URBAN WATERFRONTS FOR PARK/BUSINESS USE,
Texas A and M Univ., College Station. Dept. of Recreation and Parks.
J. W. Hanna, S. F. Philipp, and G. W. Mullins.
Water Resources Bulletin, Vol 14, No 1, p 179-189, February 1978. 1 fig, 5 tab, 18 ref.

Descriptors: *Urban renewal, *Decision making, *Planning, *Parks, *Waterfront development, Urban redevelopment, Riverfront development, Urban rivers, Implementation, Deterrents, Inventory, Data collections, Design, Houston(Tex), *Texas.

Opportunities for the development of an amalgam of park and leisure-oriented commercial establishments in urban-core waterfront settings exist in many United States cities. Public awareness of the need to enhance the environmental quality of these waterfront areas has resulted in a demand for planning and implementation action. However, the lack of understanding of urban political systems has been an inhibiting factor in the development of the park/business concept. Identified herein are the major factors that influence the decision-making process leading to the development of urban-core waterfronts for park/business use. Data collected has yielded information relating to three areas of urban-core waterfront development: inventory, decision-making process, and deterrent factors. Results show that deterrents to waterfront development include a lack of financial support for projects and proposals being prepared which are not suitable for application to the particular site. Understanding the necessary decision-making process can aid project implementation and avoid waste of planning effort in time, dollars, and productivity. (Bell-Cornell)
W78-05716

PROGRAMMER'S AND USER'S MANUAL FOR THE TRIBUTARY WATER QUALITY MODEL (FINAL REPORT ON PHASE 2),
Center for the Environment and Man, Inc., Hartford, CT.
For primary bibliographic entry see Field 5B.
W78-05717

THE RECREATIONAL RESPONSE TO CHANGES IN WATER QUALITY: A SURVEY AND CRITIQUE,
Leicester Univ. (England). Public Sector Economics Research Centre.
For primary bibliographic entry see Field 5G.
W78-05728

TOWARDS AN ECOLOGICALLY-BASED ECONOMIC PHILOSOPHY,
Oceanic Inst. Waimanalo, Hawaii.
J. A. Hanson.
Environmental Conservation, Vol 4, No 1, p 3-10, 1977. 4 fig, 17 ref.

Descriptors: *Economic theory, *Economic philosophy, *Natural resources, *Finite element analysis, *Energy, Economics, Industrial production, Conservation, Energy, Economics, Industrial production, Conservation, Energy conversion, Energy dissipation, Recycling, Urbanization, Water resources development, Regional economics, Negantrophy, Human population, Social values, Social change.

The present world economic order is one which fails to recognize the finiteness of global resources and limits of the global ecosystem to absorb wastes. As this order continues, the threshhold of economic energy recovery will reach a point where the amount of energy and materials needed to exploit the low grade energy resources will exceed the net energy produced these same resources. There are two alternatives to this problem: (1) an abrupt end of the present population level and material abundance; (2) a new global economic order based on recognition of the finiteness of this planet. Should the new economic order succeed its viability will depend on the complementarity of efficient energy conversion and conservation of negantropy (trend toward higher levels of organization). The extent to which the civilization can conserve its negantropy will determine the amount of energy available for the nonproductive activities related to a continuation of progress. The attainment of the new global economic order will require a move away from centralization and megagrowth of urban/industrial complexes towards a proliferation of moderate-size, semi-self-sufficient agri-industrial communities relying primarily on technolgy for wider communication. Such an approach would have following advantages: (1) conservation of transportation energy; (2) facilitation of recycling; (3) decreases in community management problems; (4) stimulation of geothermal, ocean-thermal, wind, and solar energy usages. (Harris-Wisconsin)
W78-05734

THE EFFECTS OF WATER RESOURCE DEVELOPMENT ON ECONOMIC GROWTH: THE CONDITIONS FOR SUCCESS,
Colorado Univ., Boulder. Dept. of Economics.
C. W. Howe.
In: Natural Resources Journal, Vol 16, No 4, p 939-955, October 1976. 1 tab, 21 ref. Symposium on Water Resources Management in a Changing World.

Descriptors: *Water resources development, *Water management(Applied), *Water supply, *Economic growth, Kenya, Mexico, Arizona, Middle East, Arkansas River, Uganda, Ghana, Africa, Developing countries.

Successful transfer of Western water development technology to the Third World depends on four conditions only rarely present: (1) that water is the real bottleneck to growth; (2) that capital is available; (3) that institutions exist which can manage the technology; and (4) that the technology fits the local social structure and values. Specific cases where water is a bottleneck are discussed, along with the relative importance of water to growth in various activities. Case studies are given for water development projects in Kenya, Mexico, Arizona,

the Middle East, the Arkansas River, Uganda, and Ghana. It is concluded that; (1) the relative importance of water services will change with growth; (2) water development has the most impact in early stages of growth due to the importance of agriculture; (3) provision of all requisite complementary inputs can result in high productivity and growth effects; (4) irrigation is a necessary but not sufficient condition for agricultural growth in arid and semiarid areas; (5) in mixed economics private sector investment response to public water project investment is a critical factor in determining total social returns; and (6) the availability of low-cost hydroelectric power is a strong attraction to the power-intensive metallurgical and chemical industries. (Lynch-Wisconsin)
W78-05735

SELECTING ALTERNATIVES IN WATER RESOURCES PLANNING AND THE POLITICS OF AGENDAS,
Johns Hopkins Univ., Baltimore, MD.
G. M. Wolman.
In: Natural Resources Journal, Vol 16, No 4, p 773-789, October 1976. 38 ref. Symposium on Water Resources Management in a Changing World.

Descriptors: *Alternative planning, *Decision-making, *Water resources planning, *Agenda, *Problem identification and ranking, Water management(Applied), Multiple-purpose projects, Conflict, Political constraint, Governments, Democracy, Planning.

The list of alternatives to be considered in water resources planning analagous to the political scientist's agenda of issues, is fundamental to the democratic process and access to it represents the politics of influencing or controlling the outcome of a decision. Examples taken from water resources planning demonstrate the relationship of agenda-building to democratic action, and indicate that multiplication of alternatives and participants can stymie decision-making. In moving toward more open democratic processes we are at present heavy on withholding approval at many levels and weak on decision-making mechanisms. While no simple rules exist for including or excluding alternatives from consideration, it is clear that selection of alternatives selection may not be an adequate guideline for future action. The kind of democracy that is evolved determines the rules for selection of agenda, of alternatives. Facts of geography involving local, regional, state, and national interests, as well as the pluralism of society, influence the choice of alternatives. Constraints on alternative planning include physical, and financial factors, illustrated by the examples presented. (Lynch-Wisconsin)
W78-05736

AMENITY AND EQUITY: A REVIEW OF LOCAL ENVIRONMENTAL PRESSURE GROUPS IN BRITAIN,
University Coll., London (England). School of Environmental Studies.
For primary bibliographic entry see Field 6E.
W78-05741

THE ROLE OF SYSTEMS ANALYSIS IN WATER PROGRAM DEVELOPMENT,
Harvard Univ., Cambridge, MA. Dept. of Engineering and Applied Mathematics.
For primary bibliographic entry see Field 6A.
W78-05748

A PUBLIC EDUCATION CAMPAIGN TO CONSERVE WATER,
Washington Suburban Sanitary Commission, Hyattsville, MD.
For primary bibliographic entry see Field 3D.
W78-05752

VERMONT'S WATER RESOURCE RESEARCH NEEDS,
Vermont Univ., Burlington. Dept. of Civil Engineering.
D. W. Stone.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 829, Price codes: A12 in paper copy, A01 in microfiche. Master of Science Thesis, February, 1976. 242 p, 2 fig, 34 tab, 33 ref, 7 append. OWRT A-021-VT(1).

Descriptors: *Vermont, *Water resources, *Research priorities, *Water quality, *Planning, *Management, Water requirements, Water pollution, Lakes, Reservoirs.

A three-fold approach provided a complete analysis of Vermont's water resource research needs. Research information was obtained from responses to a general topical questionnaire, developed from research needs identified by 62 individuals knowledgeable on the State's problems. In addition, the questionnaire was sent to members of four important Vermont organizations (engineering, recreation, planning, and resource societies). Topics found to be of high importance were discussed and elaborated in a round table discussion. Generally, research on ground water quality protection, lake and reservoir quality degradation, non-point source pollution, and municipal waste water systems was considered most significant. The Lake Champlain Basin, the Connecticut River Basin, the Lake Memphremagog Basin, and the Hudson River Basin were ranked as highly important to Vermont. Flowing rivers/streams, lakes/ponds, and ground water were also important to respondenst; little overall concern was shown for wetlands. Water quality management research, planning management, and sociological research, and water quantity management research were also ranked. The consensus indicated the value of this strategy in identifying research needs; it was inferred that this method may be applied in identifying similar needs in other areas of the U.S. (Wares-IPA)
W78-05801

WATER USE RATES FOR RURAL WATER SYSTEMS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
R. S. Schulz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 618, Price codes: A08 in paper copy, A01 in microfiche. Master of Sciences Thesis, 1975. 148 p, 59 fig, 15 tab, 32 ref, 1 append. OWRT A-048-IA(4).

Descriptors: *Water utilization, *Rural areas, *Livestock, Water requirements, Iowa, Peak discharge, Water distribution(Applied), Storage requirements, Kansas, *Water demand, *Water use rates, *Nomographs.

Rural water system use rates in Iowa were computed to predict livestock needs and ascertain rural domestic use patterns. Nomographs predicted livestock water use based on animal weight and environmental temperature; average gallons/capita/day value contributing to the domestic water requirements were determined. General trends in the daily occurrence of peak flows were established. Uniform water use indicated the distribution patterns ascertained in line test sections were representative of patterns for all consumers. Use rates data showed that Iowa rural water is not being used in quantities predicted by design criteria; differences are attributed to the effect of metered water, the associated cost of metered water, and farmers' reluctance to abandon the farm wells. Peak use periods were spread out over a longer span than is normally seen in high density residential areas, probably because of livestock feeding operations. Higher peaking factors were observed in the testing than those used for design of water systems meeting residential, industrial, and commercial water requirements. Comparison of data obtained with simultaneous peak demand curves used for the design of other systems showed that recorded peak rates fell short of values read from Kansas data. Nomographs indicating livestock water consumption developed from data in the literature are higher than water requirements based on animal weight and average environmental temperature; they are recommended, therefore, for use for the ranges indicated, with special consideration for simultaneous peak demands and storage requirements. (Wares-IPA)
W78-05809

ESTIMATION OF BENEFITS AND ANALYSIS OF FACTORS INFLUENCING LAND USE CHANGE IN THE IOWA RIVER FLOOD PLAIN,
Iowa Univ., Iowa City. Dept. of Economics.
D. B. Oyen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 559, Price codes: A09 in paper copy, A01 in microfiche. PhD Thesis, July, 1973. 173 p, 3 fig, 10 tab, 89 ref, 2 append. OWRT A-0380-IA(3), 14-31-0001-3215.

Descriptors: *Land use, *Flood plain, Dams, *Iowa, Farms, *Regression analysis, *Mathematical studies, Farm prices, Cost-benefit analysis, Model studies, *Coralville Dam(IA), *Iowa River(IA), *Pareto optimum, Net benefits, Land value.

The extent of land use change in the Iowa River flood plain following the 1958 installation of the Coralville Dam is investigated; benefits accruing from and economic factors accounting for these changes are analyzed. The claiming of benefits from land use change is justified via an extension of the Pareto optimum conditions. Approximately 938 acres of flood plain land have been brought into agricultural production. Using historical prices, the present value of estimate benefits from land use change is $235,712 when discounting at 3.25%, and $189,958, discounting at 7%. Using estimated free market prices, the present values are $110,772 and $93,531, when discounting at 3.25% and 7% respectively. Based on a theoretical model of flood plain land usage and data compiled in previous land use change studies, it was revealed that farmers who made land use changes: (1) had smaller crop acreages, (2) were older an better educated, (3) had smaller percent of their incomes derived from farm operations, and (4) had higher incomes than farmers who made no change. Farmers who brought land into production tended to live closer to the Dam, realized higher yields on corn and beans, and had more land available for conversion. A regression model was used to account for the simultaneous influences of variables; results indicate that the probability of land use change increases with increases in the number of acres available for conversion, the landowner's age, and number of years of education. Probability of land use change decreases as distance from the Dam increases and the number of crop acres increases. (Seip-IPA)
W78-05811

TECHNOLOGICAL FORECASTING APPLIED TO WATER RESOURCE PLANNING,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 6A.
W78-05813

REVIEW OF THE FLINT CREEK SMALL WATERSHED PROJECT, DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE ONTARIO COUNTY ENVIRONMENTAL MANAGEMENT COUNCIL,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 6G.
W78-05814

CONCEPTS AND TECHNIQUES FOR EVALUATION OF ENERGY-RELATED WATER PROBLEMS,
Florida Univ., Gainesville. Center for Wetlands.
For primary bibliographic entry see Field 6A.
W78-05940

ENVIRONMENT, TECHNOLOGY, AND FUTURE GENERATIONS,
Oregon State Univ., Corvallis. Water Resources Research Inst.
D. A. Bella.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 605, Price codes: A03 in paper copy, A01 in microfiche. Completion Report WRRI-57, January 1978. 36 p, 1 fig, 45 ref. OWRT C-5195 (4209)(2).

Descriptors: Environmental techniques, *Attitudes, *Social values, Costs, Benefits, *Technology, *Environment, Environmental effects, *Social change, *Future planning(Projected).

Environmental strategies involve comprehensive and broad outlooks. In contrast, environmental tactics involve more limited concerns which can be usually addressed in a disciplinary or multidisciplinary manner. The development of strategies necessitates interdisciplinary and transdisciplinary outlooks. Such outlooks are extremely difficult to achieve because different 'structures of reasoning' are found to conflict with each other and confusion and disagreements result. Environmental strategies must accommodate such confusions. They must recognize and accommodate the high levels of ignorance involved in the prediction and appreciation of complex and long-term technological impacts. A strategy is proposed which encourages an adjusting, learning and creative approach to the future rather than an approach which is ultimately based upon prediction and control. The approach is described through a set of five commitments which are intended, not as absolute rules, but as attitudes or considerations which should have increased influence upon decisions. A number of applications and examples are briefly discussed.
W78-05941

PROCEEDINGS OF THE ELEVENTH BIENNIAL CONFERENCE ON GROUND WATER.
California Univ., Davis. Water Resources Center; and California State Dept. of Water Resources. Sacramento.
For primary bibliographic entry see Field 4B.
W78-06039

DIRECTORY OF WATER RESOURCES EXPERTISE, WATER RESEARCH FACULTY AND STAFF SCIENTISTS.
California Univ., Davis. Water Resources Center.
For primary bibliographic entry see Field 9A.
W78-06041

INTEGRATING SCIENTIFIC DATA INTO ENVIRONMENTAL PLANNING AND IMPACT ANALYSIS, GENERAL METHODOLOGY AND A CASE STUDY,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 6G.
W78-06058

OFF-PEAK HOUR PUMPING RATE REDUCTION: ARE THE BENEFITS WORTH THE COSTS,
Boyle Engineering Corporation, Ventura, CA.
R. J. Mauck.
Water and Wastes Engineering, Vol 14, No 9, September 1977, p 70-72. 4 fig, 2 tab.

Descriptors: *Cost-benefit analysis, *Pumping plants, *Off-peak hour pumping rate reductions, *Water supply, *Water management(Applied), Costs, Antelope Valley-East Kern Water Agency(CA), California, Waste storage, Pricing, Electric power costs, Economic analysis, Water demand, Treatment facilities, Water treatment, Sanitary engineering.

Analysis of four off-peak hour pumping rate reduction alternatives shows there is a point at which construction costs for facilities to increase the capacity for off-peak pumping exceeds savings in annual power costs. The study was commissioned by the Antelope Valley-East Kern Water Agency, California. As the local power company charges lower rates for off-peak hours, lower power costs could be realized through use of an off-peak demand adjustment. Conclusions were: (1) A large on-peak power usage rate must occur before a 'total off-peak' pumping system becomes competitive; in such a system the entire treatment plant flow is pumped in the 8-hr off-peak period, requiring an expansion of facilities greater than for the other systems. (2) The 'variable speed' system is sensitive to power rate increases; in this system pumps operate 24 hrs/day, but match flow output of the treatment plant. (3) The 'on-off-peak' system has lower present worth power costs, while the 'constant' system has lower construction capital costs; the former limits flow pumped in the off-peak period to maximum peak flow capacity of the treatment plant, and requires a minimum flow during the on-peak period. The 'constant' system employs pumps with constant speed drives, and pumps cycle to on when working storage capacity is reached (= one hr peak flow) and cycle to off when storage is emptied. (Lynch-Wisconsin)
W78-06134

STRICTER CONSERVATION SOUGHT AS PART OF ANY WATER RESOURCE POLICY,
C. W. Heckroth.
Water and Wastes Engineering, Vol 14, No 9, September 1977, p 48-50.

Descriptors: *Water policy, Water resources, *Water supply, *Water conservation, *Water management(Applied), Governments, Social participation, Attitudes, Pricing, Water rates, Incentives, Recycling, Economics, Groundwater, Water utilization, *Planning, Water demand.

A federal issue paper on water conservation is summarized, and options for consideration for each of five primary problems are discussed. The issue paper was published in the July 15, 1977 Federal Register with three others--planning and evaluation criteria, cost-sharing, and institutions--as part of a comprehensive review of federal water resources policy being conducted by the Carter administration to lead to establishment of a national resources management policy. Hearings were scheduled in eight U.S. cities to obtain public participation and viewpoints. The problems analyzed in this article are: (1) The price of water is insufficient to provide the incentives necessary to promote efficiency and prevent wasteful uses. (2) Inadequate consideration has been given to meeting existing water needs by means of comprehensive watershed management practices, including storage and transfer of surplus water derived from existing supplies. (3) Limited reuse and recycling of water reduces the quantity and quality of water available for all offstream uses and instream values. (4) Groundwater supplies are poorly regulated and are being seriously depleted in some areas through excessive withdrawals. (5) Large quantities of water are wasted in existing water-consuming facilities and production processes where a significant change in the process could greatly reduce the need for water. (Lynch-Wisconsin)
W78-06136

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

PRICE VARIABLE IN RESIDENTIAL WATER DEMAND MODELS,
Oregon State Univ., Corvallis. Dept. of Resource Recreation Management.
For primary bibliographic entry see Field 6D.
W78-05703

POLICY OF PRICING IRRIGATION WATER,
Ministry of Agriculture and Irrigation, New Delhi (India).
For primary bibliographic entry see Field 3F.
W78-05730

RATIONALISATION OF IRRIGATION RATES IN A DEVELOPING COUNTRY,
Central Water Commission, New Delhi (India).
For primary bibliographic entry see Field 3F.
W78-05731

ARE NATURAL RESOURCES CAPITAL USING A MICROANALYTIC APPROACH,
Tulane Univ., New Orleans, LA.
J. R. Moroney.
Southern Economic Journal, Vol. 43, No. 3, p 1203-1217, January 1977. 3 tab, 30 ref. NSF HES 75-20778.

Descriptors: *Natural resources, *Capital use, *Industrial production, *Economics, Industries, Model studies, Labor, Capital-labor ratios, Costs, Wages.

A microanalytic framework is given for testing the hypothesis that natural resource requirements tend to be capital-using across industries, and the resulting statistical models are applied to a sample of 104 American manufacturing industries. Application of these models, each based on different assumptions concerning capital-labor substitution, suggests four conclusions: (1) The most restrictive model indicates resources tend to be capital-using. The evidence is weaker if allowance is made for intergroup differences in intercept terms, and the capital-using hypothesis is not sustained with more general models incorporating factor substitution. (2) With the model incorporating the most general approach, resources appear to exert a capital-using bias in three resource-intensive sectors, but seem to be neutral or labor-using in all others. (3) Although some resource-intensive sectors (e.g., petroleum, chemicals primary metals) have high average capital-labor ratios, this is due more to high wage rates than to intensive natural resource requirements. Other industries processing intermediate inputs of equal or greater resource intensity (e.g., tobacco, certain foodstuffs) have low capital-labor ratios correspondingly attributable to low wage rates. (4) These findings indicate that certain resources may be intrinsically suited to capital-intensive development methods, and that the capital-using thesis is not a substantive cause for the factor content of American trade. (Lynch-Wisconsin)
W78-05732

THE ENVIRONMENTAL COSTS OF LANDFILLS AND INCINERATORS,
Chicago Univ., IL. Center for Urban Studies.
For primary bibliographic entry see Field 5E.
W78-05738

WATER USE RATES FOR RURAL WATER SYSTEMS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W78-05809

COST-EFFECTIVENESS OF ON-SITE AND COMMUNITY SEWERAGE ALTERNATIVES,
Brown and Caldwell, Eugene, OR.
For primary bibliographic entry see Field 5D.
W78-05910

6D. Water Demand

PRICE VARIABLE IN RESIDENTIAL WATER DEMAND MODELS,
Oregon State Univ., Corvallis. Dept. of Resource Recreation Management.
K. C. Gibbs.
Water Resources Research, Vol 14, No 1, p 15-18, February 1978. 2 tab, 9 ref.

Descriptors: *Water demand, *Mathematical models, *Marginal price, *Residential water, Miami(Fla), Equations, Estimating, Systems analysis.

There have been inconsistencies in past residential water demand studies concerning the specification of the relevant price variable. Both average and marginal price have been used. Households faced with the decision to expand (or contract) their water consumption are responsive to the additional cost (or savings) involved with this decision. The appropriate measure of this price is marginal price, not average price. Data were gathered from a large metropolitan area--Miami, Florida--to illustrate the divergence in estimation from two demand models, identically specified, except for the price variable. One utilized marginal price and the other used average price. Predictions of consumption varied from 22 to 107% between the two models. The average price model significantly overestimated the response of consumption to price and income changes, a result worthy of consideration. (Bell-Cornell)
W78-05703

CAPACITY EXPANSION FOR WATER RESOURCE FACILITIES: A CONTROL THEORETIC ALGORITHM FOR NONSTATIONARY UNCERTAIN DEMANDS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
D. Grossman, and D. H. Marks.
Advances in Water Resources, Vol 1, No 1, p 31-40, September 1977. 8 fig, 9 ref.

Descriptors: *Water resources development, *Capacity expansion, *Alternative planning, *Dynamic programming, Stochastic processes, *Algorithms, Demand, Cost minimization, Optimization, Water shortage, Mathematical models, Equations, Systems analysis, Risks, *Water demand.

Municipal water and waste water investments represent a large and important segment of the expenditures made by local governments. The response of designers to the problem of sizing increments to capacity has been to overbuild in order to assure safe and adequate supplies. A growing body of evidence suggests that the magnitude of overbuilding has been excessive. Earlier research has neglected to model demand growth as uncertain with the possibility of both nonstationary mean and variance. Also, failure to recognize the problem as one of closed loop control has resulted in erroneous modeling efforts. This research presents the use of stochastic dynamic programming to model the optimal capacity expansion of water resources facilities, where the objective function is to minimize the expected cost. Excess capacity--the state of the system--increases due to investment decisions. Negative excess capacity implies shortage. As time progresses, known but possibly uncertain demands impinge upon the system. In conclusion, several highly flexible capacity planning models for nonstationary demands can be formulated which are computationally feasible and produce excellent approximations to known solutions. However, these models should be used only after sensitivity testing in conjunction with simpler approaches. (Bell-Cornell)
W78-05706

MEASURING CONSUMER SURPLUS BENEFITS OF WATER SUPPLY EXTENSIONS IN DEVELOPING COUNTRIES,
Texas Univ. at Dallas, Richardson.
M. T. Katzman.
Water Resources Bulletin, Vol 14, No 1, p 46-54, February 1978. 1 fig, 3 tab, 15 ref.

Descriptors: *Water supply, *Cost-benefit analysis, *Investment, *Demand curve technique, Developing countries, Projects, Linear model, Regression analysis, Water mains, Capitalization, Estimating, Penang Island(Malaysia), Consumer surplus benefits, Methodology, Systems analysis.

For investments in water mains serving new households, consumer surplus benefits may far outweigh those measured by revenues recoupled from user fees. While consumer surplus might be capitalized in the value of sites with access to mains, empirical attempts to measure such capitalization have not proved invariably successful. An alternative technique based upon the direct estimation of the demand curve is utilized. An analysis of Penang Island, Malaysia indicates that the consumer surplus benefits are one and one-half times greater than the revenues recoupled though user fees. The applicability of this technique to cost-benefit analysis of water supply investments is discussed. In conclusion, the estimation of consumer surplus by tracing the demand curve is feasible for systems which have accurate metering and billing procedures and which have exhibited substantial variation in water charges over time and space. For systems meeting these conditions, the calculation of the net benefits of water supply extensions by the demand curve technique is simpler than by the method of land capitalization; the demand curve technique is less general in that it applies only to priced services and it is less likely to measure the external benefits. (Bell-Cornell)
W78-05710

POLICY OF PRICING IRRIGATION WATER,
Ministry of Agriculture and Irrigation, New Delhi (India).
For primary bibliographic entry see Field 3F.
W78-05730

A PUBLIC EDUCATION CAMPAIGN TO CONSERVE WATER,
Washington Suburban Sanitary Commission, Hyattsville, MD.
For primary bibliographic entry see Field 3D.
W78-05752

TECHNOLOGICAL FORECASTING APPLIED TO WATER RESOURCE PLANNING,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 6A.
W78-05813

STRICTER CONSERVATION SOUGHT AS PART OF ANY WATER RESOURCE POLICY,
For primary bibliographic entry see Field 6B.
W78-06136

WATER RESOURCES INVENTORY OF NORTHWEST FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
J. E. Dysart, C. A. Pascale, and H. Trapp, Jr.
Water-Resources Investigations 77-84, November 1977. 114 p, 10 fig, 9 tab, 49 ref.

Descriptors: *Water resources, *Surveys, *Surface waters, *Groundwater resources, *Florida, Water quality, Available water, Projections, Water supply, Water demand, Rainfall-runoff relationships, Flood plains, Gulf Coastal Plain, Streamflow, Flow rates, Aquifer characteristics, Water wells, Water yield, Drawdown, Water level fluctuations, Groundwater recharge, Northwest Florida, Florida panhandle.

Water resources of the 16 counties of the northwest Florida appear adequate until at least 2020. In the 4 westernmost counties, the sand-and-gravel aquifer and streams combined could provide 2,200 to 3,600 million gallons per day of water. Streams outside these counties could provide 5,600 million gallons per day. The Floridan aquifer could provide 220 million gallons per day. Generally, water of quality suitable for most purposes is available throughout the area, although water in smaller streams and in the sand-and-gravel aquifer is acidic and locally contains excessive iron. Water in the upper part of the Floridan aquifer is generally fresh, but saline at depth and in some coastal areas. The quantity of water available in the study area is about 8,020 to 9,420 million gallons per day and projected needs for the year 2020 range from 2,520 to 4,130 million gallons per day. 'Approximate method' flood-prone area maps cover most of the area. (Woodard-USGS)
W78-06183

6E. Water Law and Institutions

RATIONALISATION OF IRRIGATION RATES IN A DEVELOPING COUNTRY,
Central Water Commission, New Delhi (India).
For primary bibliographic entry see Field 3F.
W78-05731

THE EFFECTS OF WATER RESOURCE DEVELOPMENT ON ECONOMIC GROWTH: THE CONDITIONS FOR SUCCESS,
Colorado Univ., Boulder. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-05735

AMENITY AND EQUITY: A REVIEW OF LOCAL ENVIRONMENTAL PRESSURE GROUPS IN BRITAIN,
University Coll., London (England). School of Environmental Studies.
P. D. Lowe.
Environmental Planning A, Vol. 9, No. 1, p 35-58, January 1977. 1 fig, 85 ref.

Descriptors: *Great Britain, *Political aspects, *Pressure groups, *Social aspects, *Environmental control, *Decision-making, Amenity societies, Interest groups, Social change, Social participation, Urban sociology, Social needs, Legislation, Planning, Aesthetics, Community development, Administration, City planning, Public access, Organization, Economic impact, Pollution abatement, Social impact.

Activities of local environmental pressure groups in Britain could have major spatial and social distributional consequences; but participation may serve to exacerbate certain inequalities, and persons whose interests are least represented by the existing social and spatial structure are likely to fare worst politically. The basic question is not whether amenity societies contribute to good planning, but rather what the relationship is between statutory planning and various powerful sectional interests. Local environmental pressure groups, which are geographically-defined, comprise the amenity, civic, and preservation societies, residents' and tenants' associations, and community action groups. They seek to influence public decision-making and to protect the material, but nonproductive, interests of their number. They are concerned with protecting and enhancing the

environment, the amenity and accessibility of a street, development, town, suburb, or county. Amenity includes safety, freedom from pollution, local interest, peace and quiet, and aesthetics, while accessibility covers convenience of schools, shops, clinics, open space, recreation, transportation, and employment. Six aspects of such groups include: (1) their origins and evolution, (2) ethic and ideology, (3) political equity, (4) representativeness, (5) variations in political efficacy, and (6) failure of some groups to achieve effective political expression. (Lynch-Wisconsin)
W78-05741

INTERNATIONAL CO-OPERATION AND INLAND WATERS: THE INFLUENCE OF FEDERALISM,
United Nations Secretariat.
D. Alheritiere.
In: Natural Resources Journal, Vol. 16, No. 4, p 903-921, October 1976. 97 ref. Symposium on Water Resources Management in a Changing World.

Descriptors: *International waters, *Inland waterways, *Federalism, *Treaties, *Governments, International cooperation, Canada, United States, Conflict, International law, Riparian rights.

A review of international agreements shows that, in general, federalism favors rather than hinders international cooperation in terms of inland waterways. This essay analyzes both positive and negative aspects of federalism, and cites many examples of each. By federalism is meant a form of government in which internal pluralism is compromised with external uniformity; over one-third of the world population lives under federal regimes. Due to the involvement of member states in federal decision-making, the process of international agreement is often slowed. Interstate experience has shown that detailed legal rules may not be needed to frame and guide the cooperative process, although strong, broad legal principles are necessary as a reference. Governments often prefer loose, informal agreements to formal legal frameworks; the technique of using joint technical boards rather than permanent political interstate agencies has proved attractive, as indicated by agreements between Canada and the United States. As each water body is an individual case, a pragmatic approach should be followed, including, for example, special river commissions instead of a general law of rivers. Interstate law is helpful in international cooperation since it demonstrates the necessity of developing original solutions for each conflict. (Lynch-Wisconsin)
W78-05746

WATER FOR THE WEALTHY,
For primary bibliographic entry see Field 5G.
W78-05750

CHALLENGING EFFLUENT LIMITATIONS,
Morgan, Lewis and Bockius, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-05759

JAMESPORT TRANSMISSION EXITS; A REVIEW FOR THE TOWN OF RIVERHEAD OF THE LONG ISLAND LIGHTING COMPANY APPLICATION TO THE NEW YORK PUBLIC SERVICE COMMISSION FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED FOR THE JAMESPORT TRANSMISSION EXITS,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 6G.
W78-05816

ALASKA SHELLFISH REGULATIONS: PRESENT IMPACTS ON FISHERY PARTICIPANTS,
Illinois Univ. at Chicago Circle. Dept. of Information Engineering.
P. L. Katz, and L. J. Bledsoe.
Transactions of the American Fisheries Society, Vol. 106, No. 6, November 1977, p 505-529, 6 fig, 2 tab, 31 ref. NOAA 04-5-158-48 and 03-6-208-70.

Descriptors: *Fisheries, *Fish management, Alaska, *Shellfish regulations, Catch allocation, Season openings(Fishing).

Considered is one aspect of the present Alaska Shellfish Regulations: the effective creation of advantages and disadvantages to various types of shellfish fishery participants. The existence of many other important effects of these regulations such as conserving the stocks, accurate reporting of catch and maintaining orderly fisheries is recognized. It is suggested that effective shellfish catch allocation results from exclusive area regulation; pot limits and presoak regulations; seasonal catch allocations and gear restrictions for shrimp; scheduling of season openings; and king crab regulation for multiple year classes. The paper considers some possibilities for regulating incidental catch of halibut and crab, taken by a potential U. S. ground-fish trawl fishery in the region. (Chilton-ORNL)
W78-05955

HEAVY HANDS ON THE POLLUTION CONTROLS,
Harvard Univ., Boston, MA. Graduate School of Business Administration.
For primary bibliographic entry see Field 5G.
W78-06031

PROCEEDINGS OF THE ELEVENTH BIENNIAL CONFERENCE ON GROUND WATER.
California Univ., Davis. Water Resources Center; and California State Dept. of Water Resources. Sacramento.
For primary bibliographic entry see Field 4B.
W78-06039

FEDERAL LAKE ERIE WATER QUALITY STANDARDS PROPOSALS.
Environmental Protection Agency, Region V, Chicago, IL.
For primary bibliographic entry see Field 5G.
W78-06048

INLAND WETLAND DEFINITIONS,
Connecticut Univ., Storrs. Biological Sciences Groups.
For primary bibliographic entry see Field 2H.
W78-06083

A GUIDE TO UNDERSTANDING AND ADMINISTRATING THE MASSACHUSETTS WETLANDS PROTECTION ACT.
Massachusetts Audubon Society, Lincoln.
1977. 270 p.

Descriptors: *Massachusetts, *Wetlands, *Legislation, *Water resources development, Administration, Administrative agencies, Legal aspects, Project planning, Regulation, Permits, Water law, Marsh management, *Massachusetts Wetland Protection Act.

This guide is designed to aid local officials think through the wetland protection process as established by the Wetlands Protection Act and its regultions. Chapters are organized according to the step-by-step procedures required of conservation commissions, applicants, the Massachusetts Department of Environmental Quality Engineering, and other interested citizens. It starts with establishing the commission's jurisdiction and ending with the final order of conditions. Explanations of the law and regulations are provided to clarify what areas and acts are covered and the responsibilities of the enforcing agencies. While designed for the Massachusetts legislation, the full discussion of functions and values of wetlands and the legal basis for wetland protection and regulatory processes make it a basic reference with application beyond this single state. (Steiner-Mass)
W78-06084

STRICTER CONSERVATION SOUGHT AS PART OF ANY WATER RESOURCE POLICY,
For primary bibliographic entry see Field 6B.
W78-06136

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION: MONONGAHELA, WEST FORK AND TYGART RIVERS, MARION COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-05761

FLOOD PLAIN INFORMATION: WEST FORK RIVER AND ELK CREEK, CLARKSBURG AND VICINITY, HARRISON COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-05762

FLOOD PLAIN INFORMATION: LITTLE WHEELING CREEK, TRIADELPHIA TO VALLEY GROVE, OHIO COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-05763

FLOOD PLAIN INFORMATION: FULTON BRANCH, WEBSTER CREEK AND TRIBUTARIES, WAMAC, ILLINOIS.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 4A.
W78-05764

FLOOD PLAIN INFORMATION: SILVER CREEK AND TRIBUTARIES, ST. CLAIR COUNTY, ILLINOIS - NO. 1.
Army Engineer District, St. Louis, MO.
Prepared for County of St. Clair, IL, September 1974, 32 p, 10 fig, 41 plates, 4 tab.

Descriptors: *Illinois, *Streamflow forecasting, *Flood profiles, *Flood data, Floods, Flood flow, Storms, Historic floods, Flood stages, Peak discharge, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Flood plain insurance, Warning systems, Land use, Planning, Zoning, Control structures, St. Clair County(IL), *Silver Creek(IL), Little Silver Creek(IL), Loop Creek(IL), Ogles Creek(IL), Intermediate Regional Flood.

The study area covers a distance of approximately 28.4 miles and involves the portions of St. Clair County, Illinois that are subject to flooding from Silver Creek and its tributaries, Little Silver, Loop, and Ogles Creek. The flood plains are mostly agricultural, although commercial and residential land uses are encroaching on the open flood plain lands. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs from April through June and results from thunderstorms preceded by long periods of ground saturating rainfall. The worst known flood recorded at the downstream limit of the study area occurred in August, 1946, cresting at approximate-

ly 414 feet mean sea level (msl). At the same location, the Intermediate Regional Flood would crest at 407.6 feet msl, and would discharge 32,100 cubic feet per second (cfs), while the Standard Project Flood would crest at 411.3 feet msl and would discharge 50,000 cfs. Numerous bridges would obstruct these flood flows. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC).
W78-05765

ESTIMATION OF BENEFITS AND ANALYSIS OF FACTORS INFLUENCING LAND USE CHANGE IN THE IOWA RIVER FLOOD PLAIN,
Iowa Univ., Iowa City. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-05811

HEAVY HANDS ON THE POLLUTION CONTROLS,
Harvard Univ., Boston, MA. Graduate School of Business Administration.
For primary bibliographic entry see Field 5G.
W78-06031

A TECHNIQUE FOR DETERMINING DEPTHS FOR T-YEAR DISCHARGES IN RIGID-BOUNDARY CHANNELS,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06189

6G. Ecologic Impact Of Water Development

A MODEL CRITERION FOR SITE SELECTION OF LARGER SCALE TECHNICAL FACILITIES IN THE UPPER RHINE REGION,
Nuclear Research Center, Karlsruhe (West Germany).
For primary bibliographic entry see Field 5G.
W78-05720

TOWARDS AN ECOLOGICALLY-BASED ECONOMIC PHILOSOPHY,
Oceanic Inst. Waimanalo, Hawaii.
For primary bibliographic entry see Field 6B.
W78-05734

THE ENVIRONMENTAL COSTS OF LANDFILLS AND INCINERATORS,
Chicago Univ., IL. Center for Urban Studies.
For primary bibliographic entry see Field 5E.
W78-05738

AMENITY AND EQUITY: A REVIEW OF LOCAL ENVIRONMENTAL PRESSURE GROUPS IN BRITAIN,
University Coll., London (England). School of Environmental Studies.
For primary bibliographic entry see Field 6E.
W78-05741

ENVIRONMENTAL PROTECTION GUIDELINES FOR CONSTRUCTING PROJECTS,
East Bay Municipal Utility District, Oakland, CA.
W. F. Anton, and J. L. Bunnell.
Journal of American Water Works Association, Vol. 68, No. 12, p 643-646, December 1976.

Descriptors: *Environmental control, *Construction, *Water pollution control, *Erosion, *Runoff, Air pollution, Drainage, Oakland(CA), California, Waste disposal, Vegetation establishment.

Guidelines for minimizing the environmental impact of construction projects were issued by the East Bay Municipal Utility District (EBMUD) of Oakland, California for use by inspectors and design engineers. The guidelines cover (1) noise abatement, (2) traffic controls and detours, (3) elimination of safety hazards, (4) protection of vegetation, (5) runoff and erosion controls, (6) dust control, (7) air quality control, (8) visual/aesthetic enhancement, (9) limitations on service interruptions, (10) historical and archaeological protection, (11) paving repair, (12) construction wastes disposal, and (13) completion of the project. For runoff and erosion control reseeding, fertilizing, and mulching (where specified) are recommended to ensure recovery of grass cover; on steep slopes hemp mesh or other approved methods of mulching, seeding, and fertilizing should be used to minimize erosion until natural ground cover is established. Temporary drainage channels and structures should be provided to minimize erosion and prevent pond formation, and water used in washing down construction areas or flushing pipelines must be diverted into storm sewers or natural channels. Detention ponds, silt dams, and settling basin should be used to lessen soil erosion and sedimentation. Solid wastes generated by the project should be recycled or reused where possible, or disposed of properly. (Lynch-Wisconsin)
W78-05742

ECONOMIC AND ENVIRONMENTAL IMPACTS OF FOREST RESOURCE DEVELOPMENT,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 6A.
W78-05803

REVIEW OF THE FLINT CREEK SMALL WATERSHED PROJECT, DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE ONTARIO COUNTY ENVIRONMENTAL MANAGEMENT COUNCIL,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
J. Bart, E. Duvernoy, and J. Stanturf.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 762, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, November, 1975. 71 p, 1 fig, 1 tab, 4 ref, 8 append. OWRT A-056-NY(1).

Descriptors: *Reviews, Documentation, *New York, *Environmental effects, *Watershed management, Cultivated lands, Flood control, Evaluation, Land management, Land subsidence, Erosion, Sheet erosion, Erosion rates, Soil erosion, Sediments, Wind erosion, Estimated benefits, *Environmental Impact Statement, *Flint Creek(NY), Ontario County(NY), Guidelines, Flood prevention.

A review of the 'Flint Creek Watershed Environmental Impact Statement' was carried out using the EIS guidelines supplied by the DOA's Soil Conservation Service as the principal evaluation criterion. Conclusions of the agency regarding completeness, accuracy, and judgemental aspects of the guidelines are presented along with constructive criticism, wherein defects in the guidelines themselves are identified. Each section was evaluated in terms of environmental impact identification, measurement, interpretation, and communication to information users. The watershed project involves flood prevention measures and expansion of the current land treatment plan. The flood control measures would expend $1.6 million to reduce flood damages on 1,695 acres and increase income on 10 farms, to withdraw 28 acres of cropland from production, and to increase flooding on 84 acres; the land treatment plan is budgeted at $700,000. It was determined that specific data on environmental factors are not always provided. Sheet erosion, wind erosion, annual erosion, and annual sediment are expected to decrease, subsidence reduction and flood damage downstream are predicted, however little substantiation is provided in either case. Impacts on plants and animals and changes in the flood plain are also estimated, based on habitat requirements rather than on census data and flooding behavior analysis. Reduction of flood damages may result in net income benefits to farmers and produce additional employment, but unexplained terminology and lack of documentation cause the socioeconomic analysis and impacts estimates to be questioned. (Wares-IPA)
W78-05814

JAMESPORT TRANSMISSION EXITS; A REVIEW FOR THE TOWN OF RIVERHEAD OF THE LONG ISLAND LIGHTING COMPANY APPLICATION TO THE NEW YORK PUBLIC SERVICE COMMISSION FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED FOR THE JAMESPORT TRANSMISSION EXITS,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
E. Duvernoy, and J. Stanturf.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 695, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, May, 1976. 50 p, 2 fig, 3 tab, 25 ref, 7 append. OWRT A-056-NY(2).

Descriptors: *Transmission lines, Electrical networks, Evaluation, Public utilities, Permits, Environmental effects, Agriculture, *New York, Land use, Economics, Compensation, Routing, Legislation, *Riverhead(NY), Mitigation, Tradeoffs, Environmental impacts, Applications, Environmental compatibility.

A review was made of the document 'PSC Case 26897--Jamesport Transmission Exits' and associated testimony, using the NYCRR 16, Subchapter G, Parts 85, 86, and 88 as principal evaluation criteria. Conclusions presented by the applicant and comments on conclusions are presented for each major topic covered in the application for placement of transmission. Findings indicated that: (1) criteria used to develop the preferred route for the lines did not consider probable environmental consequences on agricultural lands, (2) the approach to assessing visual impacts relied too heavily on judgment rather than on analysis and fact finding, and (3) the proposed facility could adversely affect economic viability of agriculture in Riverhead, New York. The major impacts of the transmission lines will be visual and interfere with land use, but if the transmission facility is justified it will be necessary to consider mitigation techniques or compensation for these impacts to produce a facility acceptable to the utility and to affected communities. The appendices contain information on review chronology, electrical terminology, comments, screening, impacts of an underground alternative, calculations, and the Article VII procedure. (Wares-IPA)
W78-05816

COASTAL WATER RESEARCH PROJECT. ANNUAL REPORT FOR THE YEAR ENDED 30 JUNE 1977.
Southern California Coastal Water Research Project, El Segundo.
For primary bibliographic entry see Field 5B.
W78-05911

ENVIRONMENT, TECHNOLOGY, AND FUTURE GENERATIONS,
Oregon State Univ., Corvallis. Water Resources Research Inst.
For primary bibliographic entry see Field 6B.
W78-05941

RESPONSE OF THE DEVIL'S RIVER (TEXAS) FISH COMMUNITY TO FLOODING,
Baylor Univ., Waco, TX. Dept. of Biology.

For primary bibliographic entry see Field 2I.
W78-05951

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 4. PHYTOPLANKTON OF LAKE MICHIGAN,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environment Research Lab.
For primary bibliographic entry see Field 5C.
W78-05973

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 6. ZOOBENTHOS OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 5C.
W78-05974

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 14. BIRDS OF THE LAKE MICHIGAN DRAINAGE BASIN,
Michigan State Univ., East Lansing.
For primary bibliographic entry see Field 5C.
W78-05975

ENVIRONMENTAL STATUS OF THE LAKE MICHIGAN REGION, VOLUME 16. AMPHIBIANS AND REPTILES OF THE LAKE MICHIGAN DRAINAGE BASIN,
Wisconsin Univ.-Madison. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W78-05976

NITROGEN - AN ESSENTIAL LIFE FACTOR AND A GROWING ENVIRONMENTAL HAZARD, REPORT FROM NOBEL SYMPOSIUM NO. 38.
For primary bibliographic entry see Field 5B.
W78-05999

SHOULD DAMS BE BUILT. THE VOLTA LAKE EXAMPLE,
United Nations Environment Program, Nairobi (Kenya).
For primary bibliographic entry see Field 5C.
W78-06033

ECOLOGICAL STUDIES IN THE WESTERN SACRAMENTO-SAN JOAQUIN DELTA DURING A DRY YEAR,
California Univ., Davis. Dept. of Water Science and Civil Engineering.
For primary bibliographic entry see Field 2L.
W78-06042

THE ENVIRONMENTAL IMPACT OF FRESHWATER WETLAND ALTERATIONS ON COASTAL ESTUARIES.
Georgia Dept. of Natural Resources, Atlanta. Office of Planning and Research.
For primary bibliographic entry see Field 5C.
W78-06053

CASE STUDY: THE SANTEE RIVER, S.C.,
South Carolina Univ., Columbia.
For primary bibliographic entry see Field 5C.
W78-06055

HYDROLOGIC AND ENVIRONMENTAL EFFECTS OF A LONG-TERM DRAINAGE ON A COASTAL AREA, (CASE STUDY: MELBOURNE TILLMAN DRAINAGE DISTRICT, PALM BAY, FLORIDA),
Florida Inst. of Tech., Melbourne. Center for Coastal Zone Research.
For primary bibliographic entry see Field 2L.
W78-06057

INTEGRATING SCIENTIFIC DATA INTO ENVIRONMENTAL PLANNING AND IMPACT ANALYSIS, GENERAL METHODOLOGY AND A CASE STUDY,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
W. M. Kemp, and W. R. Boynton.
In: The Environmental Impact of Freshwater Wetland Alterations on Coastal Estuaries, Conference held at Savannah, Georgia on June 23, 1976. p 61-86, 5 fig, 3 tab, 23 ref.

Descriptors: *Planning, *Methodology, *Environmental effects, *Apalachicola River(FL), Analytical techniques, Alternative planning, Model studies, Project planning, Feasibility studies, Cost-benefit analysis, Mathematical models, Army Corps of Engineers, *Florida.

Seven basic steps in environmental evaluation are outlined. These guidelines are pertinent to any environmental evaluation issue, including land use and water management interactions between upstream (freshwater) and downstream (estuarine) ecosystems: (1) conceptualization of models describing a problem; (2) selection of alternative plans to be presented for evaluation; (3) definition of the objective function of a plan in terms of the net energy channeled into work processes in the region, where work includes both work of man and nature; (4) collection and/or measurement of data descriptive of the systems under evaluation; (5) development of mathematical models based on conceptual models; (6) conversion of model outputs and other pertinent data into a common measure unit; (7) selection of the final plan on the basis of comparison of calculated costs and benefits to the objective function for all the plans under consideration. Following the seven outlined steps, the impact of the proposed dam over the Apalachicola River, Florida was evaluated. The conclusion was that the net loss of dam construction would be about 8 billion Kcal FFE per year and therefore the proposed dam would not justify all major costs. (See also W78-06053) (Harris-Wisconsin)
W78-06058

ALTERNATIVE MANAGEMENT STRATEGIES FOR VIRGINIA'S COASTAL WETLANDS: A PROGRAM OF STUDY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
W. M. Park, and S. S. Batie.
Sea Grant Program, January, 1978. 14 p, 24 ref.

Descriptors: *Wetlands, *Virginia, *Marsh management, *Project planning, *Economic efficiency, Coastal marshes, Swamps, Marshes, Land reclamation, Planning, Future planning(Projected), Decision making, Water resources development, Conservation, Economic feasibility, Project feasibility, *Alternative planning, *Coastal wetlands(Va).

The planning and procedural processes to be used for a coastal wetland research project, focusing on alternative management strategies, are discussed. The project's objective is to provide a framework within which decision-makers can estimate the tradeoffs between development and presevation. Case studies of coastal wetlands in an urban and a rural recreational county will be part of the project. For each of these counties, the historical use patterns of wetlands, present use patterns, ownership, and exchange values will be identified. Surveys of wetland owners in each study area will be conducted and wetland preservation and development services will be identified to provide framework for decision making. Strategies will be examined in terms of economic efficiency (i.e. maximizing net social values), and in terms of feasibility of implementation. (Steiner-Mass)
W78-06086

DISTRIBUTION, SEASONALITY, AND BIOMASS OF AQUATIC MACROPHYTES IN LAKE OPINICON (EASTERN ONTARIO),
Queen's Univ., Kingston (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 2H.
W78-06088

EFFECTS OF STREAM CHANNELIZATION ON FISH POPULATIONS IN THE BUENA VISTA MARSH, PORTAGE COUNTY, WISCONSIN,
Wisconsin Cooperative Fishery Research Unit, Stevens Point.
For primary bibliographic entry see Field 5C.
W78-06090

AN ECOLOGICAL MODEL FOR LAKE ONTARIO MODEL FORMULATION, CALIBRATION, AND PRELIMINARY EVALUATION,
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.
For primary bibliographic entry see Field 2H.
W78-06119

THE EFFECT OF MILITARY TRANSPORTATION ACTIVITIES ON THE ENVIRONMENT,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 4C.
W78-06126

TWO ANOMALIES OF FISH LARVAL TRANSPORT AND THEIR IMPORTANCE IN ENVIRONMENTAL ASSESSMENT,
Power Authority of the State of New York.
For primary bibliographic entry see Field 5C.
W78-06155

7. RESOURCES DATA

7A. Network Design

VERMONT'S WATER RESOURCE RESEARCH NEEDS,
Vermont Univ., Burlington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6B.
W78-05801

7B. Data Acquisition

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS.
Ecosystems International, Inc., Gambrille, MD.
For primary bibliographic entry see Field 4D.
W78-05718

A STUDY OF APPLICATION OF REMOTE SENSING TO RIVER FORECASTING, VOLUME II.
IBM Federal Systems Div., Huntsville, AL.
For primary bibliographic entry see Field 4A.
W78-05719

REMOTE SENSING OF LAND USE AND WATER QUALITY RELATIONSHIPS-WISCONSIN SHORE, LAKE MICHIGAN,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 5A.
W78-05749

INVESTIGATION OF THE DYNAMICS OF SNOW-COVER MELTING FROM METEOROLOGICAL-SATELLITE DATA,
For primary bibliographic entry see Field 2C.
W78-05788

ESTIMATION OF SNOW-COVER DYNAMICS FOR FORECASTS OF THE SPRING FLOOD IN THE GORNYY ALTAY FROM SATELLITE DATA,
For primary bibliographic entry see Field 2C.
W78-05789

REMOTE DETERMINATION OF THE CONCENTRATION OF SUSPENDED PARTICLES IN THE WATER OF RESERVOIRS ON THE BASIS OF MEASUREMENTS OF SPECTRAL LUMINANCE COEFFICIENTS,
For primary bibliographic entry see Field 2H.
W78-05790

EMISSION CHARACTERISTICS OF MOIST STRATIFIED STRUCTURES IN THE VHF RANGE,
For primary bibliographic entry see Field 2G.
W78-05791

SOME RESULTS OF MEASUREMENTS OF THE RADIO EMISSION OF SOILS USING A HIGHLY SENSITIVE AIRCRAFT RADIOMETER WITH A 3-CM WAVE RANGE,
For primary bibliographic entry see Field 2G.
W78-05792

APPLICATION OF HEAT-FLOW TEMPERATURE MODEL FOR REMOTELY ASSESSING NEAR SURFACE SOIL MOISTURE BY THERMOGRAPHY,
South Dakota State Univ., Brookings. Dept. of Physics.
For primary bibliographic entry see Field 2G.
W78-05932

THE USE OF SATELLITE IMAGERY FOR LAKE CLASSIFICATION IN WISCONSIN,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2H.
W78-05935

UTILIZATION OF SATELLITE DATA FOR INVENTORYING PRAIRIE PONDS AND LAKES,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 2H.
W78-05979

THE ABC'S OF DIATOM IDENTIFICATION USING LASER HOLOGRAPHY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W78-06035

WETLAND MAPPING IN NEW JERSEY AND NEW YORK,
Earth Satellite Corp., Washington, DC.
For primary bibliographic entry see Field 7C.
W78-06092

SOME REMARKS ON THE USE OF DAILY RAINFALL MODELS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Land and Water Use; and Agricultural Univ., Wageningen (Netherlands). Dept. of Mathematics.
For primary bibliographic entry see Field 2B.
W78-06101

THE INFILTRATION CYLINDER: SOME COMMENTS ON ITS USE,
Dundee Univ. (Scotland). Dept. of Geography.
For primary bibliographic entry see Field 2G.
W78-06103

PACKING AND ANGLE OF REPOSE OF NATURALLY SEDIMENTED FINE SILICA SOLIDS IMMERSED IN NATURAL AQUEOUS ELECTROLYTES,
Imperial Coll. of Science and Technology London (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W78-06106

FACTORS INFLUENCING THE CRUST TEST FOR IN SITU MEASUREMENT OF HYDRAULIC CONDUCTIVITY,
Wisconsin Univ.-Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W78-06109

SOLUTE DISTRIBUTION PROFILES COMPUTED WITH STEADY-STATE AND TRANSIENT WATER MOVEMENT MODELS,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W78-06110

STUDY OF NEAR-INFRARED SNOW REFLECTANCE USING SKYLAB S192 MULTISPECTRAL SCANNER DATA,
Environmental Research and Technology, Inc., Concord.
For primary bibliographic entry see Field 2C.
W78-06120

RELATION OF SAMPLE VARIATIONS TOPLATE ORIENTATION IN THE HESTER-DENDY PLATE SAMPLER,
North Dakota State Dept. of Health, Bismarck. Div. of Water Supply and Pollution Control.
J. F. Harrold, Jr.
The Progressive Fish Culturist, Vol. 40, No. 1, p 24-25, 1978. 1 tab, 8 ref.

Descriptors: *Sampling, *On-site data collections, *Aquatic insects, *Aquatic animals, Testing, *Testing procedure, Research equipment, *Invertebrates, *Insects, Research and development, Methodology, On-site investigations, Benthic fauna, *Hester-Dendy Plate Sampler.

This study was undertaken to determine whether variation in the orientation of the rough and smooth sides of the sampler vanes would impose a variation on sample representatives and numbers. It was concluded that a majority of immature aquatic insects display a preference in accordance with the orientation of the rough or smooth sides of the vanes. It was proposed that a standardized vane arrangement be established in order to maximize the collecting capability of the apparatus and to allow inter-experiment data comparison. (Dael-EIS)
W78-06147

USE OF THERMAL-INFRARED IMAGERY IN GROUND-WATER INVESTIGATIONS IN MONTANA,
Geological Survey, Helena, MT. Water Resources Div.; and Kansas Univ., Lawrence. Space Technology Labs.
A. J. Boettcher, and R. M. Haralick.
In: Proceedings of the Eleventh International Symposium on Remote Sensing of Environment, April 25-29, 1977, Michigan University, Ann Arbor; Center for Remote Sensing Information and Analysis Environmental Research Institute of Michigan, p 1161-1170, 1977. 6 fig, 3 ref.

Descriptors: *Remote sensing, *Groundwater, *Inflow, *Surface waters, *Montana Streams, Lakes, Aerial photography, Thermal properties, Water temperature, Infrared radiation, Methodology, Computers, Columbia River(Mont), *Thermal-infrared imagery, Clark Fork of Columbia River, Kootenai River, Tongue River.

Thermal-infrared imagery was used to locate ground-water inflow along three streams and one lake in Montana. The thermal scanner used in May 1972, March 1973, and November 1975 was mounted in a twin-engined aircraft. On the 1973 and 1975 flights, the data were recorded in an analog format on magnetic tape in flight, later were converted to digital format, and were computer-processed using an assignment of patterns to indicate differences in water temperature. Outputs from the image-processing program was converted to a temperature map having an isotherm spacing of 0.5 degrees C. Computerization was found to be the most efficient method to manipulate data from lakes, large rivers, and narrow sinuous streams. (Woodard-USGS)
W78-06187

COASTAL WETLANDS: THE PRESENT AND FUTURE ROLE OF REMOTE SENSING,
Geological Survey, Reston, VA. Water Resources Div.
V. Carter.
In: Proceedings of the Eleventh International Symposium on Remote Sensing of Environment, April 25-29, 1977, Michigan University, Ann Arbor; Center for Remote Sensing Information and Analysis Environmental Research Institute of Michigan, p 301-303, 1977. 2 fig, 5 tab, 60 ref.

Descriptors: *Wetlands, *Coastal marshes, *Mapping, *Remote sensing, *Aerial photography, Surveys, Classification, Standards, Planning, Satellites(Artificial), Data collections, United States.

During the past decade, there has been a rapid expansion of remote sensing research and technology development related to coastal wetlands. As a result of this research all of the 23 coastal States have ongoing or completed wetland inventories, most utilizing aerial photographs as the data source for producing a variety of map products with varying scales, formats, classification systems, and intended uses. The U.S. Geological Survey is increasing emphasis on map production and revision for the coastal zone. The new U.S. Fish and Wildlife Service National Wetland Inventory is intended to provide a standardized method for comparison of wetlands on a national basis - it too will use available aerial photographs as a basic data source. At present, satellite data is not used for operational mapping of coastal wetlands because of resolution and geometric constraints. In the future, however, satellite data may provide an accurate reliable and economical source to update wetland inventories and to monitor or evaluate coastal wetlands. (Woodard-USGS)
W78-06188

7C. Evaluation, Processing and Publication

THE WELMM APPROACH TO ENERGY STRATEGIES AND OPTIONS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6A.
W78-05704

CAPACITY EXPANSION FOR WATER RESOURCE FACILITIES: A CONTROL THEORETIC ALGORITHM FOR NONSTATIONARY UNCERTAIN DEMANDS,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6D.

W78-05706

REGIONAL WATER SUPPLY PLANNING BY INTERACTIVE SYSTEMS ANALYSIS,
Army Engineer District, Sacramento, CA.
For primary bibliographic entry see Field 4A.
W78-05712

ECONOMIC ANALYSIS OF IRRIGATION PRODUCTION FUNCTIONS: AN APPLICATION OF LINEAR PROGRAMMING,
International Bank for Reconstruction and Development, Washington, DC. Development Research Center.
For primary bibliographic entry see Field 3F.
W78-05714

A STUDY OF APPLICATION OF REMOTE SENSING TO RIVER FORECASTING, VOLUME II.
IBM Federal Systems Div., Huntsville, AL.
For primary bibliographic entry see Field 4A.
W78-05719

THE ANATOMY OF THE MODELLING PROCESS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2A.
W78-05726

RANDOM SEARCH OPTIMIZATION: STOPPING RULES,
Aalborg Universitetscenter (Denmark).
For primary bibliographic entry see Field 2A.
W78-05727

FLOOD PLAIN INFORMATION: MONONGAHELA, WEST FORK AND TYGART RIVERS, MARION COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-05761

FLOOD PLAIN INFORMATION: WEST FORK RIVER AND ELK CREEK, CLARKSBURG AND VICINITY, HARRISON COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-05762

FLOOD PLAIN INFORMATION: LITTLE WHEELING CREEK, TRIADELPHIA TO VALLEY GROVE, OHIO COUNTY, WEST VIRGINIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W78-05763

FLOOD PLAIN INFORMATION: FULTON BRANCH, WEBSTER CREEK AND TRIBUTARIES, WAMAC, ILLINOIS.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 4A.
W78-05764

FLOOD PLAIN INFORMATION: SILVER CREEK AND TRIBUTARIES, ST. CLAIR COUNTY, ILLINOIS - NO. 1.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6F.
W78-05765

SPATIAL INTERPOLATION OF DAILY TOTALS OF RAINFALL,
Royal Netherlands Meteorological Inst., De Bilt.
For primary bibliographic entry see Field 2B.

W78-05766

COMPUTER MODELLING OF GROUNDWATER 13C AND 14C ISOTOPE COMPOSITIONS,
Waterloo Univ. (Ontario). Dept. of Earth Sciences.
For primary bibliographic entry see Field 2F.
W78-05767

A GENERAL CLASS OF STOCHASTIC MODELS FOR HYDROLOGIC SEQUENCES,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2A.
W78-05768

DEVELOPMENT OF A VERSION OF STANFORD MODEL AND ITS EVALUATION FOR STREAMFLOW SYNTHESIS FROM SMALL WATERSHEDS IN WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2E.
W78-05808

COST OPTIMIZATION OF RURAL WATER SYSTEMS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-05810

OPTIMAL STATE ANALYSIS OF RESERVOIRS,
California Univ., Riverside. Dry Lands Research Inst.
For primary bibliographic entry see Field 4A.
W78-05817

ADEQUACY OF HYDROLOGIC DATA FOR APPLICATION IN WEST VIRGINIA,
West Virginia Univ., Morgantown. Water Research Inst.
M. Chang, R. Lee, and W. H. Dickerson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 602, Price codes: A08 in paper copy, A01 in microfiche. Water Research Institute Bulletin 7, (WRI-WVU-76-01), 1976. 145 p, 46 fig, 20 tab, 84 ref, 13 append. West Virginia University Bulletin, Series 78, No 8-3, Feb 1978. OWRT A-023-WVA(3). 14-34-0001-6051.

Descriptors: Evaluation, *Floods, Flow characteristics, *Forecasting, *Hydrologic data, *Isohyets, *Maps, Planning, *Precipitation(Atmospheric), *Streamflow, Water balance, Water management(Applied), *West Virginia, Analysis, Climatology, Evapotranspiration, Hydrology, Low flow, Meterology, Models, Rainfall, Runoff, Snowfall, Storms, Topography, Water resources, Weather.

Surface and atmospheric hydrologic data for West Virginia, and related topographic and climatic information, were assembled and computerized. The data were evaluated, summarized, and reduced to more usable form, and deterministic and stochastic methods were used to develop predictive techniques for describing the spatial and temporal variability of the water resource. The adequacy of the data for assaying, planning, and managing the state's water resources was evaluated in terms of the most frequent or common user needs. The results revealed that the usefulness of raw hydrologic data, and the derived data forms and predictive models, in solving practical water-related problems is inestimable; current inadequacies are related primarily to increasing needs for greater detail and precision. Current and future requirements for more intensive planning and management of the state's water resource will require (1) additional emphasis on data quality, especially in the precipitation network, (2) some broadening of observational networks to include additional rainfall and snow measurements at higher elevations, wind observations in valleys, solar radiation measurements, and streamflow measurements on small streams, and (3) additional research on small watersheds to determine the effects of topography, vegetal cover, and land disturbance on low flows and the water balance.
W78-05931

THE USE OF SATELLITE IMAGERY FOR LAKE CLASSIFICATION IN WISCONSIN,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 2H.
W78-05935

USE OF CLIMATIC DATA IN ESTIMATING STORAGE DAYS FOR SOILS TREATMENT SYSTEMS,
Environmental Data Service, Asheville, NC.
For primary bibliographic entry see Field 5E.
W78-05993

WETLAND MAPPING IN NEW JERSEY AND NEW YORK,
Earth Satellite Corp., Washington, DC.
W. W. Brown.
Photogrammetric Engineering and Remote Sensing, Vol 44, No 3, p 303-314, March, 1978. 6 fig, 2 tab, 22 ref.

Descriptors: *Wetlands, *Photogrammetry, *Bioindicators, *Mapping, *New Jersey, *New York, Marshes, Coastal marshes, Tidal marshes, Freshwater marshes, Marsh plants, Aerial photography, Remote sensing, Tidal waters, Distribution patterns, Biogeography, High water mark, Boundaries(Surfaces), Earth-water interfaces, Upper wetland boundary.

Wetlands were mapped using a 1:12,000 scale color infrared aerial photographs. In support of tidal wetlands legislation, the Mean High Water (approximate position) and Upper Wetland Boundary lines were delineated using plant species. In New Jersey, dominant plant species were identified on each map. In New York, a broader classification system was used based on plant species categories such as Coastal Fresh Marsh and High Marsh. In borh New York and New Jersey, an Upper Wetland Boundary Line was delineated. This line represents the landward extent of tidal inundation. In New Jersey, an additional line, the Biological High Water Line, seaward of or coincident with the Upper Wetland Boundary was delineated. This is the approximate high tide line established through use of wetland plant species indicators. (Steiner-Mass)
W78-06092

STUDY OF NEAR-INFRARED SNOW REFLECTANCE USING SKYLAB S192 MULTISPECTRAL SCANNER DATA,
Environmental Research and Technology, Inc., Concord.
For primary bibliographic entry see Field 2C.
W78-06120

STATISTICAL METHODS IN HYDROLOGY,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
C. T. Haan.
The Iowa State University Press, Ames, Iowa. 1977. 378 p. $11.95.

Descriptors: *Hydrology, *Statistical methods, *Publications, *Model studies, Statistics, Correlation analysis, Frequency analysis, Probability, Regression analysis, Time series analysis,

Stochastic processes, Markov processes, Statistical models, Mathematical models, Analytical techniques, Hydrologic systems, Sampling, Data generation, Multivariate analysis, Normal distribution, Spectral analysis, Probability distributions.

The random variability of such hydrologic variables as streamflow and precipitation has been recognized for centuries. The general field of hydrology was one of the first areas of science and engineering to use statistical concepts in an effort to analyze natural phenomena. The purpose of this book was to enable engineers and hydrologists to apply better statistical methods to hydrologic problems through a knowledge of the methods, their foundations, and their limitations. Subject areas covered included: basic concepts of probability and probability distributions, properties of random variables, some discrete probability distributions and their applications, normal distributions, some continuous probability distributions, probability plotting and frequency analysis, confidence intervals and hypothesis testing, simple linear regression, multiple linear regression, correlation, multivariate analysis, data generation, analysis of hydrologic time series, and some stochastic hydrologic models. This is not a statistical '(cookbook' for hydrologists. Basic statistical concepts were discussed and illustrated in enough detail so that one can develop his own computational procedures or models. (Humphreys-ISWS)
W78-06125

RESOURCES ALLOCATION TO OPTIMIZE MINING POLLUTION CONTROL,
Ohio State Univ. Research Foundation, Columbus.
For primary bibliographic entry see Field 5G.
W78-06138

DETERMINATION OF BIOCHEMICAL-OXYGEN-DEMAND PARAMETERS,
Geological Survey, Bay St. Louis, MS. Water Resources Div.; and Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-06174

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1975.
Geological Survey, Oklahoma City, OK. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 939, Price codes: A23 in paper copy, A01 in microfiche. Water-Data Report OK-75-1, June 1976. 528 p, 4 fig, 3 tab, 32 ref.

Descriptors: *Oklahoma, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1975 water year for Oklahoma consist of records of stage, discharge, and warer quality of streams; stage, contents, and water quality of lakes or reservoirs. This report contains discharge records for 134 gaging stations; stage and contents for 22 lakes or reservoirs; water quality for 59 gaging stations, 2 partial-record flow stations, and 3 lakes. Also included are 68 crest-stage partial-record stations and 1 low-flow partial-record station. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal Agencies in Oklahoma. (Woodard-USGS)
W78-06175

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1975.
Geological Survey, Salt Lake City, UT. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 783, Price codes: A23 in paper copy, A01 in microfiche. Water-Data Report UT-75-1, July 1976. 509 p, 8 fig, 4 tab.

Descriptors: *Utah, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1975 water year for Utah consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoir; and water levels and water quality in wells and springs. This report contains discharge records for 238 gaging stations, stage or contents for 20 lakes and reservoirs, water quality for 41 surface-water stations and 363 wells, and water levels for 159 observation wells. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Utah. (Woodard-USGS)
W78-06176

WATER RESOURCES DATA FOR MONTANA, WATER YEAR 1976.
Geological Survey, Helena, MT. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 663, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report MT-76-1, September 1977. 766 p, 10 fig, 4 tab.

Descriptors: *Montana, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Montana consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 217 gaging stations, stage only records for 1 lake station, stage and contents for 7 lakes and reservoirs, water quality for 104 stations and 4 lakes, and water levels for 25 observation wells. Also included are 205 crest-stage partial-record stations and 53 smaller reservoirs. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Montana. (Woodard-USGS)
W78-06177

SELECTED HYDROLOGIC DATA, PAROWAN VALLEY AND CEDAR CITY VALLEY DRAINAGE BASINS, IRON COUNTY, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
L. J. Bjorklund, C. T. Sumsion, and G. W. Sandberg.
In cooperation with Utah Dept of Natural Resources, Salt Lake City, Div of Water Rights, Utah Basic-Data Release No 28, 1977. 55 p, 1 fig, 1 plate, 5 tab.

Descriptors: *Groundwater resources, *Well data, *Water levels, *Water quality, *Drillers logs, Water wells, Springs, Aquifer characteristics, Water level fluctuations, Water analysis, Chemical analysis, Sampling, Sites, *Utah, Iron County(Utah), *Parowan drainage basin(Utah), *Cedar City drainage basin(Utah).

This report presents selected basic data from a study of the ground-water resources of the Parowan Valley and Cedar City Valley drainage basins, Iron County, Utah. The study was made during 1973-75 by the U.S. Geological Survey in cooperation with the Utah Department of Natural Resources, Division of Water Rights. The basic data consist of well and spring records, water levels in wells, logs of wells, and chemical analyses of water samples collected from selected wells. A map of Parowan Valley and Cedar City Valley drainage basins shows location of selected wells and springs. A diagram shows well- and spring-numbering system used in Utah. (Woodard-USGS)
W78-06180

COASTAL WETLANDS: THE PRESENT AND FUTURE ROLE OF REMOTE SENSING,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7B.
W78-06188

QUALITY OF RIVERS OF THE UNITED STATES, 1974 WATER YEAR--BASED ON THE NATIONAL STREAM QUALITY ACCOUNTING NETWORK (NASQAN),
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 5A.
W78-06192

WATER RESOURCES OF NO NAME VALLEY, COLVILLE INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06194

ESTIMATING PARAMETERS OF COMPACTING FINE-GRAINED INTERBEDS WITHIN A CONFINED AQUIFER SYSTEM BY A ONE-DIMENSIONAL SIMULATION OF FIELD OBSERVATIONS,
Geological Survey, Sacramento, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06196

A TWO DIMENSIONAL LAKE CIRCULATION MODEL USING THE METHODS OF FINITE ELEMENTS,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 2H.
W78-06200

8. ENGINEERING WORKS

8A. Structures

A LABORATORY STUDY OF THE STABILITY OF SAND-FILLED NYLON BAG BREAKWATER STRUCTURES,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8G.
W78-06121

8B. Hydraulics

DESIGN OF LARGE URBAN SEWER SYSTEMS WITH A WATER-FLOW SIMULATION PROGRAM,
Balzari Blaser Schudel, Bern (Switzerland).
For primary bibliographic entry see Field 5D.
W78-05722

OPTIMIZATION METHODS FOR PLANNING WASTE WATER MANAGEMENT SYSTEMS,
Karlsruhe Univ. (West Germany). Inst. fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 5G.
W78-05723

INTERACTION OF TSUNAMIS WITH THE HAWAIIAN ISLANDS CALCULATED BY A FINITE-ELEMENT NUMERICAL MODEL,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 2L.
W78-05772

DILUTION GAUGING ON THE RECESSION LIMB: 1. CONSTANT RATE INJECTION METHOD,
Institute of Hydrology, Wallingford (England).
K. Gilman.
Hydrological Sciences Bulletin, Vol 22, No 3, p 353-369, September 1977. 2 fig, 2 tab, 27 ref.

Descriptors: *Tracers, *Streams, *Dispersion, *Mixing, Model studies, Mathematical models, Streamflow, Flow, Gaging, Dye dispersion, Dye releases, Fluorescent dye, Hydrographs, Hydraulics, *Dilution gaging, Dilution, Injection methods.

The application of dilution gauging techniques to rivers and streams and other variable flows incurs a systematic error caused by the change in discharge with time. The discharge calculated from dilution gauging results may be considered as an estimate of the stream discharge at the injection section or the sampling section, and the magnitude and sense of the error vary according to this choice. On the recession limb of a hydrograph and in other cases where the discharge may be expected to change smoothly and gradually, the equations derived from a residence time model previously proposed may be linearized, and formulas of general applicability maybe developed. In this paper formulas were presented for the error arising in the case of a constant rate tracer injection, and examples were given of their application to results from a number of different flow systems. It was shown that the error may be significant in two situations: where the rate of change of discharge is high, and where poor mixing necessitates long gauging reaches and hence long tracer injections. (Sims-ISWS)
W78-05774

QUADRANT-PLATE WEIR,
Concordia Univ., Montreal (Canada), Dept. of Civil Engineering.
T. S. Ramamurthy, K. Subramanya, and B. S. Rani.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 103, No HY12, Proceedings Paper 13395, p 1431-1441, December 1977. 9 fig, 3 tab, 8 ref, 2 append.

Descriptors: *Weirs, *Discharge(Water), *Flowmeters, *Rating curves, Theoretical analysis, Measurement, Flow, Hydraulics, Laboratory tests, Equations, Data collections, Discharge coefficient, *Proportional weirs, Quadrant plate weirs, Sharp crested weirs, Linear proportional weirs.

The simple weir flow equation was integrated numerically for a quadrant plate weir to show that the head-discharge relationship for this weir is approximately lenear. Theoretically, deviations from linearity (H vs Q) can be limited to 0.5% by a judicious choice of the parameters that determine the weir geometry. The results of experiments on selected weirs were in agreement with the predicted relationships. The coefficient of discharge for the quadrant-plate weir is a function of the approach channel Froude number. For very low Froude numbers (F less than 0.1), the coefficient of discharge asymptotically approaches a value of 0.61. (Humphreys-ISWS)
W78-05784

DEPENDENCE OF THE CORIOLIS AND BOUSSINESQ COEFFICIENTS ON THE SLOPE OF A MOUNTAIN STREAM,
For primary bibliographic entry see Field 2E.
W78-05797

CHARACTERISTICS OF SOME REGULARIZING PROCEDURES FOR DETERMINING THE MORPHOMETRIC CHARACTERISTICS OF A RIVER CHANNEL,
For primary bibliographic entry see Field 2E.
W78-05798

COST OPTIMIZATION OF RURAL WATER SYSTEMS,
Iowa State Univ., Ames. Dept. of Civil Engineering.
R. B. Robinson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 619, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, 1975. 94 p, 28 fig, 7 tab, 29 ref. OWRT A-048-IA(3).

Descriptors: *Optimization, *Rural areas, *Water distribution(Applied), *Distribution systems, Pipes, Dynamic programming, Linear programming, Computer programs, Looped distribution systems, Unlooped distribution system, Dead end system, Rural water systems.

A method was developed and demonstrated for optimizing a rural water distribution system in Iowa. The method described achieves the least cost design or the optimal design for certain portions of such a system, which is generally and uniquely unlooped or dead end; linear programming and engineering judgement are the combined techniques utilized. The variables which can be considered by this approach are: the pipe diameter, pipe pressure rating, pressure reducing valve setting and location, and pumping head or water tower height. These variables are considered for a minimum pressure to be met throughout the system and for several maximum pressures for pipe classes and service lines. The solution obtainable by the procedure is considered closer than that produced by conventional design techniques. The method was demonstrated successfully on a simple distribution system. Recommendations are made for refinement of the optimization method, development of a computer program for distribution, and eventual application of linear programming to looped distribution systems. (Wares-IPA)
W78-05810

DESIGN OF AN OUTFALL,
Montgomery (James M.), Inc., Pasadena, CA.
F. A. Grant, J. L. Chao, and P. V. Hennessy.
Journal Water Pollution Control Federation, Vol 50, No. 2, p 347-361, February, 1978. 10 fig, 3 tab, 18 ref.

Descriptors: *Outfall sewers, *Ocean waves, *Surf, *Corrosion control, *Construction materials, Anodes, Structural design, Steel, Construction joints, Diffusion, Pulp wastes, Ocean currents, Zinc, Waste water disposal, Municipal wastes.

An ocean outfall was designed for the cities near Humboldt Bay, California, with specific attention to wave forces, ocean bottom velocities, ocean floor sediment composition and topography, seasonal irregularities, and outfall construction materials. The pipeline design was a compromise between a fully articulated pipe with ball joints and a totally static buried or pile-supported pipe. The pipeline was constructed of flexible, coated steel and supported by sheet piling within the first 2,000 ft from shore with ball joints joining the sheet piling to the diffuser. The diffuser, maintained above the ocean floor in a wave breaking zone, was anchored with ballast rock ranging 1.5-2.0 ft in diameter. Protection against cathodic corrosion was provided by a sacrificial zine anode system. The outfall, which was located between two pulp mill outfalls discharging log-bearing debris, was protected from physical damage by minimum burial. The final outfall pipe design included five ball joints at 200-ft intervals, two joints near the trunkline rock foundation, and a diffuser wall thickness of 1.5 inches to resist corrosion. The outfall was designed to last at least 50 years. (Lisk-FIRL)
W78-05828

FLOW ATTENUATION IN SEWERS,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Hydraulic Engineering.
D. Stephenson.
Public Health Engineer, Vol. 5, No. 6, p 157-159, 1977. 1 fig, 8 ref.

Descriptors: *Hydraulic models, *Attenuation, *Conduits, *Channel flow, *Storm water, Hydraulic engineering, Mathematical models, Graphical analysis, Chezy equation, Darcy-Weisbach equation, Mannings equation, Waste water disposal, Municipal wastes.

A mathematical model was developed for the cost-effective estimation of flow attenuation in storm water and sewage drains and for the calculation of water quality and velocity required to flush these drains. Flow attenuation studies are often designed for steady state conditions. Steady state friction equations developed by Mannings, Chezy, and Darcy were employed. Short duration inflow waves were found to decrease in depth, elongation and flattening as they move down the conduit. Velocities, inflow rate, duration, conduit length, bed slope, diameter, friction fator, and base flow are considered as variables in the equations. A graph depicting the attenuation in depth of the surge was developed for calculating minimum drain diameters for storm routeing, end capacities after routeing, and the flow required to scour deposits accumulated on the interior sewer walls. Flow rates in conduits were maximized by the addition of storm water inflows along the length of the pipe. (Lisk-FIRL)
W78-05830

SEEPAGE FROM A TRAPEZOIDAL AND A RECTANGULAR CHANNEL USING VARIATIONAL INEQUALITIES,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 4B.
W78-06098

BED CONDUCTION COMPUTATION FOR THERMAL MODELS,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
H. E. Jobson.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol 103, No HY10, Paper 13251, p 1213-1217, October 1977. 11 ref.

Descriptors: *Computer models, *Heat transfer, *Water temperature, *Channels, *Thermal conductivity, Heat budget, Thermal pollution, Analytical techniques, California, Thermal modeling.

The conduction of energy between water and the channel bed is shown to be an important consideration in predicting instantaneous temperatures in water bodies as deep as 3 meters. Assessment is based on 141 days of data collected on a canal in southern California. By considering the bed to be a homogeneous flat plate, insulated on the bottom and with an instantaneous surface temperature on the top equal to that of the overlying water, a model is derived which accounts for bed conduction. The rate of change of heat content of the plate, which must equal the heat flux between the water and bed, is determined from the heat-storage capacity and thermal diffusivity of 0.01 sq cm/s was found to apply to this concrete-lined canal. A convolution interval of 24 hours was sufficient to represent the water temperature of the systems. (Woodard-USGS)
W78-06185

8C. Hydraulic Machinery

JAMESPORT TRANSMISSION EXITS; A REVIEW FOR THE TOWN OF RIVERHEAD OF THE LONG ISLAND LIGHTING COMPANY APPLICATION TO THE NEW YORK PUBLIC SERVICE COMMISSION FOR A CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY AND PUBLIC NEED FOR THE JAMESPORT TRANSMISSION EXITS,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 6G.
W78-05816

OPTIMAL STATE ANALYSIS OF RESERVOIRS,
California Univ., Riverside. Dry Lands Research Inst.
For primary bibliographic entry see Field 4A.
W78-05817

USE OF MIXING PIPES TO IMPROVE THE FLOW OF WASTE WATER INTO LAKES (EINSATZ VON MISCHROHREN ZUR VERBESSERUNG DER EINLEITUNG VON ABWASSER IN SEEN),
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Versuchsanstalt fuer Wasserbau, Hydrologie und Glaziologie.
For primary bibliographic entry see Field 5E.
W78-05829

MOBILE DIESELS STAND-BY AT SEWAGE PUMPING STATIONS.
Progress Engineering, p 13, September, 1977.

Descriptors: *Generators, *Motor generators, *Pumping plants, *Electric power, *Floods, Hydraulics, Treatment facilities, Waste water treatment, Sewage disposal, Overflow.

The use of stationary automatic and mobile generators, manufactured by Auto Diesels Braby of England, is suggested for the prevention of waste water flooding in pumping stations or treatment plants during electrical power failures. Automatic generators are recommended for unmanned or remote pumping stations where there is an immediate danger of flooding in the event of a power loss. The standby power of these automatic diesels can be supplied within 20 seconds of an electrical failure. The diesels can also be programmed for manual start in manned operations. The generator, which is hooked into the main controls, can supply the initial high voltage necessary to restart the pumping equipment. Mobile generators are practical for remote or regional facilities where electrical power failure does not pose an immediate threat of flooding. Since the system is mobile, with its own control panel and fuel tank equipped trailer, it can be transported to the site of the power failure and connected to the main controls. The mobile generator may also be used as a stand-by power source for other activities when not in service at a pumping station. (Lisk-FIRL)
W78-05855

TRENDS EMERGE, BUT SOLAR DESIGN OPTIONS STILL OPEN,
Modern Metals, Chicago, IL.
J. A. Mungovan.
Modern Metals, Vol. 33, No. 10, p 22-24, 26, November, 1977. 3 fig.

Descriptors: *Solar radiation, *Energy, *Treatment facilities, *Sewage treatment, Equipment, Design, Methane, Electric power costs, Fuels, Maine, Government finance, Municipal wastes, Waste water treatment.

A new plant for waste water treatment in Wilton, Maine, will obtain most of its energy requirements from solar collectors located on the southern exposure of the plant and from methane generated by the treatment processes. Due to federal and state participation, payback to Wilton will be about two yrs; the plant would require about 18 yrs to pay for itself without aid. The $2 million plant will use 54-double-glazed, copper-and-aluminum flat plate collectors supplied by Grumman Energy Systems. The energy demand of the equipment is low and the plant is designed so as to minimize heat loss. Fuel cost savings are expected to amount to $3594 annually; electricity cost savings should be $875 each year. This application of solar energy won the Owens-Croning Fiberglass Corporation Energy Conservation Award for 1975. Grumman Energy System's aluminum flat plate collector can be used interchangeably with its copper-and-aluminum flat plate collector in some applications. (Snyder-FIRL)
W78-05861

CONVERTING WASTES TO ENERGY--A CONCEPTUAL APPROACH,
Nihon Suido Consultants Co. Ltd., Tokyo.
For primary bibliographic entry see Field 5D.
W78-05896

PHOTOSYNTHESIS AND SOLAR ENERGY CONVERSION,
Cornell Univ., Ithaca, NY. Div. of Biological Sciences.
R. K. Clayton.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL 50530, Price codes: A17 in paper copy, A01 in microfiche. In: Chlorophyll-Proteins, Reaction Centers, and Photosynthetic Membranes, Rep No. 28. Rep BNL 50530, Mar 1977. p 1-15, 2 fig, 1 tab, 36 ref. Edited by J. M. Olson and G. Hind. ERDA EY-76-C-02-0016.

Descriptors: *Photosynthesis, *Solar energy, *Fuels, *Energy conversion, Nuclear energy, Heat, Thermal power, Wind-powered turbines, Solar heating, Oceans, Algae, Solar radiation, Plant tissues, Fossil fuels, Hydrogen, Silicon photovoltaic cells.

A study of potential uses of photosynthesis for energy production is included in the proceedings of the Brookhaven National Laboratory Symposium, 'Chlorophyll-Proteins, Reaction Centers, and Photosynthetic Membranes.' Energy sources stemming directly or indirectly from solar origin which might become important in the United States include: (1) wind-powered turbines; (2) ocean thermal gradients (heat engines); (3) direct solar heating (heat engines or chemical reaction cycle producing hydrogen from water); (4) photosynthetic systems (growth of plants, including algae, and conversion to fuels, or photosynthetic hydrogen production); and (5) photoelectric devices, possible using materials derived from photosynthetic tissues. Sunlight offers our best long-term hope for an inexhaustible source of pollution-free energy, and the most practical schemes utilize direct heating and wind power. Costs of silicon photovoltaic cells must be reduced if such cells are to be competitive. Conversion of organic waste and plants into fuel is practical, but demands exceed supply. Use of photosynthetic tissues in special ways appears highly visionary, but worthy of investigation. U.S. energy reserves are estimated as follows: current oil and gas, < 10 years; total oil and gas, 100 years; fission, < 100 years; coal and oil shale, > 1000 years; geothermal, > 100 years; fusion, one million-one trillion years; and solar, > one trillion years. (Lynch-Wisconsin)
W78-05969

TURBINE ASPIRATION FOR OXYGEN SUPPLEMENTATION,
Alabama Univ., University. Dept. of Engineering Mechanics.
For primary bibliographic entry see Field 5G.
W78-06017

OFF-PEAK HOUR PUMPING RATE REDUCTION: ARE THE BENEFITS WORTH THE COSTS,
Boyle Engineering Corporation, Ventura, CA.
For primary bibliographic entry see Field 6B.
W78-06134

8D. Soil Mechanics

A STOCHASTIC MODEL OF LEVEE FAILURE,
Eotvos Lorand Univ., Budapest (Hungary). Dept. of Numerical Methods.
F. Szidarovszky, L. Duckstein, and I. Bogardi.
In: Mathematical Models for Environmental Problems. Proceedings of the International Conference, University of Southampton, England, Sept. 8-12, 1975. C.A. Brebbia (Ed.), Southampton University. John Wiley & Sons, N.Y., N.Y., p 129-140, 1976. 1 fig, 1 tab, 13 ref.

Descriptors: *Stochastic processes, *Levee failure, *Flood control, *Probability, Flat land, Hungary, Flood damage, Design, River basins, Equations, Mathematical models, Reach(Streams), Systems analysis.

In flood control development, available funds must be used to provide the greatest benefit to the protected area. The optimal development may be determined in four steps: (1) establish the present degree of protection of the flood control system; (2) consider development alternatives; (3) estimate the optimal development in a reach; and (4) calculate the optimal program of development of the flood control system. Herein, a method is described for the present degree of protection. The approach is applicable primarily to flat-land type rivers, where the most successful method of flood control is still the levee. In Hungary, the only effective method for decreasing flood damages is the construction, strengthening, and maintenance of flood levees. Considered first is the probability of failure in a given cross-section and then in a river reach. The method deals with (1) the stochastic character of flood load, (2) the various degrees of protection offered along the levee reach, and (3) the different modes of failure. For each failure mode, the levee reach is divided into subreaches, within which the mean value and variance of resistance for each failure model is constant. The equation for this can be solved in four different cases depending on the various uncertainties involved, and a practical example is presented to illustrate the difference between these four cases. It is shown that reliability of levee systems can be estimated by considering uncertainties in the load and resistances, as well as parameter uncertainty due to small sample size of loads. (See also W78-05720) (Bell-Cornell)
W78-05724

GROUND PROBLEMS OVERCOME ON CRAWLEY SEWER JOB.
Surveyor, Vol. 150, No. 4452, p 15, October, 1977.

Descriptors: *Sewers, *Excavations, *Construction materials, *Soil engineering, *Soil erosion, Design data, Equipment, Soil dynamics, Earth handling equipment, Seepage control.

A support system for excavation site walls has been developed by Shorco Trench Systems Ltd of Leeds, England. The Escon box system has been used in sewer construction projects where the ground is unstable or saturated and where the soil lacks cohesion. The Escon box consists of steel side supports connected with braces and shock absorbing equipment. The modular assembly has sharp bottom edges for ease of installation. The supports are 3.4-m long by 2.6-m high and the system has an expandable width from 0.9-4.5 m. The support system prevents erosion of the trench walls where seepage pressures or soil properties cause unstable conditions. Additional supports can be added to the shoring system in 1.3-m sections where excavation depth exceed the height of the support walls. The system has been used for a sewer installation project in Crawley, England. (Lisk-FIRL)
W78-05824

LIQUEFACTION POTENTIAL OF DAMS AND FOUNDATIONS, REPORT 1. LABORATORY STANDARD PENETRATION TESTS ON REID BEDFORD MODEL AND OTTAWA SANDS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
W. A. Bieganousky, and W. F. Marcuson, III.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-033 337, Price codes: A08 in paper copy, A01 in microfiche. Research Report S-76-2, October 1976. 156 p, 41 fig, 13 tab, 2 append.

Descriptors: Dams, *Dam foundations, *Failures, *Laboratory tests, *Penetration, *Sands, Bulk density, Soil tests, Curves, Overburden, Soil pressure, Statistical methods, Correlation analysis, Uniformity coefficient, Testing, Equipment, Consolidation, Sieve analysis, Submergence, *Liquefaction, *Standard penetration tests, Relative density, In situ tests, Ottawa sand.

The Standard Penetration Test (SPT) was examined critically with respect to its ability to estimate relative density in situ. A review of the literature tracing the development of the SPT was presented. Using Reid Bedford Model sand and Ottawa sand, 26 test specimens, 4 ft in diameter by 6 ft high, were constructed. A variety of placement techniques were incorporated in the test program. The problems encountered in constructing large homogeneous test specimens were discussed. Using field drilling equipment, the SPT was performed at 3 overburden pressures on test specimens built to various densities. The results were presented as a family of curves correlating relative density with the SPT N-values at the testing pressures. This correlation was compared with correlations prepared by Gibbs and Holtz at the Bureau of Reclamation and Bazaraa at the University of Illinois. It was concluded that the SPT is repeatable in homogeneous deposits; however, variations in density, structure, or lateral stress within the test medium will produce widely scattered N-values. Thus, estimates of in situ relative densities from N-values should be considered gross values or trends and should not be interpreted as accurate determinations for any specific case. (Visocky-ISWS)
W78-06124

8G. Materials

QUADRANT-PLATE WEIR,
Concordia Univ., Montreal (Canada). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-05784

PROTECTION OF UNDERGROUND WATER MAINS AGAINST CORROSION,
Bombay Municipal Corp., Bombay (India).
V. M. Shidhaye.
Journal of the Institution of Engineers (India), Vol. 57, Part CH 3, p 127-133, June, 1977. 4 tab, 6 ref.

Descriptors: *Construction materials, *Corrosion, *Pipelines, *Sewers, *Linings, Pipes, Conveyance structures, Soil properties, Waste water treatment.

Various aspects of the protection of underground pipelines against corrosion are discussed. The collection of preliminary data on soil properties, the behavior of existing pipelines, and soil resistivity is recommended before large diameter pipelines are emplaced. Various coating materials have been used to segregate the pipe surface from corrosive soils or water. The chemical resistance, resistance to water absorption, electrical resistance, mechanical strength, ease of application, durability, and curing time are compared for various coating materials, including: gunite, coal tar enamel, fiberglass wrap, blown asphale, plastic tape, and impregnated hessian. Coal tar coatings are recommended for areas characterized by a high water table or saturated soil conditions. Polyethylene sleeving is recommended for use in aggressive soils. (Baker-FIRL)
W78-05826

DESIGN OF AN OUTFALL,
Montgomery (James M.), Inc., Pasadena, CA.
For primary bibliographic entry see Field 8B.
W78-05828

A PUMP TEST IN THE DAKOTA SANDSTONE AT WALL, SOUTH DAKOTA,
South Dakota School of Mines and Technology, Rapid City. Dept. of Geology and Geological Engineering.
For primary bibliographic entry see Field 4B.
W78-05946

A LABORATORY STUDY OF THE STABILITY OF SAND-FILLED NYLON BAG BREAKWATER STRUCTURES,
Coastal Engineering Research Center, Fort Belvoir, VA.
R. Ray.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A039 265, Price codes: A05 in paper copy, A01 in microfiche. Miscellaneous Report No. 77-4, March 1977. 75 p, 56 fig, 5 tab, 9 ref, 1 append.

Descriptors: *Breakwaters, *Waves(Water), *Ocean waves, Laboratory tests, Shores, Coasts, Beaches, Structures, Coastal structures, Coastal engineering, Materials, Materials testing, *Sand bags, Sandbag breakwaters, Sandbag materials, Nylon sandbags, Wave tank tests.

One emergent and three submerged breakwaters built of sand-filled nylong bags on a sand bed were subjected to progressively more severe wave conditions in full-scale laboratory tests. The tests determined the properties of the bags, the effects of wave action on placement of bags, and the performance of bags and structures for various combinations of structure configuration and wave conditions. The changes in the sand bed at the base of the structures and the wave attenuation by the breakwaters also were investigated. The uncoated nylon material deteriorated after 1-year exposure to sunlight and was torn by handling equipment during breakwater water construction. Wet material was slippery and trapped air. When filled with sand, the smooth, rounded bags, sometimes cushioned by an air bubble, failed to interlock adequately to prevent motion under the least severe wave condition. Bags were dropped accurately into place during wave action to construct one of the submerged breakwaters. During testing, the structures' configurations changed drastically, primarily from movement of bags during the first wave attack of the least severe wave condition and during the steepest wave condition. The two highest submerged breakwaters lost whole layers of bags from their crests, and the seaward face of the emergent breakwater slumped from a slope of 1 on 3 to a slope of 1 on 5.3. As wave conditions changed, scour and accretin occurred alternately at the breakwaters' toes but caused no measureable settlement. The emergent breakwater and the highest submerged breakwater, the two producing greater than 30% wave attenuation, underwent the most wave-induced damage. (Sims-ISWS)
W78-06121

LIQUEFACTION POTENTIAL OF DAMS AND FOUNDATIONS, REPORT 1. LABORATORY STANDARD PENETRATION TESTS ON REID BEDFORD MODEL AND OTTAWA SANDS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
For primary bibliographic entry see Field 8D.
W78-06124

8I. Fisheries Engineering

IDENTIFICATION OF LARVAL FISHES TAKEN FROM THE INSHORE WATERS OF SOUTHEASTERN LAKE MICHIGAN NEAR THE DONALD C. COOK NUCLEAR PLANT, 1973-1975,
Michigan Univ., Ann Arbor. Great Lakes Research Div.
For primary bibliographic entry see Field 2H.
W78-05758

DETERMINATION OF PHYSICAL AND HYDRAULIC PREFERENCES OF BROWN AND BROOK TROUT IN THE SELECTION OF SPAWNING LOCATIONS,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
D. W. Reiser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 558, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, May, 1976. 112 p, 29 fig, 12 tab, 111 ref, 3 append. OWRT C-7002 (620)(1).

Descriptors: *Spawning, *Brook trout, *Brown trout, *Trout, Behavior, *Wyoming, *Salmonids, Depth, Velocity, Stream gage, Streamflow, Incubation, Spawning criteria, Spawning behavior, Egg planting, *Spawning establishment, Instream flow, Stream resource maintenance flow, Incubation flow, Substrates, Cover proximity.

Spawning criteria for 56 brook and 121 brown trout redds in 7 stream sections of southeastern Wyoming were developed using the parameters of depth, velocity, and substrate size. Egg planting experiments were conducted to determine the combinations of parameters which afford the highest percent survival of brown trout eggs. The physical and hydraulic characteristics of spawning locations and the influence on spawning exerted by the proximity of cover were analyzed. Measurements of depth, mean velocity, and point velocity, were taken at the upper edge, pit and tailspill of each redd. A representative substrate sample was collected from the tailspill and later analyzed using a series of 9 seives. Permeability of the substrate was measured at the redd site using a Mark IV standpipe. The developed criteria are applicable for brook trout up to 12 in. and brown trout up to 16 in. Brook and brown trout exhibit preferences for depths, velocities, and substrate types when selecting spawning areas; brown trout appear to use velocity more than depth in the

selection process. No definitive relationship was determined between the location of spawning areas and the distance from cover. The egg planting experiment failed to generate any substantial data concerning suitable spawning areas. Procedural changes and further study in the effects of superimposition of redds, stream sedimentation, and egg predation are recommended. (Scip-IPA)
W78-05802

TWO ANOMALIES OF FISH LARVAL TRANSPORT AND THEIR IMPORTANCE IN ENVIRONMENTAL ASSESSMENT,
Power Authority of the State of New York.
For primary bibliographic entry see Field 5C.
W78-06155

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

CALIFORNIA WATER RESOURCES CENTER ANNUAL REPORT, JULY 1, 1976-SEPTEMBER 30, 1977.
California Univ., Davis. Water Resources Center.
For primary bibliographic entry see Field 9D.
W78-06040

DIRECTORY OF WATER RESOURCES EXPERTISE, WATER RESEARCH FACULTY AND STAFF SCIENTISTS.
California Univ., Davis. Water Resources Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 688, Price codes: A05 in paper copy, A01 in microfiche. Revised Edition, December 1977. 86 p.

Descriptors: *Scientific personnel, *Professional personnel, *Research and Development, Comprehensive planning, Project planning, Water Resources Institute, Education, Universities, Colleges, Training, *Directories, *California.

This publication was compiled to fill a need for the identification of persons working in water resources research on the several campuses of the University for the benefit of those with the University of California as well as individuals, governmental agency personnel, and business and industrial personnel. The primary purpose is to facilitate contact between those desiring information in a specific area and those able to provide such information. (See also W75-11580) (Snyder-Calif, Davis)
W78-06041

9D. Grants, Contracts, and Research Act Allotments

CALIFORNIA WATER RESOURCES CENTER ANNUAL REPORT, JULY 1, 1976-SEPTEMBER 30, 1977.
California Univ., Davis. Water Resources Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 614, Price codes: A06 in paper copy, A01 in microfiche. Report No. 42, December 1977, 96 p.

The principal investigators of fresh water projects sponsored by the Water Resources Center have submitted their annual reports, from which the most essential information has been abstracted to form this narrative section. The individual narratives have been purposely kept brief. Each emphasized, whereever pollsible, the 'hard' results and the actual or potential applications of those results to benefit affected interests. Shown also are starting and scheduled ending dates for each research project. The reader may infer from these the relative degree of progress achieved to data, together with an indicaton of when further information might become available--usually at least six months after completion of the project for any detailed account. The report covers both State of California and Federally funded research activities. (Snyder-Calif, Davis)
W78-06040

DIRECTORY OF WATER RESOURCES EXPERTISE, WATER RESEARCH FACULTY AND STAFF SCIENTISTS.
California Univ., Davis. Water Resources Center.
For primary bibliographic entry see Field 9A.
W78-06041

10. SCIENTIFIC AND TECHNICAL INFORMATION

10B. Reference and Retrieval

GREAT LAKES FISH EGG AND LARVAE IDENTIFICATION: PROCEEDINGS OF A WORKSHOP, APRIL 19-21, 1976, ANN ARBOR, MICHIGAN.
National Power Plant Team, Ann Arbor, MI.
For primary bibliographic entry see Field 2H.
W78-05753

10C. Secondary Publication And Distribution

GREAT LAKES FISH EGG AND LARVAE IDENTIFICATION: PROCEEDINGS OF A WORKSHOP, APRIL 19-21, 1976, ANN ARBOR, MICHIGAN.
National Power Plant Team, Ann Arbor, MI.
For primary bibliographic entry see Field 2H.
W78-05753

CURRENT LEVEL OF TAXONOMIC INFORMATION ON GREAT LAKES FISH EGGS AND LARVAE,
State Univ. of New York at Syracuse. Dept. of Forest Zoology.
For primary bibliographic entry see Field 2H.
W78-05754

FISH INHABITING U.S. WATERS OF THE GREAT LAKES, WITH INDICATIONS OF THEIR RELATIVE ABUNDANCE AND OF THEIR IMPORTANCE AS COMMERCIAL, SPORT, OR FORAGE SPECIES,
National Marine Fisheries Service, Ann Arbor, MI. Great Lakes Fishery Lab.
For primary bibliographic entry see Field 2H.
W78-05755

FISH EGG AND LARVAE STUDIES: SOME PROBLEMS AND RECOMMENDED SOLUTIONS,
Maryland Univ., Solomons. Chesapeake Biological Lab.
For primary bibliographic entry see Field 02H.
W78-05756

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SELECTED WATER RESOURCES ABSTRACTS

VOLUME 11, NUMBER 14
JULY 15, 1978

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SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 11, NUMBER 14
JULY 15, 1978

W78-06201 -- W78-06700

etary of the U.S. Department of the Interior has de-
that the publication of this periodical is necessary in the
n of the public business required by law of this Depart-
ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

elected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent nographs, journal articles, reports, and other publication mats. The contents of these documents cover the water-ated aspects of the life, physical, and social sciences as ll as related engineering and legal aspects of the charac-istics, conservation, control, use, or management of water. ch abstract includes a full bibliographical citation and a set descriptors or identifiers which are listed in the **Water sources Thesaurus.** Each abstract entry is classified into fields and 60 groups similar to the water resources re-arch categories established by the Committee on Water sources Research of the Federal Council for Science and chnology.

RSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE PIES OF DOCUMENTS ABSTRACTED IN THIS JOUR-L. Sufficient bibliographic information is given to enable ders to order the desired documents from local libraries ther sources.

ected Water Resources Abstracts is designed to serve scientific and technical information needs of scientists, gineers, and managers as one of several planned services he Water Resources Scientific Information Center RSIC). The Center was established by the Secretary of the erior and has been designated by the Federal Council for ence and Technology to serve the water resources com-nity by improving the communication of water-related earch results. The Center is pursuing this objective by co-nating and supplementing the existing scientific and tech-al information activities associated with active research investigation program in water resources.

provide WRSIC with input, selected organizations with ve water resources research programs are supported as nters of competence" responsible for selecting, abstract-ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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SELECTED WATER RESOURCES ABSTRACTS

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1B. Aqueous Solutions and Suspensions

THE EFFECT OF DISSOLVED AIR AND NATURAL ISOTOPIC DISTRIBUTIONS ON THE DENSITY OF WATER,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
For primary bibliographic entry see Field 2K.
W78-06383

2. WATER CYCLE

2A. General

VALIDATION AND IMPLEMENTATION OF A SIMPLIFIED STREAMFLOW SIMULATOR,
Nebraska Univ., Lincoln. Dept. of Computer Science.
For primary bibliographic entry see Field 2E.
W78-06205

OPTIMAL OPERATION OF A FLOOD CONTROL RESERVOIR,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-06208

FACING THE LONGTERM: AN INQUIRY INTO OPPORTUNITIES TO IMPROVE THE CLIMATE FOR RESEARCH WITH REFERENCE TO LIMNOLOGY IN CANADA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 6E.
W78-06217

RIVER-INDUCED CURRENTS IN A FJORD LAKE,
Canada Centre for Inland Waters, Burlington (Ontario).
P. F. Hamblin, and E. C. Carmack.
Journal of Geophysical Research, Vol 83, No C2, p 885-899, February 20, 1978. 13 fig, 3 tab, 24 ref.

Descriptors: *Lakes, *Canada, *Rivers, Currents(Water), *Model studies, Mathematical models, Temperature, Water temperature, Turbidity, Density, Flow, Entrainment, Mixing, Friction, Flow friction, Dye releases, Limnology, Kamloops Lake(British Columbia), *Thompson River(British Columbia).

Models based on stream tube geometry and geostrophy were used to describe the passage of a strong river through a long narrow (fjord-type) lake. Analysis was applied specifically to the entry of the Thompson River into Kamloops Lake, British Columbia. Lake-river interaction was considered in three stages of flow: a sinking plume stage during which the incoming river water sinks to a depth where its density matches that of the inflowing river, a horizontal spreading stage during which the movement of river water is unconstrained by bottom and/or shoreline effects, and a shorebound stage during which the flow of river water downlake occurs principally in a balance between cross-stream pressure gradients and the Coriolis force. Echanges of mass and momentum were parameterized by entrainment and friction coefficients evaluated from field data. Results of this study showed, in general, that river-induced currents influence or even dominate circulation patterns within a fjord lake. (Sims-ISWS)
W78-06219

A MONTHLY WATER BALANCE MODEL INCLUDING DEEP INFILTRATION AND CANAL LOSSES,
Vrije Univ., Brussels (Belgium). Lab. of Hydrology.
A. Van Der Beken, and J. Byloos.
Hydrological Sciences Bulletin, Vol 22, No 3, p 341-351, September 1977. 5 fig, 2 tab, 3 ref.

Descriptors: *Water balance, *Model studies, *Infiltration, Seepage, Monthly, Hydrologic budget, Precipitation(Atmospheric), Streamflow, Evaporation, Base flow, Hydrology, Canals, *Canal water losses, *Belgium, *Grote Nete test basin(Belgium).

A monthly water balance model was applied successfully to the Grote Nete test basin (553 sq km) in the North of Belgium. This low region has a complex geological structure. Its boundaries are more of less unknown, and deep infiltration into a deep aquifer is most likely to occur. Moreover, the area is crossed by several navigation canals which import and export an unknown volume of water. The inputs were monthly precipitation and Penman potential evapotranspiration values. The model computes actual evapotranspiration, water storage in the basin, direct runoff and infiltration, baseflow and total stream discharge, deep infiltration loss into the underlying aquifer, and constant seepage from the canals. The 'pattern search' procedure, was used for automatic optimization of the six model parameters. All parameters have a physical meaning and can be evaluated initially. For the calibration period 1967-1972, total stream discharge was calculated with a precision of 0.2% compared to total measured volume. The correlation coefficient is 92% for the same calibration period. Prediction for the period 1973-1974 gave a volume precision of 8.7% and a correlation coefficient of 93%. (Lee-ISWS)
W78-06220

AOIPS WATER RESOURCES DATA MANAGEMENT SYSTEM,
Earth Satellite Corp., Washington, DC.
For primary bibliographic entry see Field 7C.
W78-06239

THE DYNAMICS OF STRATIFICATION AND OF STRATIFIED FLOW IN LARGE LAKES.
International Joint Commission-United States and Canada, Windsor (Ontario). Standing Committee on the Scientific Basis for Water Quality Criteria.
For primary bibliographic entry see Field 2H.
W78-06388

NOTES ON RECENT RESEARCH ON SIMULATION OF TWO-DIMENSIONAL STRATIFIED FLOWS,
Resource Management Associates, Lafayette, CA.
For primary bibliographic entry see Field 2H.
W78-06395

SAFETY OF DAMS, A REVIEW OF THE PROGRAM OF THE U. S. BUREAU OF RECLAMATION FOR THE SAFETY OF EXISTING DAMS.
National Research Council, Washington, D.C. Committee on the Safety of Dams.
For primary bibliographic entry see Field 8B.
W78-06522

CALIBRATION OF HYDROLOGICAL MODEL USING OPTIMIZATION TECHNIQUE,
Severn-Trent Water Authority, Birmingham (England).
R. E. Manley.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 104, No. HY2, p 189-202, February 1978. 4 fig, 3 tab, 20 ref.

Descriptors: Water resources, *Optimization, *Simulation analysis, *Computer models, Digital computers, Hydrology, Hydraulics, Surface waters, Groundwater, Conservation, Droughts, Wave velocity, *Mathematical models, Systems analysis, Equations, Model studies, Algorithms.

Computer-based mathematical models that simulate the response of a catchment to climatic variables have been available for more than a decade. One of the drawbacks to the use of these models has been the difficulty of calibrating them to a particular catchment. The catchment model HYSIM has all but four of its parameters estimated from catchment details or hydrograph analysis; the four are calibrated using a modified version of the Rosenbrock algorithm. The complete model occupies about 12K words (36K bytes) of computer core storage. HYSIM was used to produce a 44-year record for a river in England extensively used for water supply. Despite the fact that only a limited amount of data was available, the extended record has proven adequate for water resources analysis. (Bell-Cornell)
W78-06561

APPLICATION OF A RAINFALL-RUNOFF MODEL IN ESTIMATING FLOOD PEAKS FOR SELECTED SMALL NATURAL DRAINAGE BASINS IN TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06602

2B. Precipitation

THE 1976 DROUGHT IN FRANCE: CLIMATOLOGICAL ASPECTS AND CONSEQUENCES (LA SECHERESSE 1976 EN FRANCE: ASPECTS LIMATOLOGIQUES ET CONSEQUENCES),
Direction de la Meteorologie, Boulogne-Billancourt (France).
P. Brochet.
Hydrological Sciences Bulletin, Vol 22, No 3, p 393-411, September 1977. 10 fig, 2 tab.

Descriptors: *Droughts, *Surface waters, *Climatology, *Rainfall, Water pollution, Agriculture, Soil water, Water storage, Hydrologic budget, Rainfall disposition, Navigation, Transport, Rivers, Data collections, Foreign research, Meteorology, Maps, Weather data, Synoptic analysis, Meteological data, Runoff, Hydroelectric power, Water utilization, *France.

The four classical definitions of drought were mentioned: (1) pluviometric drought, numerically characterized by a pluviometric ratio; (2) climatic drought, depending on the potential water budget; (3) agricultural drought, referring to the easily available soil water storage; and (4) hydrological drought, recognized by an anomaly in the water supply to the water courses. The first two types were analyzed with respect to the 1976 drought in France, and the results were plotted on maps. The meteorological causes of the drought were examined, using data from Europe and North Africa. Finally, the effects of the drought on surface water (groundwater does not appear to have been affected), river transport, pollution, hydroelectric power supply, and above all on agriculture, were given. (Humphreys-ISWS)
W78-06221

CLIMATIC EFFECTS ON WASTEWATER TREATMENT,
North Dakota State Univ., Fargo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-06305

CLIMATIC AND ECOLOGICAL ASPECTS OF DESERTIFICATION,
New South Wales Univ. (Australia). School of Geography.
J. A. Mabbutt.
Nature and Resources, Vol. 8, No. 2, p 3-9, April-June, 1977.

Descriptors: *Deserts, *Environmental effects, *Ecology, *Climates, Arid lands, Semiarid climates, Droughts, Rainfall, Africa, Albedo, Subclimax, Grazing, Weather forecasting, Land management, Land reclamation, *Desertification.

Desertification is the spread of desert conditions beyond desert margins, or the intensification of desert conditions within them. The problem of increasing desertification is examined and its causes are discussed. The primary focus is upon the climatic and ecological aspects. Questions explored concerning climate and desertification are concerned with man's effect on deterioration of desert climates, the problems of weather forecasting, and the possibility of man changing the desert/climate to his advantage. The value of using an ecological approach in dealing with the problem of desertification is examined. The physical processes of desertification are discussed. (Jamail-Arizona)
W78-06338

GREATEST KNOWN AREAL STORM RAINFALL DEPTHS FOR THE CONTIGUOUS UNITED STATES,
NOAA National Weather Service, Silver Spring, MD. Office of Hydrology.
For primary bibliographic entry see Field 7C.
W78-06380

WEATHER MODIFICATION ACTIVITIES IN KANSAS 1972-1977,
Kansas Water Resources Board, Topeka.
For primary bibliographic entry see Field 3B.
W78-06382

2C. Snow, Ice, and Frost

SATELLITE IMAGES OF LAKE ERIE ICE: JANUARY-MARCH 1975,
National Environmental Satellite Service, Washington, DC.
M. C. McMillan, and D. Forsyth.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 458, Price codes: A02 in paper copy, A01 in microfiche. NOAA Technical Memorandum NESS 80, June 1976. 18 p, 18 fig, 1 ref.

Descriptors: *Remote sensing, *Great Lakes, *Ice cover, *Lake Erie, Satellites(Artificial), Radiation, Infrared radiation, Photography, Clouds, Lakes, Ice, Lake ice, Freezing, Melting, Radiometers, Visible imagery, Thermal imagery.

The NOAA-4 environmental satellite provides daily images of portions of Earth in the visible (0.6 to 0.7 micrometer) and thermal (10.5 to 12.5 micrometer) spectral regions from a Very High Resolution Radiometer (VHRR) having approximately 1-km resolution. This improved resolution has permitted more detailed observations of Great Lakes ice than was possible with the previous generation of operational satellites. Both visible and infrared imagery were presented to show ice formation and dissipation in Lake Erie and vicinity. Coverage began on January 21 and ended on March 18, 1975. Only cloudfree or partly cloudy imagery was included. (Sims-ISWS)
W78-06231

BIBLIOGRAPHY ON COLD REGIONS SCIENCE AND TECHNOLOGY, VOLUME XXVIII, PT. 1.
Cold Regions Research and Engineering Lab., Hanover, NH.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A007 092, Price codes: A14 in paper copy, A01 in microfiche. CRREL Report 12, July 1974. 304 p.

Descriptors: *Bibliographies, *Cold regions, *Technology, Abstracts, Publications, Information retrieval, Snow, Ice, Frost, Permafrost, Documentation, Ice cover, Tundra, Temperature, Glaciers, Lakes, Remote sensing, Glaciology, Exploration, Polar regions, Antarctic, Arctic, Indexes.

The Bibliography on Cold Regions Science and Technology, CRREL Report 12, is a continuing publication of the Cold Regions Bibliography Project in the Science and Technology Division of the Library of Congress. The present volume contains material accessioned between July 1973 and June 1974. The volume consists of two parts, each separately bound. Pt. 1 contains the full citation of 4312 items, in many cases with abstracts. Pt 2 is an index section is an index section divided into author and subject indexes. In the author index, principal and joint personal and corporate authors are listed along with the title, date, pagination, and language of the document and the accession number. The subject index is composed of three basic elements: (1) terms taken from a controlled vocabulary based on the Thesaurus of Engineering and Scientific Terms (LEX-EJC), (2) free terms added as needed, and (3) geographic names, generally entered under countries. The terms are listed in a single alphabetical arrangement, along with title (original, translated, abridged, expanded, or supplied), principal author, date, pagination, and language of pertinent documents, and their accession numbers. (Froehlich-ISWS)
W78-06232

INVESTIGATION OF THE FLOW OF NATURAL ICE,
S. K. Khanina, and A. R. Shul'man.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 677, Price codes: A02 in paper copy, A01 in microfiche. Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, Draft Translation TL 525, May 1976. 16 p, 8 fig, 2 tab, 8 ref. Translated from Trudy Gosudarstvennogo Gidrologicheskogo Instituta, No. 16, pt. 70, p 89-95, 1949.

Descriptors: *Ice, *Flow, *Rivers, *Lakes, Elastic deformation, Deformation, Lake ice, On-site investigations, Sampling, Laboratory tests, Crystallography, Crystals, Viscosity, *USSR.

The structure of natural ice from the Neva and Volkhov rivers and from Ladoga and Suzdal' lakes was investigated during January-April 1948. River ice crystals resembled artificial ice crystals in size. Tests indicated that deformation is a function of time, the load, and the direction of application of the load in relation to the optical axis of the ice crystals. Maximum deformation occurred when the load was applied perpendicularly to the optic axis of the crystals. Deformation increased with time. The viscosity was less in monocrystals than in river ice. (Sims-ISWS)
W78-06233

DEVELOPMENT OF A HYDROPHOBIC SUBSTANCE TO MITIGATE PAVEMENT ICE ADHESION,
Ball Bros. Research Corp., Boulder, CO.
For primary bibliographic entry see Field 4C.
W78-06241

DEVELOPMENT AND EVALUATION OF AN EXPERIMENTAL FRAZIL ICE MEASUREMENT INSTRUMENT,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
G. Tsang.
Scientific Series No. 78, 1977. 35 p, 12 fig, 1 tab, append.

Descriptors: *Frazil ice, *Measurement, *Instrumentation, Evaluation, Conductivity, Laboratory tests, *Instrument development project.

Theoretical investigations show that the presence of frazil ice in water can be quantitively measured by its effect on the conductivity and the permittivity of the water. At frequencies much lower than 10 to the seventh power Hz, the fraxil ice effect on conductivity predominates, and at frequencies much higher than 10 to the seventh power Hz, the ice effect on permittivity is predominant. An experimental instrument based on the resistance (i.e., conductivity) principle has been constructed and tested. Experiments were performed in a cold room with fraxil ice produced in a beaker. The experiments showed that the laboratory instrument could quantitatively sense the presence of ice. The detailed circuit of the experimental instrument is shown. Some modifications of the circuit and the probe for improving the instrument are suggested as a consequence of the laboratory experiments and further theoretical investigations. The concentrations of frazil ice measured by the experimental instrument were by average about three times the concentration calculated theoretically. If the frazil ice crystals are assumed to have elongated spheroidal shapes with a length to breadth ratio of 10 to 1, the measured concentrations are about twice the calculated concentration. Further theoretical investigation is needed to explain this puzzle. The puzzle, however, is beneficial because it increases the sensitivity of the instrument. This report describes phase I of an instrument development project. The design and production of an improved and manufacturable instrument will be phase II of the project. (WATDOC)
W78-06313

FLASH FLOOD FORMATION IN PERMAFROST REGIONS,
F. V. Zalesskiy.
Soviet Hydrology, Selected Papers, Vol 15, No 2, p 95-97, 1976. 1 tab. Translated from Trudy IV Vsesoyuznogo Gidrologicheskogo S'yezda, Vol 3, p 40-44, 1975.

Descriptors: *Flash floods, *Permafrost, *Cold regions, Seepage, Runoff, Foreign countries, Foreign research, Storms, Rainfall, Precipitation(Atmospheric), Floods, Groundwater, Groundwater movement, Hydrology, *USSR.

The conditions of formation of the flash flood peak in the Soviet Northeast, i.e., in regions ith continuous permafrost, were analyzed on the basis of the data of the Kolyma and Yakutsk Hydrometeorological Service Administrations, particularly observations of the Kolyma hydrologic station, and of personal observations over 14 years of engineering surveys of roads, dams, channel outlets, and other hydraulic installations in the Northeast. Emphasis was placed on small basins, since maximum runoff from such basins is the least resolved engineering hydrology problem. Maximum discharge was usually determined on the basis of surface runoff over slopes. It also was assumed that the entire basin area can participate in flood peak formation. Surface runoff from slopes is hardly ever observed during flash floods in the region in question. This is attributable to the uniqueness of the underlying surface (moss cushion, tundra, etc.) and to the absence of high-intensity rainfalls. therefore, storm seepage-groundwater runoff on slopes were analyzed. (Sims-ISWS)
W78-06402

2E. Streamflow and Runoff

VALIDATION AND IMPLEMENTATION OF A SIMPLIFIED STREAMFLOW SIMULATOR,
Nebraska Univ., Lincoln. Dept. of Computer Science.
A. J. Surkan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 108, Price codes: A09 in paper copy, A01 in microfiche. Nebraska Water Resources Institute, Lincoln, Completion Report, (1977). 179 p, 19 fig, 3 tab, 5 ref, 2 append. OWRT B-031-NEB(2). 14-31-0001-088.

Descriptors: *Model studies, *Computer models, Simulation analysis, Nebraska, *Computer programs(HYDRA), Illinois, North Carolina, Streamflow, *Storm runoff, Monitoring, Flood forecasting, Drainage basins.

Three diverse basin types were selected to demonstrate the ability of the HYDRA package computer programs to successfully simulate the effects of storm events. The Hooper Creek Contributary is an eight-square-mile basin located in a rural area near Eagle, Nebraska. The Oakdale Basin is a small 13-acre residential area in Chicago, Illinois. The Tar Branch Basin drains an area of 384 acres including parts of downtown Winston-Salem, North Carolina and adjacent industrial areas. The results obtained are reported in a manuscript included as an appendix. Both channel and distributed network representations were used for the Hooper Basin. Oakdale and Tar Branch were represented as distributed networks. The results obtained using HYDRA for the Tar Branch Basin were comparable to those obtained using the Road Research Laboratory method and the ILLUDAS method. The results for the Hooper and Oakdale basins showed that HYDRA was highly successful in the simulation of storm runoff responses for the conditions of the watersheds at the time of the storms studied. The second appendix documents the programs of the HYDRA package for users wanting to operate and adapt the system for a wide range of applications. The HYDRA package's versatility coupled with its ability to simulate the effects of a storm moving over the network should help to identify those patterns of storm speed and direction which have the potential of producing abnormally sharp increases in flow volume. The HYDRA package could also be used as a system dedicated to the real-time monitoring of potential flood sites with the foal of minimizing damage by providing timely warning of flood conditions.
W78-06205

FLOOD ROUTING BY THE MUSKINGUM METHOD,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
M. A. Gill.
Journal of Hydrology, Vol 36, No 3/4, p 353-363, February 1978. 7 fig, 2 tab, 5 ref.

Descriptors: *Flood routing, Equations, *Rivers, Streamflow, Hydrology, Surface waters, Mathematical studies, Least squares method, Numerical analysis, Channels, *Muskingum method.

The coefficients k and x in the linear Muskingum equation were determined by the least-squares method (LSM). A routing scheme was proposed for situations where the storage and weighted flow relationship is nonlinear. Although the routing coefficients in the nonlinear equation were not determined by LSM, an alternative working method was proposed. Another simple method for nonlinear flood routing was proposed which was called herein the segmented- curve method. The coefficients in this method were determined by LSM. This method involved only slightly more work than was required in the linear Muskingum method which is inaccurate in nonlinear problems. (See-ISWS)
W78-06211

ALGEBRAIC SOLUTION OF THE HORTON-IZZARD TURBULENT OVERLAND FLOW MODEL OF THE RISING HYDROGRAPH,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
M. A. Gill.
Nordic Hydrology, Vol 8, No 4, p 249-256, 1977. 2 fig, 8 ref.

Descriptors: *Overland flow, *Turbulent flow, *Hydrographs, Analytical techniques, Hydraulics, Mathematics, Methodology, Laminar flow, Equations, Flow, *Horton's equation, Equilibrium time, Transitional flows.

In the differential equation of the overland turbulent flow which was first postulated by Horton, the value of c equals 5/3. For this value of c, the flow equation could not be integrated algebraically. Horton solved the equation for c = 2 and believed that his solution was valid for mixed flow. The flow equation with c = 5/3 was solved algebraically herein. It was shown elsewhere that the flow equation indeed can be integrated for any rational value of c. (Singh-ISWS)
W78-06215

THE 1976 DROUGHT IN FRANCE: CLIMATOLOGICAL ASPECTS AND CONSEQUENCES (LA SECHERESSE 1976 EN FRANCE: ASPECTS LIMATOLOGIQUES ET CONSEQUENCES),
Direction de la Meteorologie, Boulogne-Billancourt (France).
For primary bibliographic entry see Field 2B.
W78-06221

LOW RIVER RUNOFF,
A. M. Vladimirov.
Soviet Hydrology, Selected Papers, Vol. 15, No. 2, p 138-141, 1976. 7 ref. Translated from Trudy IV Vsesoyuznogo Gidrologicheskogo S'yezda, Vol. 3, p 398-406, 1975.

Descriptors: *Low flow, *Rivers, *Runoff, *Groundwater, Base flow, Droughts, Foreign research, Water levels, Flow, Streamflow, River flow, Water supply, Water shortage, Subsurface waters, Subsurface runoff, Surface-groundwater relationships, Evaporation, Precipitation(Atmospheric), Hydrology, *USSR.

There are two main phases in the water regime of rivers: a high-flow (spring flood and flash flood) phase, and a low-flow phase. The latter is typical of periods with limited water inflow into rivers and can be observed in winter and the summer-autumn season. In those periods, river runoff is tens and even hundreds of times lower than during the spring flood and flash floods. Runoff in some rivers become depleted to the extent that the rivers dry out (in summer) or freeze solid (in winter). The duration of the low-flow period may vary from tens of days to 10-11 months, depending on climatic conditions and the size of the river. In that period, various branches of industry may experience a severe water shortage. Furthermore, in some regions the water shortage may be the only factor limiting the development of industry and economy. It is obvious, therefore, that sufficiently accurate informtion on river runoff during the low-flow period is sorely needed. Correct analysis of the conditions of runoff formation and development of sound recommendations for computations are impossible without a clear idea of the role of physiographic factors in river runoff formation. A combination of factors affects the conditions of formation of low runoff and its magnitude. This combination can be divided into two groups: climatic factors and underlying-surface factors. (Sims-ISWS)
W78-06227

HYDROGRAPH SYNTHESIS USING LANDSAT REMOTE SENSING AND THE SCS MODELS,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. M. Ragan, and T. J. Jackson.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-30632, Price codes: A04 in paper copy, A01 in microfiche. Report No. NASA-TM-X-71175 or Preprint X-913-76-161, July 1976. 57 p, 14 fig, 15 tab, 12 ref.

Descriptors: *Satellites(Artificial), *Aerial photography, *Hydrographs, *Synthetic hydrology, Methodology, Urban runoff, Computers, Model studies, Soil types, *LANDSAT data.

The land cover requirements of the Soil Conservation Service (SCS) Model used for hydrograph synthesis in urban areas were modified to be LANDSAT compatible. The curve numbers obtained with these alternate land cover categories compared well with those obtained in published example problems using the conventional categories. Emergency spillway hydrographs and synthetic flood frequency flows computed for a 21.1 sq mi test area showed excellent agreement between the conventional aerial photo-based and the LANDSAT-based SCS approaches. (Singh-ISWS)
W78-06236

POTAMOLOGY INVESTIGATION, RELATIONSHIP BETWEEN CALCULATED HYDRAULIC PARAMETERS AND PHYSICAL FEATURES OF THE CHANNEL.
Water and Environment Consultants, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 8B.
W78-06237

POTAMOLOGY INVESTIGATION, A STUDY OF THE SHIFT IN THE STAGE-DISCHARGE RELATIONSHIP OF THE MISSOURI RIVER AT SIOUX CITY, IOWA.
Water and Environment Consultants, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 4A.
W78-06238

HISTORICAL STREAMFLOW SUMMARY, MANITOBA, TO 1976.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W78-06310

HISTORICAL STREAMFLOW SUMMARY, SASKATCHEWAN, TO 1976.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W78-06311

MAGNITUDE AND FREQUENCY OF FLOODS IN SOUTHERN ONTARIO,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
B. P. Sangal, and R. W. Kallio.
Technical Bulletin Series No. 99, 1977. 336 p, 171 fig, 13 tab, 77 ref.

Descriptors: *Flood data, *Flood forecasting, *Flood frequency, Flow average, Flow measurement, Drainage, Drainage water, *Canada, *Flood frequency regions, *Ontario, Canadian Shield, St. Lawrence lowlands, Saugeen-Nottawasaga system, Maitland-Thames-Grand systems, Lake St. Clair, Niagara Peninsula, Lake Ontario, Trent-Severn system.

Flood frequency analyses for southern Ontario rivers have been performed using five theoretical frequency distributions: the extreme value type I

or Gumbel, Pearson type III, log-Pearson type III, log-normal and the three-parameter log-normal. A total of 129 gauging stations with 10 to 58 years of recorded maximum mean daily flows have been used. The Fuller formula, and a modification of the formula, have been found applicable for the estimation of the average and maximum ratios of the instantaneous peak flow to the mean daily flow. A regional flood frequency analysis has been carried out. Southern Ontario has been divided into nine hydrologic regions with roughly similar soils and physiographic characteristics. For each region, a graphical relationship between the mean annual flood and drainage areas was determined. The use of the ratio of the mean annual flood to mean annual runoff was investigated to determine if an additional parameter, mean annual runoff, had an effect on the mean annual flood in the study area. Dimensionless frequency curves based on the three-parameter log-normal distribution were derived for each region, giving the ratio of flood estimate to the mean annual flood for selected probabilities. (WATDOC)
W78-06312

BUOYANCY EFFECTS IN THERMALLY STRATIFIED OPEN-CHANNEL FLOW,
Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
For primary bibliographic entry see Field 8B.
W78-06371

URBANIZATION: HYDROLOGIC-HYDRAULIC-DAMAGE EFFECTS,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 4C.
W78-06385

PARALLEL CASCADES MODEL FOR URBAN WATERSHEDS,
Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Civil Engineering.
For primary bibliographic entry see Field 4D.
W78-06386

FLASH FLOOD FORMATION IN PERMAFROST REGIONS,
For primary bibliographic entry see Field 2C.
W78-06402

METHODS FOR REFINING SAMPLE ESTIMATES OF THE PARAMETERS OF HYDROLOGIC SERIES,
V. V. Aturin, V. V. Zubarev, and C. G. Kostina.
Soviet Hydrology, Selected papers, Vol 15, No 2, p 123-126, 1976. 2 tab, 8 ref. Translated from Trudy IV Vsesoyuznogo Gidrologicheskogo S'yezda, Vol 3, p 192-200, 1975.

Descriptors: *Hydrologic data, *Data processing, *Estimating equations, Mathematics, Equations, Runoff, Rivers, Annual, Statistics, Markov processes, Monte Carlo method, Analytical techniques, Mathematical models, Hydrology, Hydrologic series, Hydrologic parameters.

Some ways of refining sample estimates of the parameters of the probability distribution of annual river runoff were examined by comparison with the values obtained by methods developed at the present time. The following parameters, characterizing (along with the type of distribution curve and the correlation apparatus) the patterns of annual runoff fluctuations, were refined: the coefficient of variations, the ratio of the coefficient between the runoff of successive years (with approximation of the physical process in question by a simple Markov chain). Three ways were considered of refining sample estimates of the parameters of annual runoff series: (1) experimentally, on the basis of investigations of the distributions of instantaneous estimates of the parameters from samples of artificial hydrologic series simulated by the Nonte Carlo method; (2) on the basis of the method of maximum likelihood by allowing for connectedness within the series; and (3) using Bayes' approach to estimating the parameters of time series. It was found that the methods for estimating the parameters of runoff series, developed in hydrology, do not exhaust the possibilities of modern mathematics. The accuracy of the estimates can be improved by continuing the investigations described here. Their effectiveness will determine future computations. The investigations described were performed in application to annual runoff fluctuations. However, they can be used also to study runoff fluctuations over smaller time intervals. (Sims-ISWS)
W78-06403

REGIONAL WORKING FORMULA OF MAXIMUM RUNOFF IN THE SYRIAN ARAB REPUBLIC,
For primary bibliographic entry see Field 4A.
W78-06404

PROBLEMS ASSOCIATED WITH MAINTENANCE OF CHANNEL CAPACITY BELOW FEDERAL RESERVOIRS IN KANSAS,
Kansas Water Resources Research Inst., Manhattan.
T. Huang, and E. C. Pogge.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 560, Price codes: A06 in paper copy, A01 in microfiche. Contribution No. 195, February 1978. 108 p, 39 fig, 4 tab, 36 ref, 2 append. OWRT A-075-KAN(1), 14-34-0001-6017.

Descriptors: *Morphology(Channel), *Stream erosion, *Alternation of flow, Degradation(Stream), *Channel flow, Alluvial channels, Reservoir operation, Model studies, *Kansas, Wakarusa River(Kan), Fluvial sediments, Clinton Dam(Kan), *Channel capacity, *Reservoir regulated flow, *Channel geometry.

Changes in channel geometry and channel capacity resulting from the construction of large impoundment structures on alluvial streams are examined. The theories and concepts of fluvial morphology and free-surface flow are utilized to develop conceptual models relating to the changes and trends of changes resulting when the natural flow regime of a stream is altered through the construction and operation of a large reservoir. A series of case studies for stream reaches below existing reservoirs are performed utilizing the limited amount of data that was available. Results of the case studies support conclusions derived from the conceptual models. A channel degradation model is developed and tested on the Wakarusa River below Clinton Dam near Lawrence, Kansas. Although the results are not conclusive, they indicate consistent trends which are in agreement with those predicted by theoretical analysis. A series of channel cross-sections on the Wakarusa River have been established, monumented and surveyed. These will be periodically resurveyed to provide more consistent data on actual channel changes occurring below Clinton Dam.
W78-06580

TIME-OF-TRAVEL AND DYE-DISPERSION STUDIES OF SELECTED STREAMS AND LAKES IN THE OSWEGO RIVER BASIN, NEW YORK, 1967-75,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06589

TECHNIQUE FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS IN TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06591

APPLICATION OF A RAINFALL-RUNOFF MODEL IN ESTIMATING FLOOD PEAKS FOR SELECTED SMALL NATURAL DRAINAGE BASINS IN TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06602

WATER RESOURCES ALONG THE TAPS ROUTE, ALASKA, 1970-74,
Geological Survey, Anchorage, AK. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06603

HYDROLOGIC DATA FOR LITTLE ELM CREEK TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06604

2F. Groundwater

DETERMINATION OF UNCONFINED AQUIFER PARAMETERS USING PARTIALLY PENETRATING WELLS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soil and Water Engineering.
S. K. Sondhi, and S. R. Singh.
Journal of Hydrology, Vol 36, No 3/4, p 225-231, February 1978. 2 fig, 2 tab, 17 ref.

Descriptors: *Water table aquifers, *Aquifer characteristics, *Hydraulic properties, *Wells, *Penetration, *Mathematical models, Model studies, Curves, Equations, Dupuit-Forchheimer theory, Groundwater movement, Pumping, *Partially penetrating wells, *Effective penetration, Sand tank models.

An analytical solution was developed to determine unconfined aquifer parameters by conducting pump tests on partially penetrating wells. The aquifer was assumed to be homogeneous, isotropic, and infite in areal extent. A new concept of 'effective penetration' was introduced. A dimensionless curve was developed to find the effective penetration of the well. A circular sand tank model was used to check the applicability of the relationships developed. (Visocky-ISWS)
W78-06209

ANALYTIC SOLUTIONS FOR DRAWDOWNS IN WEDGE-SHAPED ARTESIAN AQUIFERS,
Birmingham Univ. (England). Dept. of Mechanical Engineering.
Y. K. Chan, N. Mullineux, J. R. Reed, and G. G. Wells.
Journal of Hydrology, Vol 36, No 3/4, p 233-246, February 1978. 7 fig, 6 ref, 3 append.

Descriptors: *Drawdown, *Artesian aquifers, *Mathematical models, *Equations, Wells, Pumping, Boundaries(Surfaces), Homogeneity, Equations, Model studies, *Wedge-shaped aquifers.

Analytical solutions for the drawdowns due to a single well pumping at a constant rate from homogeneous artesian aquifers, whose plan view is wedge-shaped, were derived both for infinite and finite wedges under a variety of boundary conditions and for general angle. The influence of the bounding arc in the finite wedge was examined. The methods can be used in wedges in which the traditional method of images is not applicable. (Visocky-ISWS)
W78-06210

MEASUREMENT OF VERTICAL RECHARGE TO GROUNDWATER IN HARYANA STATE (INDIA) USING TRITIUM TRACER,
Indian Inst. of Tech., Kanpur. Dept. of Chemistry.
P. S. Goel, P. S. Datta, and B. S. Tanwar.
Nordic Hydrology, Vol 8, No 4, p 211-224, 1977. 10 fig, 4 tab, 10 ref.

Descriptors: *Groundwater recharge, *Measurement, *Tritium, *Tracers, *Soil water movement, Unsaturated flow, Aquifers, Recharge, Radioisotopes, Rainfall, Monsoons, Irrigation, Sampling, Foreign countries, Foreign research, *India, Piston-type flow.

Downward movement of soil moisture due to rainfall and supplemental irrigation in the unsaturated zone has been followed by tagging a layer of soil with tritiated water at a number of sites in the state of Haryana. The activity apparently moves by a piston type flow. The average recharge for 15 sites during the interval July-November, 1973, has been equivalent to 9 cm of water which is 14% of the irrigation plus rainfall. For 18 sites sampled after two monsoons (July 1973 to December 1974) the average recharge is 19 cm and the fractional recharge is 0.15. Wide variations in recharge values are noted. The most significant factor affecting the fractional recharge is the clay content of the soil. (Visocky-ISWS)
W78-06212

GROUNDWATER RECHARGE IN PANJAB-STATE (INDIA) USING TRITIUM TRACER,
ndian Inst. of Tech., Kanpur. Dept. of Chemistry.
P. S. Datta, and P. S. Goel.
Nordic Hydrology, Vol 8, No 4, p 225-236, 1977. 0 fig, 3 tab, 7 ref.

Descriptors: *Groundwater recharge, Measurement, *Tritium, *Tracers, Aquifers, Recharge, Radioisotopes, Rainfall, Monsoons, Irigation, Sampling, Water table, Foreign countries, Foreign research, *India.

Vertical recharge to groundwater due to the 1972 nonsoon plus supplemental irrigation was meaured at 21 sites in the state of Panjab (India) using ritium tracer. Average recharge was found to be quivalent to 8.5 cm of water. This is about 18% of he average rainfall and 12% of the total watering. Visocky-ISWS)
W78-06213

MICROWAVE INTERFERENCE DETECTION OF SUBSURFACE WATER,
Drexel Univ., Philadelphia, PA. Dept. of Civil Engineering.
. A. Okrasinski, A. E. Lord, Jr., and R. M. Koerner.
ournal of the Geotechnical Engineering Division, merican Society of Civil Engineers, Vol. 104, o. GT1, p 119-124, January 1978. 2 fig, 1 tab, 7 ef, 1 append. EPA R-804763010.

escriptors: *Microwaves, *Radio interference, Groundwater, *Water table, Laboratory tests, adar, Radio waves, Subsurface waters, Measurent, Equipment, Instrumentation, Hydrology.

series of laboratory tests was presented. The sts confirmed the feasibility and indicated the ccuracy of using microwave interference patterns locate the depth from the ground surface to a ater surface. Using existing microwave technolo- (which is well advanced) and equipment (which asonably priced and commercially available), it ppears that this technique can be applied to oblems of concern to the geotechnical engineer. uch problems as water table location, phreatic rface location, and seepage from earth dams, om behind retaining walls and into excavations e examples that appear to be suitable candidates r use of the microwave technique. (Sims-ISWS) 78-06225

LOW RIVER RUNOFF,
For primary bibliographic entry see Field 2E.
W78-06227

GROUND WATER RECHARGE TO THE AQUIFERS OF NORTHERN SAN LUIS VALLEY, COLORADO: A REMOTE SENSING INVESTIGATION,
Colorado School of Mines, Golden, Dept. of Geology.
D. Huntley.
Available from the National Technical Information Service, Springfield, VA 22161 as E77-10149, Price codes: A19 in paper copy, A01 in microfiche. Remote Sensing Report 76-3, (NASA-CR-152649), December 1976. 298 p, 98 fig, 5 tab, 111 ref, 6 append. NASA NGL 06-001-015.

Descriptors: *Groundwater, *Remote sensing, *Hydrogeology, *Groundwater basins, *Geohydrologic units, *Groundwater recharge, *Colorado, Aerial photography, Soil types, Vegetation, Regional analysis, Water resources, *San Luis Valley(Colo), Infrared photography, Thermal sensing, Resource evaluation.

The northern San Luis Basin can be divided into three distinct but hydrologically connected provinces. Faults are important in all regions: providing areas of increased permeability or acting as groundwater barriers. Use of aerial photography and thermal-infrared imagery resulted in a significant savings in time and increase in accuracy in this regional groundwater supply. Reflectance measurements showed that absolute reflectance differences in one part of the spectrum can be extrapolated to the rest of the photographic spectrum. Spectral variations related to vegetation variation, in turn related primarily to water availability, are extremely important in hydrogeologic studies. Both vegetation and saline soils can be used to distinguish between shallow and deep groundwater, but saline soil distribution is a more dependable indicator in San Luis Valley. Temperature differences seen on thermal-infrared imagery can be related to differences in thermal inertia, solar reflectance, evaporation rates, or subsurface temperature distribution. Both evaporative cooling and temperature effects due to varying groundwater depth affect the diurnal temperature curve in the same manner and are indistinguishable. (Adams-ISWS)
W78-06242

HYDRAULIC FRACTURING OF DRILLED WATER WELLS IN CRYSTALLINE ROCKS OF NEW HAMPSHIRE,
New Hampshire Dept. of Resources and Economic Development, Concord. State Geologists Office.
For primary bibliographic entry see Field 4B.
W78-06372

ENVIRONMENTAL ISOTOPIC STUDY OF THE CAMPI FLEGREI (NAPLES, ITALY) GEOTHERMAL FIELD,
Comitato Nazionale per le Ricerche Nucleari, Pisa (Italy). Lab. di Geologia Nucleare.
For primary bibliographic entry see Field 2K.
W78-06387

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1976 TO SPRING 1977,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06583

MAP SHOWING GROUND-WATER CONDITIONS IN THE LOWER VERDE RIVER AREA, MARICOPA, YAVAPAI, AND GILA COUNTIES, ARIZONA-1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06585

THE CLINTON STREET-BALLPARK AQUIFER IN BINGHAMTON AND JOHNSON CITY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06587

APPRAISAL OF THE WATER RESOURCES OF DEATH VALLEY, CALIFORNIA-NEVADA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06593

GROUND-WATER DATA FOR MICHIGAN, 1976,
Geological Survey, Lansing, MI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06598

EFFECTIVENESS OF PILOT CONNECTOR WELL IN ARTIFICIAL RECHARGE OF THE FLORIDAN AQUIFER, WESTERN ORANGE COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06599

DIGITAL-MODEL EVALUATION OF THE GROUND-WATER RESOURCES IN THE OCOTILLO-COYOTE WELLS BASIN, IMPERIAL COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
J. A. Skrivan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 533, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-30, November 1977. 50 p, 17 fig, 2 tab, 14 ref.

Descriptors: *Mathematical models, *Groundwater resources, *Arid lands, *California, *Hydrogeology, Aquifer characteristics, Pumping, Water yield, Water supply, Water demand, Drawdown, Groundwater recharge, Projections, Finite element analysis, *Imperial County(Calif), *Ocotillo.

A flow model using finite-element techniques has been constructed for an alluvial aquifer in the Ocotillo-Coyote Wells Basin, Imperial County, Calif. Natural recharge is about 2,600 acre-feet per year, and estimated ground water in storage is 640,000 acre-feet. Pumpage totaled 880 acre-feet in 1975. The computed decline from steady-state conditions in 1925 to December 1975 was 15 feet in Ocotillo. The projected decline from 1976 to 1995 with annual pumpage of 1,000 acre-feet is 6 feet and with annual pumpage of 2,000 acre-feet is 17 feet in Ocotillo. In the latter projection, continued pumping after 1995 may cause saline water to flow toward the potable ground water in and around Ocotillo. (Woodard-USGS)
W78-06600

DIGITAL COMPUTER SIMULATION MODEL OF THE ENGLISHTOWN AQUIFER IN THE NORTHERN COASTAL PLAIN OF NEW JERSEY,
Geological Survey, Trenton, NJ. Water Resources Div.
W. D. Nichols.

Geological Survey Water-Resources Investigations 77-73 (open-file report), 1977. 101 p, 31 fig, 7 tab, 59 ref.

Descriptors: *Groundwater resources, *Model studies, *Hydrogeology, *Aquifer characteristics, *Computer models, New Jersey, Water supply, Pumping, Drawdown, Water yield, Groundwater recharge, Hydrologic properties, Leakage, Transmissivity, Groundwater movement, Simulation analysis, Evaluation, *Englishtown aquifer(NJ).

Continued decline of water levels in the Englishtown aquifer, in New Jersey, has caused considerable concern regarding the ability of the aquifer to meet future yield demands. A detailed study of the capability of the aquifer to yield water entailed the use of a digital computer simulation model to evaluate aquifer and confining layer coefficients and to test alternative concepts of the hydrodynamics of the flow system. The modeled area includes about 750 square miles of the northern Coastal Plain of New Jersey and encompasses all the major centers of pumping from the Englishtown aquifer. The simulation model was calibrated by matching computed declines with historical water-level declines over the 12-year period, 1959-70. The volume of transient and steady leakage into the Englishtown aquifer from and through the adjacent confining layers equaled more than 90 percent of the total volume of water withdrawn from the aquifer between 1959 and 1970. The analytical estimate of transient leakage indicates that about 60 percent of the water withdrawn from the Englishtown between 1959 and 1970 was replaced by water released from storage in the adjacent confining beds. An additional 34 percent of the withdrawal over this time period was supported by steady leakage through the overlying confining bed from the Mount Laurel aquifer. Of the more than 30 billion gallons withdrawn from the aquifer over the 12-year period, about 2 billion gallons were obtained from storage in the aquifer. The values of aquifer and confining-layer coefficients used in the model are nearly the same as the average values obtained from field and laboratory data. (Woodard-USGS)
W78-06601

APPRAISAL OF GROUND-WATER CONDITIONS IN MERCED, CALIFORNIA, AND VICINITY,
Geological Survey, Menlo Park, CA. Water Resources Div.
R. W. Page.
Open-file report 77-454, December 1977. 43 p, 12 fig, 5 plates, 11 tab, 26 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Hydrogeology, *Water quality, *Water yield, *California, Pumping, Water level fluctuations, Groundwater movement, Groundwater recharge, Water wells, Water supply, Evaluation, Hydrologic data, Maps, Chemical analysis, *Merced area(Calif).

Merced is in the northeastern part of the San Joaquin Valley, California. The fresh-groundwater basin is about 1,200 feet thick. Five aquifers are defined in the Merced area: (1) The Mehrten Formation (Miocene and Pliocene), (2) a confined aquifer, (3) an intermediate aquifer, (4) a shallow aquifer, and (5) a probable unconfined aquifer. Ground water moves generally westward or southwestward. Recharge to the aquifers is from ground-water flow, leakage, and irrigation water. Discharge is by seepage, evaporation, transpiration, and pumping. Fluctuations in water level vary from place to place. The chemical quality of ground water is good and is generally a bicarbonate-type water. (Woodard-USGS)
W78-06606

GROUND WATER DIFFERENCES ON PINE AND HARDWOOD FORESTS OF THE UDELL EXPERIMENTAL FOREST IN MICHIGAN,
North Central Forest Experiment Station, St. Paul, MN.
D. H. Urie.
U.S. Department of Agriculture, Forest Service, Research Paper NC-145, 14 p. 1977. 8 fig, 10 ref, 2 tab.

Descriptors: *Groundwater recharge, *Deciduous forests, *Coniferous forests, *Michigan, Pine trees, Hydrologic budget, Water table, Sands, Water yield, Watersheds(Basins), Groundwater, Natural recharge.

Groundwater recharge under hardwood and pine forests was measured from 1962 to 1971 on the Udell Experimental Forest in Michigan. Hardwood forests produced more net groundwater than pine forests by an average of 50 and 100 mm/yr, using two methods of analysis. Shallow water-table lands yield 80 to 100 mm/yr less water than deep well-drained sands. Water yield decreased the most between drainage classifications of pine plantations. (Witt-IPC)
W78-06640

2G. Water In Soils

MEASUREMENT OF VERTICAL RECHARGE TO GROUNDWATER IN HARYANA STATE (INDIA) USING TRITIUM TRACER,
Indian Inst. of Tech., Kanpur. Dept. of Chemistry.
For primary bibliographic entry see Field 2F.
W78-06212

GROUNDWATER RECHARGE IN PANJAB-STATE (INDIA) USING TRITIUM TRACER,
Indian Inst. of Tech., Kanpur. Dept. of Chemistry.
For primary bibliographic entry see Field 2F.
W78-06213

A MONTHLY WATER BALANCE MODEL INCLUDING DEEP INFILTRATION AND CANAL LOSSES,
Vrije Univ., Brussels (Belgium). Lab. of Hydrology.
For primary bibliographic entry see Field 2A.
W78-06220

SALT EFFECTS ON THE HYDRAULIC PROPERTIES OF A SWELLING SOIL,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
J. H. Dane, and A. Klute.
Soil Science Society of America Journal, Vol. 41, No. 6, p 1043-1049, November-December 1977. 10 fig, 1 tab, 24 ref.

Descriptors: *Soils, *Soil physical properties, Hydraulic properties, *Hydraulic conductivity, *Salts, Electrolytes, Salinity, Instrumentation, Hydraulic gradient, Tensiometers, Pressure head, Loads(Forces), *Sodium adsorption ratio, Water retention, Swelling soil.

The effects of soil solution composition on the hydraulic conductivity, K, and the volumetric soil solution content, theta, were measured with mixed NaCl-CaCl2 solutions. The total electrolyte concentration, C, and the sodium adsorption ratio, SAR, characterized the applied solutions. Steady-state flow cells were constructed with provision for (1) measurement of the volumetric flux of the solution phase during saturated and unsaturated flow conditions, (2) measurement of the volumetric soli solution content by gamma attenuation, (3) tensiometers for hydraulic gradient and pressure head, h, measurement, (4) application of an external load on the soil, and (5) measurement of bulk volume changes. Soil samples were subjected to sequences of solutions varying in C from 1,000 meq/liter to 10 meq/liter at constant SAR values of 0, 5, 15, 25, and 40, respectively. Hydraulic conductivity decreases occurred during the first sequence of decreasing C at fixed SAR values equal to or greater than 5. The higher the SAR value, the greater the decrease in K with decreasing C. The K decreases occurred at all volumetric soil solution contents within the range of experimental data. Increases in theta, at given h values, and decreases in bulk density (pb), occurred simultaneously with the decrease in K. Greater changes in K and theta, and smaller changes in pb occurred in the soil subjected to a higher external load. The K and pb decreases and the theta increases were to a great extent irreversible, i.e., when C was increased subsequently at a fixed SAR value, K, pb, and theta did not regain their initial values. Substantial increases in K were obtained, however, if the soil was air dried, sieved, and repacked into the flow cell. (Visocky-ISWS)
W78-06222

AN EVALUATION OF SEVERAL METHODS OF ESTIMATING SOIL VOLUME CHANGE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agronomy.
J. C. Parker, D. F. Amos, and D. L. Kaster.
Soil Science Society of America Journal Vol. 41, No. 6, p 1059-1064, November-December 1977. 4 tab, 38 ref.

Descriptors: *Soils, *Volume, *Plasticity index, *Soil properties, Soil tests, Clays, Moisture content, Shrinkage, Hygroscopic water, Regression analysis, Statistical methods, *Soil volume, *Swell index, Activity index, Potential volume change, Sodium adsorption ratio.

The accuracy of several previously proposed methods of estimating potential soil volume change was evaluated using samples from the B2 horizons of three pedons of each of five soil series having various swelling characteristics. Models involving swell index, plasticity index, clay content, activity index, initial and final water contents, shrinkage limit, shrinkage ratio, liquid limit, linear shrinkage, and hygroscopic moisture content were evaluated by regression analysis with percent volume change of natural clods as the dependent variable. Most methods were found to be either too imprecise or too involved to be useful. The most practical correlations were with swell index (r aq = 0.92) and with plasticity index (r sq = 0.79). Estimates using these procedures should be used cautiously since their accuracy is only + or - 12 to 18% volume change, respectively, at the 95% confidence level. (Visocky-ISWS)
W78-06223

SURVIVAL AND MOVEMENT OF FECAL INDICATOR BACTERIA IN SOIL UNDER CONDITIONS OF SATURATED FLOW,
Oregon State Univ., Corvallis. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W78-06224

CARBON AND NITROGEN TRANSFORMATIONS IN SOILS AMENDED WITH SEWAGE SLUDGE,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 5E.
W78-06282

TRENCH INCORPORATION OF SEWAGE SLUDGE IN MARGINAL AGRICULTURAL LAND,
Agricultural Research Service, Beltsville, MD. Biological Waste Management Lab.
For primary bibliographic entry see Field 5B.
W78-06297

FACTORS CONDUCIVE TO THE CONTAMINATION OF SOIL WITH OPISTHORCHIS EGGS AND THEIR SURVIVAL IN THE ENVIRONMENT OF THE OB RIVER AREA (IN RUSSIAN),
All-Union Scientific Research Inst. of Medical Parasitology and Tropical Diseases, Moscow (USSR).
For primary bibliographic entry see Field 5B.
W78-06346

EFFECTS OF WATER ON SLOPE STABILITY,
Kentucky Bureau of Highways, Lexington. Div. of Research.
For primary bibliographic entry see Field 8D.
W78-06377

NEW METHOD INJECTS SLUDGE INTO SOIL.
For primary bibliographic entry see Field 5D.
W78-06453

VEGETATION MANIPULATION - A CASE STUDY OF THE PINYON-JUNIPER TYPE,
Utah State Univ., Logan. Coll. of Natural Resources.
For primary bibliographic entry see Field 2I.
W78-06526

AN EVALUATION OF THE POTENTIAL FOR USING DRAINAGE CONTROL TO REDUCE NITRATE LOSS FROM AGRICULTURAL FIELDS TO SURFACE WATERS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W78-06578

QUALITY OF PERCOLATE BELOW THE ROOT ZONE OF SELECTED VEGETABLES GROWN IN NORTHERN GUAM,
Guam Univ., Agana. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-06582

PEATLAND AND WATER IN THE NORTHERN LAKE STATES,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 4D.
W78-06639

GROUND WATER DIFFERENCES ON PINE AND HARDWOOD FORESTS OF THE UDELL EXPERIMENTAL FOREST IN MICHIGAN,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 2F.
W78-06640

MOISTURE DETECTION APPARATUS,
For primary bibliographic entry see Field 3F.
W78-06668

TRANSLOCATION OF LABELLED FERTILIZER NITROGEN IN SOIL COLUMNS, (IN GERMAN),
Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf. Inst. fuer Landwirtschaft; and Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf. Forschungzentrum.
E. Haunold, and J. Zvara.
Bodenkultur 26(3), p 221-232, 1975.

Descriptors: Ammonium, Drainage, *Fertilizers, Leaching, *Nitrates, *Nitrogen, Potassium, Soil, Sulfates, *Translocation, Water pollution, Soil water.

The translocation of labelled fertilizer N in soils was studied in a 2 yr trial. (15NH4)2SO4 and K15NO3 were applied at 150 and 300 kg/ha. The fertilizers were placed in autumn on top of soil columns, in the 1st yr as salt, in the 2nd yr, in solution. The columns 45 cm in length and 5 cm in diameter contained about 1 kg soil, taken from the area of Fuchsenbigl (Lower Austria) and were buried in the soil with only a 5 cm top part remaining above ground. Soil pH was 7.6. The following year at the end of June, the columns were taken out, cut into segments and analyzed. The drainage water was also analyzed. The water balance for the 1st yr with a total amount of precipitation of 393 mm was as follows: 17% was recovered in the form of drainage water, 30% was found in the soil and 53% was lost by evaporation. At the end of the 2nd yr, with a rainfall of 170 mm during the investigation period, these figures were 12, 56, and 32%, respectively. The total amount of N, found in the drainage water after NH4 application was equal in both years and not significantly different from the controls. When N was applied as NO3, a higher amount of total N was recovered in the drains. when fertilizer was given as NH4, the interchange rate with the soil N was 10 and 13%, with NO3 2%. When fertilizing with NH4 7.6 and 6.6% were leached out, 37.9 and 33.7% remained in the soil, 54.5 and 59.7% were lost as gaseous N. After NO3 application 29.6 and 22.6% were found in the drainage water; 18.1 and 16.7% remained in the soil, and 52.3 and 60.6% were lost. At the end of the 2nd yr 10.3 and 5.9% of the applied NH4 were recovered in the drainage water, 50.1 and 44.1% remained in the soil and 39.5 and 50.1% were lost. After NO3 application these figures were 47.3 and 43.3$, then 40.0 and 34.8% and the losses were 12.7 and 21.9%, respectively.--Copyright 1977, Biological Abstracts, Inc.
W78-06674

COMPOSITION OF DIFFERENT FRACTIONS OF SOIL SOLUTIONS (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Soil Science.
E. M. Samoilova, and V. A. Demkin.
Pochvovedenie 11, p 24-27, 1976.

Descriptors: *Cation exchange, Chemicals, Ions, *Lysimetric water, Pores, *Soil solutions, *Soil water.

Lysimetric water and the capillary soil solution removed by alcohol or a membrane press have either a different chemical composition or a different quantitative ion ratio. This phenomenon is due to cation exchange between liquid and solid soil phases proceeding differently in pores of different diameters.--Copyright 1977 Biological Abstracts, Inc.
W78-06676

2H. Lakes

EFFECTS OF BURROWING TUBIFICID WORMS ON THE EXCHANGE OF PHOSPHORUS BETWEEN LAKE SEDIMENTS AND OVERLYING WATER,
Maine Univ. at Orono. Dept. of Botany and Quaternary Studies.
For primary bibliographic entry see Field 5C.
W78-06202

CHIRONOMIDS (DIPTERA) FROM SEDIMENTS OF LAKE MARTIGNANO (LAZIO), (IN ITALIAN),
Rome Univ. (Italy). Ist. di Zoologia.
For primary bibliographic entry see Field 5B.
W78-06203

FACING THE LONGTERM: AN INQUIRY INTO OPPORTUNITIES TO IMPROVE THE CLIMATE FOR RESEARCH WITH REFERENCE TO LIMNOLOGY IN CANADA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 6E.
W78-06217

RIVER-INDUCED CURRENTS IN A FJORD LAKE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2A.
W78-06219

WAVE REFLECTION AND TRANSMISSION AT PERMEABLE BREAKWATERS,
Massachusetts Inst., of Tech. Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-06229

SATELLITE IMAGES OF LAKE ERIE ICE: JANUARY-MARCH 1975,
National Environmental Satellite Service, Washington, DC.
For primary bibliographic entry see Field 2C.
W78-06231

NITROGEN FIXATION IN LAKES OF THE LAKE WASHINGTON DRAINAGE BASIN,
Washington Univ., Seattle. Dept. of Microbiology.
For primary bibliographic entry see Field 5C.
W78-06326

PROCEEDINGS, MISSISSIPPI WATER RESOURCES CONFERENCE, 1975.
Mississippi State Univ., Mississippi State. Water Resources Research Inst.
For primary bibliographic entry see Field 2J.
W78-06351

THE IMPACT OF URBAN STORMWATER ON THE WATER QUALITY STANDARDS OF A REGULATED RESERVOIR,
Tennessee Univ., Knoxville Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-06362

THE DYNAMICS OF STRATIFICATION AND OF STRATIFIED FLOW IN LARGE LAKES.
International Joint Commission-United States and Canada, Windsor (Ontario). Standing Committee on the Scientific Basis for Water Quality Criteria.
Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, Standing Committee on Lake Dynamics, International Joint Commission, Windsor, Ontario, 1976. 199 p. A.E.P. Watson, Editor.

Descriptors: *Conferences, *Great Lakes, *Stratified flow, *Model studies, *Stratification, *Lake Superior, *Lake Ontario, *Lake Michigan, Lakes, Data collections, Water temperature, Internal waves, On-site investigations, Currents(Water), Upwelling, Mixing, Mathematical models, Thermocline, Laboratory tests, Withdrawal, Inflow, Water quality.

The workshop objective was to address problems relating to the dynamics of lake stratification and to interpret their significance in lakewide, vertical mixing processes. The later contribute to the release and distribution of nutrients and contaminants from sediments. Subject matter presented covered both field observations and analogous laboratory and computer simulation experiments, together with interpretation of results. Several modelling studies were reported. The basis of existing models used for predicting the lake phenomena was reviewed critically. Intrinsic

shortcomings of the models were discussed, and caveats were suggested for guidance in their application to lake management and the related decision-making process. (See W78-06389 thru W78-06399)
W78-06388

SOME OBSERVATIONS OF STRATIFIED FLOW IN LARGE, THERMALLY STRATIFIED LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
E. B. Bennett.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 2; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 15-24, 1976. 6 fig.

Descriptors: *Lake Superior, *Lake Huron, *Great Lakes, *Stratified flow, *Surveys, *Canada, On-site investigations, Currents(Water), Water temperature, Measurements, Stratification, On-site data collections, Hydrography, Lakes, Flow, *Georgian Bay(Canada).

As part of a comprehensive program of study of Lake Superior during 1973, time series records of current flow and water temperature were obtained at 16 predominantly nearshore locations over the period late May through the beginning of October. The recording current meters were placed at depths of 10 m (all moorings), 15 m (13 moorings), 25 m (3 moorings), and 60 m (1 mooring). Fortnightly means of current speed and temperature were calculated from the data from each meter, and then grand averages were estimated for each fortnightly interval and depth. The observations demonstrated a two-fold effect of stratification on current structure: first, there is no shear if there is no stratification; and second, when stratification is strong enough, flux of momentum to the hypolimnion is limited with the result that current becomes weaker there while continuing to increase in the upper layers. A second example of stratified flow was provided by a summary of the 1974 current meter obsevations in Main Channel, which links Lake Huron and Georgian Bay. The recorded currents generally were directed either into or out of Georgian Bay, and the pattern of net currents had both horizontal and vertical structure. (See also W78-06388) (Humphreys-ISWS)
W78-06389

SOME OBSERVATIONS ON FREELY PROPAGATING INTERNAL WAVES IN LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
F. M. Boyce.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 3; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission Windsor, Ontario, p 25-51, 1976. 13 fig, 6 ref.

Descriptors: *Internal waves, *Lake Ontario, *Surveys, *Water temperature, Lakes, On-site investigations, On-site data collections, Data collections, Currents(Water), Waves(Water), Movement, Measurement, Hydrography, Analysis, Temperature.

Measurements of the temperature structure of Lake Ontario were obtained with towed profiling equipment on a north-south transect of the lake during August 1972. Internal waves at three different spatial scales of encounter were detected; 10 km, 1000 m, and 100 m. The longest scale relates to basin-wide internal standing wave modes, while the two shorter scales are associated with freely propagating internal waves. The propagating waves were described via their signatures on the temperature records, and possible mechanism of generation were invoked. It was suggested that the presence of these waves can serve as indicators of physical processes such as large-scale shear flow, laterally unstable boundary currents, and active vertical entrainment of a stratified fluid into a turbulent mixed layer. (See also W78-06388) (Humphreys-ISWS)
W78-06390

ON BULK MODELS OF THERMAL STRUCTURE IN LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
P. F. Hamblin.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 5; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 55-66, 1976. 3 fig, 7 ref.

Descriptors: *Lakes, *Mixing, *Theoretical analysis, *Mathematical models, Analytical techniques, Water temperature, Velocity, Currents(Water), Equations, Analysis, Iced lakes, Thermocline.

It was shown that the bulk approach to the theory of the dynamics of thermal structure in lakes relies upon a number of basic assumptions on the nature of the underlying thermal and velocity structure. In particular, knowledge of the velocity structure in lakes is inadequate at present. Traditionally, only temperature profiles have been measured in lakes. It was argued that before further progress can be achieved in understanding the thermal structure in both the bulk theories and the mixing coefficient approach, which itself requires knowledge of the squared vertical shear through the Richardson number, detailed measurements of the velocity structure as close as possible to the surface will have to be made under a variety of environmental conditions. (See also W78-06388 and W76-03733) (Humphreys-ISWS)
W78-06391

EVOLUTION OF THE LAKE ONTARIO THERMOCLINE DURING IFYGL (INTERNATIONAL FIELD YEAR IN THE GREAT LAKES, 1972),
Michigan Univ., Ann Arbor.
A. W. Green.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 6; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 67-78, 1976. 4 fig, 11 ref.

Descriptors: *Lake Ontario, *Model studies, *Water temperature, *Great Lakes, *Estimating, Thermocline, Lakes, Temperature, On-site tests, Surveys, On-site investigations, Stratification, Thermal stratification.

It was shown that a one-dimensional bulk model gives a good representation of the lake-averaged structure of Lake Ontario. This type of model is of interest to two groups. First, biologists, particularly biological system modelers, can use the results from models to gain some insights about the depth-time variations of some aquatic populations which are influenced by the stratification over the lake as a whole. Second, an important by-product of the model is the estimation of long-term air-lake exchanges of sensible and latent heart, kinetic energy, and water vapor. The gathering of that information was one of the important objectives of the IFYGL study. This model is the first, about which author is aware, that gives estimates of the exchanges with time scales from diurnal to seasonal. (See also W78-06388) (Humphreys-ISWS)
W78-06392

SIMULATION OF THE VERTICAL THERMAL STRUCTURES OF LAKES UNDER TRANSIENT METEOROLOGICAL CONDITIONS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
D. R. F. Harleman, and K. A. Hurley.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 7; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 79-96, 1976. 12 fig, 8 ref.

Descriptors: *Model studies, Water temperature, *Lakes, *Mathematical models, *Laboratory tests, On-site data collections, Theoretical analysis, Analytical techniques, Analysis, Forecasting, Movement, Thermal properties, Thermocline, Equations, Flow, Flow rates, Withdrawal, Reservoirs, Diffusivity, Spatial distribution, Thermal pollution, Heat transport.

The objective was to investigate the sensitivity of the vertical temperature structure of a lake to various parameters under transient meteorological conditions. The model is one-dimensional in the vertical direction; thus, the lake is assumed to be horizontally stratified. The influences of large-scale internal wave motions, waste heat discharges, and coastal boundary layers were not considered. The Ryan and Harleman model, used in the sensitivity studies, is a time dependent, one-dimensional, variable area model based on the absorption and transmission of solar radiation, advection due to inflows and outflows, and convection due to surface cooling. The validity of the basic heat transport model in the absence of wind turbulence and internal wave effects was demonstrated by carefully controlled laboratory experiments. On the model parameters examined, the least information is known about vertical diffusivity. More work needs to be done relating vertical diffusivity to such things as wind effects. (See also W78-06388) (Humphreys-ISWS)
W78-06393

NOTES ON RECENT RESEARCH ON SIMULATION OF TWO-DIMENSIONAL STRATIFIED FLOWS,
Resource Management Associates, Lafayette, CA.
G. T. Orlob.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 9; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 109-124, 1976. 8 fig, 8 ref.

Descriptors: *Stratified flow, *Model studies, *Lakes, *Thermal stratification, Mathematical models, Theoretical analysis, Flow, Junctions, Rivers, Analytical techniques, Equations, Currents(Water), Density currents, Mixing, Heated water, Distribution patterns, Spatial distributions, Two-dimensional flow.

The brief comments presented were intended to summarize some recent efforts to develop and apply the finite element method to the problem of simulation of weakly stratified flows in two dimensions. The basic equations upon which the models were founded are the general Navier-Stokes equation, the continuity equation, and the advection-diffusion equation. The monentum equations were modified to include the effects of bottom and wind friction along the appropriate boundaries. Then the equations were transformed for solution by the finite element technique using the Galerkin method of weighted residuals. The techniques discussed are finding wide application in studies of lakes, reservoirs, and other complex water bodies, particularly those with irregular boundaries or in which hydrodynamics and water quality behavior are closely coupled. Systems that are driven by wind, tide, and Coriolis forces can be simulated,

and the effects of density stratification can be considered. There is a need, as yet unfulfilled, for a more rigorous functional representation of turbulent energy exchange. (See also W78-06388) (Humphreys-ISWS)
W78-06395

NEARSHORE PLUME AND CURRENT STUDIES IN EASTERN LAKE MICHIGAN,
Environmental Technical Assessments, Inc., Oak Brook, IL.
For primary bibliographic entry see Field 5B.
W78-06396

MIXED LAYER DYNAMICS IN SMALL AND MEDIUM SIZED LAKES,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
H. Stefan.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 11; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 143-159, 1976. 8 fig, 2 ref.

Descriptors: *Lakes, *Water temperature, *Stratification, *On-site investigations, *Model studies, *Great Lakes, On-site data collections, Spatial distribution, Temperature, Mixing, Profiles, Energy budget, Reservoirs, Surveys, Entrainment, Thermal stratification, Thermocline.

The temperature structure of lakes or reservoirs depends primarily on energy inputs at the water surface as well as inflows and outflows or withdrawals. The water temperature structure of a lake is very dynamic and constantly in response to changing weather conditions. Therefore, it is appropriate and necessary to use more than a conservation of mass principle. An energy equation using integral energy input at the water surface, i.e. energy in the form of heat and mechanical energy (mostly wind work), was used with good results on small and medium sized lakes. A brief account of this work was given. Measured and predicted water temperature profiles for Lake Calhoun were presented. The integral energy approach to the analysis and prediction of water temperature structures in lakes provided very encouraging preliminary results. Additional research on the mechanics, rates, and scales of vertical energy transfer is needed. For applications to the Great Lakes, horizontal energy flow must be considered jointly with vertical fluxes, which compounds the difficulties, but probably does not make them insurmountable. (See also W78-06388) (Humphreys-ISWS)
W78-06397

NOTE ON LABORATORY MODELING OF SEASONAL THERMOCLINE,
Delaware Univ., Newark, Coll. of Marine Studies.
J. Wu.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 12; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 161-166, 1976. 2 fig, 5 ref.

Descriptors: *Laboratory equipment, *Stratification, *Hydraulic models, Model studies, Laboratory tests, Wind, Methodology, Testing procedures, *Thermocline, Seasonal, Wind-wave tank.

Experimental apparatus, procedure, and results were described briefly. The experiment was conducted in a transparent wind-wave tank 20.5 cm wide and 232 cm long. A blower was installed at the upwind end of the tank and a wave absorber at the downwind end. The tank was covered for the first 190 cm to provide a 9.5 cm high wind tunnel over 28 cm deep water. Two layers of fluids were used, blue-colred freshwater lying over clear saltwater of various densities. the thickening of the blue layer along with the tilting of the density interface under a steady wind were photographed with a movie camera. The rate of entrainment (i.e., the rate of thickening of the upper layer) was found to be constant, and the rate of change of the potential energy of the mixing layer was found to be proportional to the rate of the work done by the wind. However, only a small fraction of the work done by the wind is used for interfacial mixing of developing a seasonal thermocline. In order to simulate more closely the oceanic conditions, a track-shaped wind-wave tank was constructed. Experiments are in progress to study the thermocline erosion and the generation of internal waves. (See also W78-06388) (Humphreys-ISWS)
W78-06398

CONCLUSIONS, RECOMMENDATIONS AND RESEARCH NEEDS,
International Joint Commission-United States and Canada, Windsor (Ontario). Secretariat.
A. E. P. Watson.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 14; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 187-189, 1976.

Descriptors: *Stratification, *Lakes, *Research and development, Stratified flow, Methodology, Water quality, Instrumentation, Hypolimnion, Hydrodynamic, Flow, Water, Waves(Water), Velocity, Currents, Coasts, Boundary layers, Sampling, Profiles, On-site investigations, *Research needs, Wind stress.

Conclusions reached by the participants were: 81) Stratified flows are significant in lakewide vertical mixing processes, but their role in the release and distribution of nutrients and contaminants from sediments requires definition and further study. (2) Definitions and allocations of mixing zones demand an understanding of the dynamics of the water body concerned since, within stratified layers, dispersal rates can vary over very wide ranges. (3) Vertical profile sampling techniques need to be developed. (4) The limitations of most predictive models for the behavior of aquatic systems and their environmental quality depend upon the validity of assumptions regarding flow processes. (5) Such water quality models should be used with discretion as aids in the decision-making process in the management of the Great Lakes. (See also W78-06388) (Humphreys-ISWS)
W78-06399

RESEARCH ON HYGIENIC CONDITIONS OF THE OLIVERI-TINDARI LAKE COMPLEX (MESSINA),
Messina Univ. (Italy). Inst. of Hygiene.
For primary bibliographic entry see Field 5A.
W78-06499

FUNDAMENTAL ANALYSIS OF THE LINEAR MULTIPLE REGRESSION TECHNIQUE FOR QUANTIFICATION OF WATER QUALITY PARAMETERS FROM REMOTE SENSING DATA,
Old Dominion Univ., Norfolk, VA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-06550

TIME-OF-TRAVEL AND DYE-DISPERSION STUDIES OF SELECTED STREAMS AND LAKES IN THE OSWEGO RIVER BASIN, NEW YORK, 1967-75,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06589

PHYTOPLANKTONIC ASSOCIATIONS OF SWEDISH LAKES,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-06683

SOME MESOTROPHIC PHYTOPLANKTON INDICATORS,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-06684

SOME LITTLE KNOWN SWEDISH PHYTOPLANKTERS,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-06685

ON THE VARIATION OF MICRASTERIAS MAHABULESHWARENSIS F. WALLICHII,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-06686

STAURASTRUM PLACTONICUM ANS ST. PINGUE: A STUDY OF PLANKTONIC EVOLUTION,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-06687

PHYTOPLANKTON OF LAKE SHIWA NGANDU,
K. Thomasson.
Hydrobiological Survey of the Lake Bangweulu, Luapula River Basin (Zambia), Vol. 4, fascicule 2, October 1966, Cercle Hydrobiologique de Bruxelles (Belgium). 91 p, 21 fig, 81 ref.

Descriptors: *Lake Shiwa Ngandu(Zambia), *Lake Young(Zambia), *Phytoplankton, *Floral lists, *Algae, Zambia, Africa, Desmids, Zooplankton, Lake Bangweulu(Zambia), Species composition, Lakes.

An annotated list of the phytoplankton of Lake Shiwa Ngandu (Lake Young), Zambia, is presented, with particular emphasis on desmids. Miscellaneous notes on zooplankton are also included. The study is part of a hydrobiological survey of the Lake Bangweulu-Luapula River Basin. Lake Shiwa Ngandu is located 110 km east of Lake Bangweulu at an altitude of about 1400 m, on the northwestern side of the crest of Congo-Luangwa. The lake is 5.5 km long by 1.1 km wide, with a maximum depth of about 10m; pH varies from 5.7-6.8. There is luxuriant macrophyte vegetation. No conspicuous differences were found in plankton composition between June and December samples. The bulk of the phytoplankton were made up of the same 20-30 species. The following species were abundant: Melosira granulata, Micrasterias radiata var. brasiliensis, M. radiosa var. elegantior, Staurastrum bourrellyianum, S. tenuibrachiatum, and a number of biradiate Staurastrum species. Somewhat less abundant were Melosira agassizii, various taxa of Staurastrum fuellebornii, S. johnsonii var. altius, S. wildemanii, Xanthidium brevinasutum, and Surirella tenera var. nervosa. Twenty-one plates of phytoplankton and zooplankton are included. (Lynch-Wisconsin)
W78-06688

SEASONAL DISTRIBUTION OF VITAMIN B12 IN LAKE KINNERET,
Kinneret Limnology Lab., Tiberias (Israel).
For primary bibliographic entry see Field 5C.
W78-06690

DISTRIBUTION OF MYXOBACTERS IN AQUATIC HABITATS OF AN ALKALINE BOG,
Central Michigan Univ., Mt. Pleasant. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-06691

MERCURY IN THE LAKE POWELL ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W78-06694

COPEPOD 2: A MARKOV-TYPE MODEL FOR COPEPOD POPULATION DYNAMICS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 5C.
W78-06696

2I. Water In Plants

THE ADAPTIVE CHARACTERISTICS OF DESERT PLANTS,
Harvard Univ., Cambridge. Dept. of Biology.
O. T. Solbrig, and G. H. Orians.
American Scientist, Vol. 65, No. 4, p 412-421, July-August, 1977, 13 fig, 2 tab, 27 ref.

Descriptors: *Desert plants, *Plant growth, *Photosynthesis, Deserts, Arid lands, Semiarid climates, Cacti, Precipitation(Atmospheric), Rainfall, Mesquite, Carbon dioxide, Stomata, Water loss, Phreatophytes.

Although the physiological and anatomical similarity of plants in desert environments, regardless of phylogenetic relationship or geographical distribution, is a well established fact, the reasons for their similarity are less well understood. This study examines how the physical environment acts as a selective agent on plant form and function. First the desert environments are described and then an analysis of the costs and benefits of different photosynthetic mechanisms are presented. The conclusions are presented. The association between water loss and carbon dioxide gain through stomata and the water storage properties of desert soils are sufficient to explain the coexistence of annuals, succulents, and evergreen shrubs. (Jamail-Arizona)
W78-06337

INFLUENCE OF SOIL TYPE, PH, MOISTURE AND TEMPERATURE ON PHYTOTOXICITY AND EFFECTIVENESS OF THE FUNGICIDES OF THE PCNB AND TMTD GROUPS IN THE CONTROL OF ONION SMUT (UROCYSTIS MAGICA PASS.), (IN POLISH),
Szkola Glowna Gospodarstwa Wiejskiego Warsaw (Poland).
For primary bibliographic entry see Field 3F.
W78-06505

VEGETATION MANIPULATION - A CASE STUDY OF THE PINYON-JUNIPER TYPE,
Utah State Univ., Logan. Coll. of Natural Resources.
G. F. Gifford.
In: Watershed Management of Range and Forest Lands, March 1976. Proceedings, Fifth Workshop of the United States/Australia Rangelands Panel, Boise, Idaho, June 15 - 22, 1975, p 141-148. 2 tab, 41 ref. OWRT A-022-UTAH(2).

Descriptors: *Pinyon, Pine trees, *Juniper trees, *Revegetation, *Vegetation establishment, Planting management, Range management, Watershed management, Interception, Runoff, Grazing, Burning, Sediment discharge, Water quality, Wildlife, Forages, Economics, Moisture, Watershed impacts, Water budgets, Woodlands, Tree removal methods, Chaining, Forage production

The environmental impact of conversion of pinyon-juniper woodland to a grass or grass-shrub combination is investigated; this practice is exemplary of common vegetation manipulation used throughout Nevada, Utah, Colorado, Arizona, and New Mexico. The hydrology of eliminating pinyon and juniper trees is discussed and several treatments are detailed. Studies on interception, soil moisture patterns, runoff, water budgets, water quality, and sediment discharge are briefly reviewed; impacting factors such as grazing, soil structure, debris burning, erosion, and chemical and biological properties are outlined. Probable watershed impacts associated with various techniques of tree removal are assessed; water use efficiencies of several replacement grass species are reported. The impact of vegetation manipulation on wildlife, forage production, and archaeological values is evaluated; economic considerations are addressed. (Seip-IPA)
W78-06526

THE MACROPHYTE VEGETATION OF THE DANUBE WATER-BODIES IN BULGARIA AND ITS CHANGE UNDER THE EFFECT OF HUMANS AND CONSERVATION, (IN RUSSIAN),
Bulgarian Academy of Sciences, Sofia. Inst. of Botany.
Kh. Kochev, and D. Iordanov.
Bot Zh (Leningr) 61(9), p 1294-1297, 1976.

Descriptors: *Water conservation, *Plant physiology, Azolla-filiculoides, *Bulgaria, *Danube River, Epilobium-palustris, Lakes, Leersia-oryzoides, *Macrophytes, Nymphaea-alba, Phragmites-communis, Sium-latifolium, Swamps, Thelypteris-palustris, *Vegetation, Water bodies.

The ever-diminishing lakes and swamps along the Bulgarian Danube are described and data is given on the distribution of macrophyte phytocenoses with a classification of formations and associations. The associations determined include Phragmites communis; P. communis-Azolla filiculoides; P. communis-Thelypteris palustris; P. communis-Leersia oryzoides; P. communis-Sium latifolium; P. communis-Nymphaea alba; and P. communis-Epilobium palustris. The basic changes in vegetation from the effects of human activity are described, and measures are recommended for preservation of disappearing, rare and relict plant species.—Copyright 1977, Biological Abstracts, Inc.
W78-06675

EFFECT OF CHLOROCHOLINE CHLORIDE ON THE RESISTANCE OF WHEAT TO AN EXCESS AND DEFICIENCY OF THE WATER SUPPLY DURING THE CRITICAL PERIOD (IN RUSSIAN),
Komsomolskii-na-Amure Gosudarstvennyi Pedagogical Inst. (USSR).
For primary bibliographic entry see Field 3C.
W78-06692

GAS CHROMATOGRAPHIC DETERMINATION OF RESIDUAL AMINE LEVELS IN PLANTS (IN RUSSIAN),
All-Union Research Inst. of Agricultural Use Sewage. Staraya Kupavan (USSR).
For primary bibliographic entry see Field 5A.
W78-06699

2J. Erosion and Sedimentation

EFFECTS OF BURROWING TUBIFICID WORMS ON THE EXCHANGE OF PHOSPHORUS BETWEEN LAKE SEDIMENTS AND OVERLYING WATER,
Maine Univ. at Orono. Dept. of Botany and Quaternary Studies.
For primary bibliographic entry see Field 5C.
W78-06202

SEASONAL AND ENVIRONMENTAL VARIATIONS IN SEDIMENT ACCRETION IN A LONG ISLAND SALT MARSH,
State Univ. of New York at Stony Brook. Dept. of Earth and Space Science.
For primary bibliographic entry see Field 2L.
W78-06226

EROSION AND SEDIMENT CONTROL AUDIOVISUAL TRAINING PROGRAM, WORKBOOK,
Hittman Associates, Inc., Columbia, MD. Environmental and Geosciences Dept.
For primary bibliographic entry see Field 4D.
W78-06228

INPUT DATA FORMATS FOR ALLUVIAL CHANNEL EXPERIMENTS,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 8B.
W78-06235

BEACH AND NEARSHORE PROCESSES IN SOUTHEASTERN FLORIDA,
Coastal Engineering Research Center, Fort Belvoir, VA; and Florida Ocean Sciences Inst. Inc., Deerfield Beach.
For primary bibliographic entry see Field 2L.
W78-06246

SPATIAL AND TEMPORAL CHANGES IN NEW JERSEY BEACHES,
Coastal Engineering Research Center, Fort Belvoir, VA.; and Tetra Tech, Inc., Pasadena, CA.
For primary bibliographic entry see Field 2L.
W78-06247

SEDIMENT BUDGET ANALYSIS WRIGHTSVILLE BEACH TO KURE BEACH, NC,
Army Engineer District, Wilmington, NC. Coastal Engineering Studies Section.
For primary bibliographic entry see Field 2L.
W78-06250

SEDIMENTS IMPOUNDED BY AN OFFSHORE BREAKWATER,
Coastal Engineering Research Center, Fort Belvior, VA.
For primary bibliographic entry see Field 2L.
W78-06251

VISUAL SURF OBSERVATIONS/MARINELAND EXPERIMENT,
Coastal Engineering Research Center, Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-06252

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY, APPENDIX F--CRYSTALLINE MATRIX,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W78-06256

EFFECTS OF GULLY PLUGS AND CONTOUR FURROWS ON EROSION AND SEDIMENTATION IN CISCO BASIN, UTAH,
Utah State Univ., Logan. Coll. of Natural Resources.
For primary bibliographic entry see Field 4D.
W78-06334

THE MARINE GEOLOGY AND SEDIMENTOLOGY OF HAWAII KAI, KUAPA POND, AND ADJACENT MAUNALUA BAY,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 2L.
W78-06345

PROCEEDINGS, MISSISSIPPI WATER RESOURCES CONFERENCE, 1975.
Mississippi State Univ., Mississippi State. Water Resources Research Inst.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 324, Price codes: A07 in paper copy, A01 in microfiche. April, 1975. 133 p, 74 fig, 17 tab, 45 ref. OWRT A-999-MISS(11).

Descriptors: *Water Resources Institute, *Mississippi, *Water resources, Water resources development, Conferences, *Conference report.

Proceedings of the tenth Mississippi Water Resources Conference are reported; nine out of the ten papers presented are reprinted including (1) 'Feasibility Report on Gulf Coast Deep Water Port Facilities;' (2) 'Recent Sedimentation Rates in the Lower Mississippi River Valey: Lake Verret-Lake Palourde, Louisiana'; (3) 'Environmental Considerations and Their Impact on Water Resource Development Projects'; (4) 'Suspended Sediment in Four North Mississippi Reservoirs'; (5) 'Commentary on Long Period Sea Waves that Move into Shallow Water'; (6) 'The Role of the Corps of Engineers in Coastal Zone Management Planning'; (7) 'Water Resources and the Mississippi Coastal Zone Management Program'; (8) 'Determination of Water Quality Within and Downstream of Bay Springs Lake'; and (9) 'Wastewater Stabilization Ponds and PL 92-500 Case Studies and Upgrading'. (Seip-IPA)
W78-06351

SOIL EROSION AND DUST CONTROL ON ARIZONA HIGHWAYS, PART II, LABORATORY TESTING PROGRAM,
Arizona Univ., Tucson. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4D.
W78-06524

SOIL EROSION AND DUST CONTROL ON ARIZONA HIGHWAYS, PART III, PROGRESS REPORT-FIELD TESTING PROGRAM,
Arizona Univ., Tucson. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4D.
W78-06525

BEACH NOURISHMENT TECHNIQUES. REPORT 2: A MEANS OF PREDICTING LITTORAL SEDIMENT TRANSPORT SEAWARD OF THE BREAKER ZONE,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 2L.
W78-06534

THE INTERTIDAL FAUNA OF SANDY BEACHES. A SURVEY OF THE SCOTTISH COAST,
Aberdeen (Scotland). Marine Lab.
For primary bibliographic entry see Field 2L.
W78-06535

WAVE CLIMATE AT SELECTED LOCATIONS ALONG U.S. COASTS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-06548

PROBLEMS ASSOCIATED WITH MAINTENANCE OF CHANNEL CAPACITY BELOW FEDERAL RESERVOIRS IN KANSAS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 2E.
W78-06580

ELUTRIATION STUDY OF WILLAMETTE RIVER BOTTOM MATERIAL AND WILLAMETTE-COLUMBIA RIVER WATER,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 5C.
W78-06592

WATER EROSION,
Agricultural Research Service, Lafayette, IN.
For primary bibliographic entry see Field 4D.
W78-06679

NUTRIENT LOSS RESEARCH,
Agricultural Research Service, Columbia, MO.
For primary bibliographic entry see Field 4D.
W78-06689

2K. Chemical Processes

THE MARINE GEOLOGY AND SEDIMENTOLOGY OF HAWAII KAI, KUAPA POND, AND ADJACENT MAUNALUA BAY,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 2L.
W78-06345

THE URANIUM-SERIES RADIONUCLIDES AS TRACERS OF GEOCHEMICAL PROCESSES IN LONG ISLAND SOUND,
Yale Univ., New Haven, CT. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2L.
W78-06379

THE EFFECT OF DISSOLVED AIR AND NATURAL ISOTOPIC DISTRIBUTIONS ON THE DENSITY OF WATER,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
F. J. Millero, and R. T. Emmet.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 084, Price codes: A02 in paper copy, A01 in microfiche. Journal of Marine Research, Vol. 34, No. 1, p 15-24, February 23, 1976. 1 fig, 5 tab, 28 ref. N00014-75-C-0173 and GA-40532.

Descriptors: *Air entrainment, *Physical properties, *Density, *Isotope studies, *Water properties, Gases, Air, Temperature, Atmosphere, Properties, Sea water, Analytical techniques, Carbon dioxide, Argon, Nitrogen, Oxygen, *Density of water, *Dissolved air, *Isotopic distribution, *Dissolved gases in water, *Density measurements.

The effects of dissolved air and of natural isotopic distributions on the density of water have been determined at 1 atm by using a magnetic float densimeter. Dissolved gases were found to decrease the density by 3.0 + or - 2 x 10 to the minus 7th power g/cu cm at 4C. The apparent molal volumes of air were found to be nearly independent of saturation concentration and temperatures between 0 and 30C. The decrease in density to + or - 2 x 10 to the minus 7th power can be determined from, delta d = -0.0026Xc where c is the total concentration of air in moles/liter (O2, N2, Ar and CO2) over the saturation and temperature range of ocean waters. The dissolved air experimental results were found to be in good agreement with those determined from partial molal volume data for gases determined by other workers. The ion exchanged Miami water used in the density studies was found to be 0.000001 g/cu cm lower than distilled standard mean ocean water (SMOW) and Mediterranean deep water (MDW). (Henley-ISWS)
W78-06383

ENVIRONMENTAL ISOTOPIC STUDY OF THE CAMPI FLEGREI (NAPLES, ITALY) GEOTHERMAL FIELD,
Comitato Nazionale per le Ricerche Nucleari, Pisa (Italy). Lab. di Geologia Nucleare.
G. Cortecci, P. Noto, and C. Panichi.
Journal of Hydrology, Vol. 36, No. 1/2, p 143-159, January 1978. 9 fig, 4 tab, 21 ref.

Descriptors: *Geothermal studies, *Isotope studies, *Groundwater, Oxygen, Hydrogen, Tritium, Sulfates, Sampling, Chemical analysis, Meteoric water, Sea water, Mixing, Foreign countries, Springs, Foreign research, Spring water, Thermal springs, Water temperature, *Campi Flegrei(Italy), *Italy.

Presented are the isotopic analyses of water and dissolved sulfate (H, O, T and S isotopes) from several thermal springs emerging from the volcanic cover in the Campi Flegrei area, sampled both in 1971 and 1975. The H- and O-isotopic analyses showed variation values ranging from -30 to +12 parts per thousand and from -6.7 to 1.4 parts per thousand, respectively, relative to SMOW. These values and the positive relationships between the isotopic values and the chemical parameters, such as the Cl content, suggest that the analyzed spring waters ae formed by a mixing, in different proportions, of two components: a water of marine origin filling the volcanic cover and coming from the Tyrrhenian Sea, and a meteoric water. The S-isotope composition ranged from variation = +2.4 to +20.1 parts per thousand relative to the meteoritic troilite, as the sulfate in the water from the thermal spring formed by practically undiluted marine water shows O- and S-isotopic ratios of +9.1 and +19.4 parts per thousand, respectively; these values are close to those measured for the Tyrrhenian Sea sulfate. On the contrary, the thermal spring fed by meteoric water had a dissolved sulfate with a variation of 018 = +9.0 parts per thousand and variation of 34S = 3.4 parts per thousand, these being the mean values for those measured in 1971 and 1975. Large chemical and isotopic variations, with regard to sampling times, were observed in some manifestations as more negative isotopic contents of the dissolved sulfate and lower chloride and sulfate concentrations correspond to more negative water isotopic values, and vice versa. The chemical and sulfate-water isotopic geothermometers, in general, do not reflect the real situation in the system. Only the spring fed by marine water and unaffected by mixing phenomena shows consistent equilibrium temperatures at depth. (Sims-ISWS)
W78-06387

SURVEY OF TRACE METAL CONTENTS OF SUSPENDED MATTER IN THE ST. LAWRENCE ESTUARY AND SAGUENAY FJORD,
Quebec Univ., Rimouski. Inst. National de la Recherche Scientifique.
For primary bibliographic entry see Field 5A.
W78-06401

USING TOPOGRAPHIC CHARACTERISTICS TO PREDICT TOTAL SOLUTE CONCENTRATIONS IN STREAMS DRAINING SMALL FORESTED WATERSHEDS IN WESTERN MONTANA,
Montana Univ., Missoula.
G. T. Foggin, III, and L. K. Forcier.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 578, Price codes: A03 in paper copy, A01 in microfiche.

Montana University Joint Water Resources Research Center, Bozeman, Research Report No. 89, September 1977. 42 p, 7 fig, 2 tab, 23 ref, 2 append. OWRT A-095-MONT(1).

Descriptors: *Solutes, Suspended solids, Carbonates, *Topography, Drainage area, Regression analysis, *Solute concentrations(Streams), *Forest watersheds, Streamflow, Small watersheds, Geomorphology, Seasonal, Water chemistry, Estimating equations, Cations, *Montana, Calcium, Magnesium, Sodium, Potassium, Sulfates, Bicarbonates.

Fifty local headwater streams draining undisturbed forested basins underlain by quartzites and argillites of the Precambrian Belt Supergroup in Western Montana were sampled during the 1976 spring runoff period. Total solute concentration in these streams was determined to be primarily related to the composition of the basin's parent material and secondarily to its morphometric character. Seasonal variation in total solute concentration was related to the degree of dilution a stream experienced during the period of high discharge. Constants for total solute concentration and seasonal variation for the sample streams were predicted from regression equations in which the geologic and morphometric characteristics of the watersheds were independent variables. A strong relationship was found between the predicted and observed total solute concentration values for these streams during the sampling period.
W78-06407

THE IMPACT OF STREAM RECONSTRUCTION AND A GABION INSTALLATION ON THE BIOLOGY AND CHEMISTRY OF A TROUT STREAM,
Lehigh Univ., Bethlehem, PA. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-06410

APPRAISAL OF THE WATER RESOURCES OF DEATH VALLEY, CALIFORNIA-NEVADA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06593

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06605

COMPOSITION OF DIFFERENT FRACTIONS OF SOIL SOLUTIONS (IN RUSSIAN),
Moscow State Univ. (USSR). Faculty of Soil Science.
For primary bibliographic entry see Field 2G.
W78-06676

THE FRESH AIR--CLEAN WATER EXCHANGE,
For primary bibliographic entry see Field 5G.
W78-06693

2L. Estuaries

CONCENTRATIONS OF NUTRIENTS AND CHLOROPHYLL ON A CROSS-CHANNEL TRANSECT IN JUAN DE FUCA STRAIT, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-06216

A SIMPLE THEORETICAL MODEL FOR THE FLOW OF AN ESTUARY ONTO A CONTINENTAL SHELF,
Woods Hole Oceanographic Institution, MA. Dept. of Physical Oceanography.
R. C. Beardsley, and J. Hart.
Journal of Geophysical Research, Vol 83, No C2, p 873-883, February 20, 1978. 17 fig, 10 ref.

Descriptors: *Estuaries, *Continental shelf, *Model studies, Theoretical analysis, Stratification, Steady flow, Oceanography, Equations, Mathematical models, Mathematical studies, Mathematics, Currents(Water).

A simple theoretical model was developed to describe the steady flow of an estuary onto an adjacent continental shelf. A two-layer density stratification was assumed for the shelf water. The fluid motion is driven by the positive (upper layer) and negative (lower layer) mass fluxes associated with a pair of point sources located at the mouth of the estuary. The dynamics are linear and include the effects of Coriolis acceleration, turbulent friction, and bottom topography. Analytic solutions for the one-layer, single-source problem were found for two special depth profiles. A boundary layer solution was found for the power law depth profile, and a global solution was found for the log law profile. Both solutions indicated that the far-field flow is concentrated asymmetrically toward the right-hand coast in the northern hemisphere, a consequence of the basic balance between topographic vortex stretching and bottom friction. This mechanism also applies when a constant alongshore current is present. In the two-layer case, the flow in the upper layer generally tends to be concentrated toward the left-hand coast, since the upper fluid feels (1) the interface and not the bottom topography, and (2) the interfacial drag exerted by the lower fluid toward the right-hand coast. A brief comparison was made between model predictions and observations for the Hudson and Chesapeake Bay estuaries. (Lee-ISWS)
W78-06218

SEASONAL AND ENVIRONMENTAL VARIATIONS IN SEDIMENT ACCRETION IN A LONG ISLAND SALT MARSH,
State Univ. of New York at Stony Brook. Dept. of Earth and Space Science.
G. A. Richard.
Estuaries, Vol. 1, No. 1, p 29-35, March 1978. 6 fig, 1 tab, 18 ref.

Descriptors: *Sedimentation, *New York, *Salt marshes, *Sedimentation rates, On-site investigations, On-site data collections, Coasts, Marshes, Mud flats, Vegetation, Vegetation effects, Tides, Tidal waters, Tidal effects, Tidal marshes, Sediments, Seasonal, Deposition(Sediments), Sedimentology, Estuaries, *Long Island Sound, Spartina alterniflora, *Flax Pond(NY).

Flax Pond is a small (0.5 sq km) salt marsh on the north shore of Long Island, New York. Two 1 sq m plots within each of the following environments were covered with a market layer of either brick dust or aluminum glitter: (1) bare mud flats; (2) areas newly colonized by Spartina alterniflora; and (3) high intertidal S. alterniflora peat surfaces. Monthly cores revealed the amount of sediment that accumulated since placement of the marker. Accretion rates from October, 1974 to February, 1976 were as follows: bare mud flats -20.5 to 45.5 mm/yr; recently vegetated mud flats -9.5 to 37.0 mm/yr; and high intertidal peat surfaces -2.0 to 4.25 mm/yr. Sedimentation rates decrease with increasing elevation because of the reduced tidal submergence time and decreased height of the overlying water column. In areas of low elevation, ice and storms cause either erosion or a reduced rate of accretion during the winter months. The average mud accretion rate over the past 173 years is 3.4 mm/yr. Differences between the short-term rate and the long-term rate indicate substantial annual variation in the accumulation of mud in salt marshes. Short-term rates of peat accretion are similar to long-term estimates, indicating that rates of peat accretion are relatively constant over long intervals. (Sims-ISWS)
W78-06226

WAVE REFLECTION AND TRANSMISSION AT PERMEABLE BREAKWATERS,
Massachusetts Inst., of Tech. Cambridge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-06229

NEARSHORE DISPOSAL: ONSHORE SEDIMENT TRANSPORT,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 5B.
W78-06243

IMPLICATIONS OF SUBMERGENCE FOR COASTAL ENGINEERS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-06244

SEDIMENT HANDLING AND BEACH FILL DESIGN,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-06245

BEACH AND NEARSHORE PROCESSES IN SOUTHEASTERN FLORIDA,
Coastal Engineering Research Center, Fort Belvoir, VA; and Florida Ocean Sciences Inst. Inc., Deerfield Beach.
A. E. DeWall, and J. J. Richter.
Army Coastal Engineering Research Center Reprint 78-4, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 425-443, 10 fig, 3 tab, 12 ref.

Descriptors: *Sedimentation, *Erosion, *Sediment transport, Beaches, Water resources, Florida, Outer Continental Shelf, *Pollutant transport, Nearshore processes, Seasonal variations, Transfer processes.

A 4.5-year series of daily and weekly littoral environment observations and beach profile surveys was made at 3 localities in southeastern Florida. As a result of varying protection by the Bahamas Bank, the amount of wave energy reaching the shoreline decreases from north to south. The magnitude of beach changes decreased from north to south and was low compared to changes on more exposed beaches on the U.S. east coast. Contributing factors include the sheltering effect of the Bahamas Banks, the lack of significant storms, and the underlying coquina limestone which characteristically crops out just below the MSL shoreline at the two sites with the highest waves, forming a protective reef that effectively retards beach erosion. (Sinha-OEIS)
W78-06246

SPATIAL AND TEMPORAL CHANGES IN NEW JERSEY BEACHES,
Coastal Engineering Research Center, Fort Belvoir, VA.; and Tetra Tech, Inc., Pasadena, CA.
C. H. Everts, and M. T. Czerniak.
Army Coastal Engineering Research Center Reprint 78-9, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 444-459, 6 fig, 3 tab, 7 ref.

Descriptors: *Beaches, *Sediment transport, New Jersey, Water resources, Outer Continental Shelf, *Pollutant transport, Spatial variations, Temporal variations.

Sand volume changes above mean sea level (MSL) and shoreline position changes as MSL were obtained from 4400 beach profiles acquired over a 10-year period along three New Jersey barrier islands. The results provide insight into the behavioral characteristics of sandy ocean beaches. Storm changes were highly variable between islands, and between profile lines on the same island. Often changes on profile lines less than 0.8 km apart were opposite in sign, suggesting a closer profile line spacing is required to obtain an accurate picture of storm changes. On two islands a definite seasonal change was found when 10-year data were averaged. The maximum sand volume and most seaward shoreline position occurred in August and the least in the January-April period. A year-to-year comparison of surveys would be best using data collected from January through April because changes from month to month were least then. Large variations in beach changes were measured from one year to the next, and on one of the three islands 10-year data did not appear sufficient to establish a long term trend in beach behavior. (Sinha-OEIS)
W78-06247

EVALUATION OF A CONCRETE BUILDING BLOCK REVETMENT,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8F.
W78-06248

DESIGNING FOR BANK EROSION CONTROL WITH VEGETATION,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-06249

SEDIMENT BUDGET ANALYSIS WRIGHTSVILLE BEACH TO KURE BEACH, NC,
Army Engineer District, Wilmington, NC. Coastal Engineering Studies Section.
J. T. Jarrett.
Army Coastal Engineering Research Center Reprint 78-3, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 986-1005, 7 fig, 5 tab, 6 ref.

Descriptors: *Sediment transport, *Erosion, *Deposition, *North Carolina, Water resources, Outer Continental Shelf, Pollutant transport, Littoral transport.

Littoral transport rates and inlet bypassing quantities were estimated for a 19-mile (30.6 km) segment of the North Carolina Coast extending from Wrightsville Beach southward to Kure Beach, by adopting a sediment budget approach. The steps involved in the sediment budget analysis were: (1) an estimate of volumetric changes along the shorelines and in the inlets, (2) wave refraction analysis to determine the distribution of longshore wave energy flux along the shoreline and (3) a correlation of the volume changes with the computed longshore energy flux distribution. The base period used for this analysis was from 1966 to 1974. After the material transport rates were determined for this base period, an evaluation was made of the changes in shore processes resulting from man-induced alterations in the shoreline configuration. (Sinha-OEIS)
W78-06250

SEDIMENTS IMPOUNDED BY AN OFFSHORE BREAKWATER,
Coastal Engineering Research Center, Fort Belvior, VA.
R. O. Bruno, G. M. Watts, and C. G. Gable.
Army Coastal Engineering Research Center Reprint 78-8, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 1006-1025, 15 fig, 5 ref.

Descriptors: *Breakwaters, *Sediment transport, *Shore protection, California, Sedimentation, Water resources, *Outer Continental Shelf, Pollutant transport.

The breakwater and entrance jetties for the Channel Islands Harbor in California form a total littoral barrier to longshore sand transport. The sand impounded by these structures was monitored by repetitive bathymetric surveys and systematic surface sand sampling. This paper discusses patterns of sediment deposition behind an offshore breakwater. Data collected were studied to determine if the deposition observed agrees with that predicted prior to construction. Both the geometry and size distribution of the deposition sediment are examined. Three dimensional computer plots are used to illustrate filling patterns. Sediment size and sorting distribution which occur during filling are investigated. Analyzed data allows an evaluation of predicted verses actual filling patterns. Sediment distribution in the impoundment area was evaluated. (Sinha-OEIS)
W78-06251

VISUAL SURF OBSERVATIONS/MARINELAND EXPERIMENT,
Coastal Engineering Research Center, Belvoir, VA.
C. Schneider.
Army Coastal Engineering Research Center Reprint 78-1, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 1086-1099, 6 fig, 3 tab, 5 ref.

Descriptors: *Surf, *Winds, *Ocean waves, *Measurement, Florida, Water resources, Water temperature, *Outer Continental Shelf, *Pollutant transport, Nearshore processes, Sea surface temperature, Satellite imagery, Wave height, Environmental conditions, Ground truth, Littoral Environment Observation Program(LEO).

The experiment was designed to test instrumentation that will be used onboard the SEASAT-A satellite to be launched in 1978. This satellite is designed to provide all-weather global monitoring of sea-surface temperature, significant wave height and surface wind speed and direction. As a part of this larger SEASAT-A experiment, it was decided to obtain wave and nearshore current data collected in accordance with techniques developed under the Littoral Environment Observation Program (LEO). It was hoped that these visually obtained data could be compared with wave data obtained from both a wave rider and a seasled and that measurements obtained at one LEO site could be correlated with observations taken at similar nearby sites. The site selected for the experiment prevented accomplishment of all of the original objectives of the LEO portion of the experiment. The four relatively close observation sites were notably different in their physical characteristics making the correlation of observations between adjacent sites extremely poor. When instrument wave data were obtained, there was generally fair agreement between observations and measurements. Surf conditions were observed to change appreciably over fairly short periods of time. The use of a single observational data set to characterize surf conditions over a one day period was not found to be a satisfactory representation. (Sinha-OEIS)
W78-06252

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX A--MAIN SHIP CHANNEL (SAN FRANCISCO BAR).
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5C.
W78-06253

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX C--WATER COLUMN.
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5B.
W78-06254

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX D--BIOLOGICAL COMMUNITY,
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5C.
W78-06255

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY, APPENDIX F--CRYSTALLINE MATRIX,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W78-06256

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX I--POLLUTANT AVAILABILITY,
California Univ., Berkeley. Lawrence Berkeley Lab.; California Univ., Berkeley. Div. of Energy and Environmental; and California Univ., Bodega Bay. Inst. of Pollution Ecology.
For primary bibliographic entry see Field 5B.
W78-06257

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX J--LAND DISPOSAL,
International Engineering Co., Inc., San Francisco, CA.
For primary bibliographic entry see Field 5E.
W78-06258

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX M--DREDGING TECHNOLOGY.
JBF Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 5E.
W78-06259

ON THE CONTAMINATION OF SEA WATER WITH SALMONELLA AND FECAL INDICATOR ORGANISMS: I. OCCURRENCE AND DISTRIBUTION OF SALMONELLA AND FECAL INDICATOR ORGANISMS IN COASTAL SEA WATER OF FUKUYAMA, (IN JAPANESE),
Hiroshima Univ. (Japan). Dept. of Food Chem. Tech.
For primary bibliographic entry see Field 5B.
W78-06331

THE MARINE GEOLOGY AND SEDIMENTOLOGY OF HAWAII KAI, KUAPA POND, AND ADJACENT MAUNALUA BAY,
Hawaii Univ., Honolulu.
E. T. Sakoda.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 216, Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, Geology and Geophysics, May, 1975. 71 p, 21 fig, 4 tab, 31 ref, 1 append. OWRT A-043-HI(1).

Descriptors: *Hawaii, *Marine geology, *Sedimentology, Salinity, *Temperature, *Turbidity, Weather, Storms, *Hawaii Kai, Pua Pond(HI), Maunalua Bay(HI), Kurtosis.

Marine geology and sedimentology of the Hawaii Kai area were studied, including such physical oceanographic characteristics as salinity/temperature values and turbidity. Fair weather temperature and salinity values were stable, with salinity reduced during and after rainstorms of short duration. Although the water is generally less turbid now than it was in the 1960's, it remains somewhat so due to suspended fine, clay-sized terrigenous and carbonate sediments, planktonic organisms, and terrigenous materials brought in as runoff during storms. Samples from the marina and bay were analyzed for grain size parameters and compositition, and sediments were categorized into size groups indicating their distribution. Graphic kurtosis values showed that muds were generally platykurtic, sediments on the reef flat - leptokurtic, and sediments exposed to high energy - mesokurtic. Percentages of carbonate, terrigenous, and organic material were found for the samples, with carbonate values highest seaward and terrigenous values lowest seaward. X-ray analyses were conducted for the clay fractions of terrestrial samples included kaolinite, montmorillonite, plagioclase; bulk analysis revealed magnetite, hematite, and quartz. Marina and bay samples contained calcite, kaolinite, and montmorillonite in the clay fractions, and magnesium-rich and magnesium-poor calcite, argonite, plagioclase, magnetite, kaolinite, and montmorillonite in bulk fractions. No severe adverse effects have occurred during the course of development in the area. An appendix contains a table of sample sediment parameters. (Wares-IPA)
W78-06345

PROCEEDINGS, MISSISSIPPI WATER RESOURCES CONFERENCE, 1975.
Mississippi State Univ., Mississippi State. Water Resources Research Inst.
For primary bibliographic entry see Field 2J.
W78-06351

MARINE POLLUTION: DIAGNOSIS AND TREATMENT, (MEERESVERSCHMUTZUNG: DIAGNOSE AND THERAPIE),
For primary bibliographic entry see Field 5G.
W78-06361

INDUSTRIAL POINT SOURCES OF PETROLEUM: POLLUTION LOADS AND ECONOMIC PARAMETERS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W78-06376

THE URANIUM-SERIES RADIONUCLIDES AS TRACERS OF GEOCHEMICAL PROCESSES IN LONG ISLAND SOUND,
Yale Univ., New Haven, CT. Dept. of Geology and Geophysics.
L. K. Benninger.
PhD Dissertation, May 1976. 235 p, 33 fig, 21 tab, 145 ref, 1 append. ERDA E(11-1)-3573.

Descriptors: *Tracers, *Radioisotopes, *Geochemistry, *Estuaries, Lead, Lead radioisotopes, Uranium radioisotopes, Sediments, Plankton, Runoff, Heavy metals, Rivers, *Long Island Sound.

Natural series radionuclides are useful probes into estuarine geochemistry because of the time-dependent relationships among them, and because, as analogs of stable elements, they are much less subject to contamination during sampling and analysis. In this study, the flux of heavy metals through Long Island Sound was considered in light of the material balance for excess Pb210, and analyses of concurrent seston and water samples from central Long Island Sound were used to probe the internal workings of the estuary. In general, the plankton appear not to act as important agents of deposition for uranium-series radionuclides. Uranium is at most very slightly concentrated in plankton. Ra226 may sometimes be in enriched plankton, but it appears to be lost from surficial sediments. Pb210, which is known to be efficiently deposited, is not concentrated in the net plankton and probably sorbs non-specifically on the more abundant non-living particles. Po210 is, by contrast, certainly highly concentrated in zooplankton and probably also in some organic debris; this separation from Pb210 causes Po210 to be maintained preferentially in suspension. (Sims-ISWS)
W78-06379

HYDROCARBONS IN CORES OF NORTHWESTERN ATLANTIC COASTAL AND CONTINENTAL MARGIN SEDIMENTS,
Woods Hole Oceanographic Institution, MA. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-06384

ENVIRONMENTAL ISOTOPIC STUDY OF THE CAMPI FLEGREI (NAPLES, ITALY) GEOTHERMAL FIELD,
Comitato Nazionale per le Ricerche Nucleari, Pisa (Italy). Lab. di Geologia Nucleare.
For primary bibliographic entry see Field 2K.
W78-06387

INFLOW AND WITHDRAWAL CHARACTERISTICS OF STRATIFIED FLUIDS,
Catholic Univ. of America, Washington, DC. Dept. of Civil Engineering.
T. W. Kao.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 8; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 97-107, 1976. 2 fig, 15 ref. NSF ENG-75-09347.

Descriptors: *Stratified flow, *Density currents, *Lakes, *Model studies, Mathematical models, Inflow, Withdrawal, Stratification, Upwelling, Thermocline, Theoretical analysis, Analytical techniques, Thermal stratification, Flow, Currents(Water), Discharge(Water), Equations.

Inflow and withdrawal characteristics of stratified fluids of arbitrary stratification were presented in the two-dimensional context. A brief summary of the dynamics of establishment of selective withdrawal of stratified fluid was given, emphasizing the role of columnar disturbances. A criterion for selective withdrawal was discussed based on the ability of the fastest propagating mode to travel upstream. The fata of inflows takes the form of a density or gravity current. Various cases were discussed. The surface discharge of lighter (or warmer) inflow was presented. The density and flow structures from a numerical model (under development at the Catholic University) and their implications to coastal oceanic fronts including downwelling and upwelling were noted briefly. If the ambient is stratified and the fluid occurs as an interflow, the speed of the density current may be estimated. On assuming that the ambient stratification is undisturbed, the result gives the current velocity U to be equal to Nh/2. The corresponding interflow Froude number is 1/2. However, it should be noted that the level at which the inflow settles down to an interflow is generally higher than the level where the inflow equals the density of the ambient. This is because of the entrainment of lighter during the progress of the inflow downwards. (See also W78-06388) (Humphreys-ISWS)
W78-06394

REAL-TIME FLOW IN UNSTRATIFIED SHALLOW WATER,
Rosenstiel School of Marine and Atmospheric Science, Div. of Ocean Engineering.
J. D. Wang.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 104, No WW1, Proceedings Paper 13571, p 53-68, February 1978. 10 fig, 16 ref, 2 append.

Descriptors: *Estuaries, *Water circulation, *Model studies, Mathematical models, Finite element analysis, Tides, Waves(Water), Winds, Flow, Bays, Shallow water, Hydrodynamics.

A finite element model for prediction of time-dependent flow in shallow coastal areas was presented. The model was based upon the vertically integrated equations of motion, combined with the hydrostatic. The time integration scheme evolved on a grid with variables staggered in time and was conditionally stable. Consistent treatment of boundaries was facilitated by the flexible grid layout, and the finite element method allows straightforward treatment of convective terms throughout the domain. All variables were defined at the same points in space. The model was applied to predict tidal flow induced by a hypothetical cooling water circulation system. (Sims-ISWS)
W78-06400

SURVEY OF TRACE METAL CONTENTS OF SUSPENDED MATTER IN THE ST. LAWRENCE ESTUARY AND SAGUENAY FJORD,
Quebec Univ., Rimouski. Inst. National de la Recherche Scientifique.
For primary bibliographic entry see Field 5A.
W78-06401

AUTOMATIC MONITORING TECHNIQUES OF EUTROPHICATION SUBSTANCES IN COASTAL SEA WATER (FY 1976-1978), (SANGYO HAISUI NO FUEIYOKASEIBUN NO SHORI NI KANSURU KENKYU-KENSHUTAU-KI HAIHATSU NI KANSURU KENKYU),
Government Industrial Research Inst., Osaka (Japan).
For primary bibliographic entry see Field 5A.
W78-06469

AN ASSESSMENT OF ESTUARINE AND NEARSHORE MARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point. Applied Marine Science and Ocean Engineering.
M. P. Lynch, B. L. Laird, N. B. Theberge, and J. C. Jones.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 853, Price codes: A07 in paper copy, A01 in microfiche. Special Report No 93 (Revised) to Office of Biological Services, Fish and Wildlife Service as part of the 1975 National Water Resources Assessment, March 1976. 143 p, 4 fig, 34 tab.

Descriptors: *Estuaries, *Environmental effects, Water resources, *Land use, *Water pollution effects, Baseline studies, Estuarine environment, Economics, Resources development, United States, *Outer Continental Shelf, Nearshore environments, Environmental assessment.

The impact of water uses and projected water demands upon the estuarine and nearshore marine environments of the United States has been evaluated. This evaluation has included a regional review of major estuarine and nearshore marine habitats, the economic value of the areas, the major problems impacting water and water resources, and the management approach of the states. Federal management initiatives, particularly with regard to Federal-State interactions, have also been reviewed. Conflicts between recreational and commercial users highlight problems of resource allocation and space allocation both of the adjoining shoreline and the water itself. These conflicts will increase in frequency and intensity, particularly if the projected increases in recreational demands and consumption

of fisheries products based on population trends and present consumption are realized. (Sinha-OEIS)
W78-06528

OIL SPILLS, AND SPILLS OF HAZARDOUS SUBSTANCES.
Environmental Protection Agency, Washington, D.C. Div. of Oil and Hazardous Materials.
For primary bibliographic entry see Field 5B.
W78-06529

THE SEVERN ESTUARY AND THE BRISTOL CHANNEL, AN ASSESSMENT OF PRESENT KNOWLEDGE.
Bristorl Univ. (England).; and University Coll. of Swansea (Wales); and Institute of Coastal Oceanography and Tides Birkenhead (England); and Institute for Marine Environmental Research, Edinburgh (Scotland).
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-037 877, Price codes: A02 in paper copy, A01 in microfiche. The Natural Environment Research Council Publications Series C, No 9, December 1972. 24 p, 264 ref.

Descriptors: *Estuaries, Water resources, *Water quality, Baseline studies, Resources development, Pollution abatement, *Outer Continental Shelf, *United Kingdom, *Severn Estuary, Bristol Channel, Transfer processes.

An assessment is made of current understandings of the geology and sedimentology; water movements and other physical aspects; chemistry; and biology of the Severn Estuary and the Bristol Channel. These understandings are intended to serve as measurement baselines for the prevention and control of the water quality alterations by future uses of the area. (Sinha-OEIS)
W78-06530

OBSERVATIONS OF WINDS AND CURRENTS IN HOOD CANAL,
Washington Univ., Seattle. Dept. of Oceanography.
L. H. Larsen.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-039 501, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No 350, Reference No M76-47, June 1976. 36 p. ONR-N00014-75-C-0502.

Descriptors: *Tidal effects, *Winds, *Currents(Water), Baseline studies, Resources development, Water resources, *Washington, *Outer Continental Shelf, *Pollutant transport, *Tidal flow, Water characteristics, Transfer processes, *Hood Canal(Wash), Puget Sound(Wash).

Selected portions of data collected in Hood Canal during the months of March 1976 through June 1976 are presented. This document is a report to the Navy on tidal currents in the vicinity of the refit facility at Bangor, Washington. The data input for this report comes from 5 moorings of Aanderra current meters, each mooring having 3 instruments. Currents were measured during the months of March, April, May, and June 1976. In addition, tide height, wind direction and magnitude were monitored at the Keyport Bangor Pier. (Sinha-OEIS)
W78-06532

MODELING OF OIL EVAPORATION IN AN AQUEOUS ENVIRONMENT (RESEARCH ON THE EFFECTS OF CRUDE OIL TRANSFER AND UPSTREAM REFINERIES ON DELAWARE BAY),
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5G.
W78-06533

BEACH NOURISHMENT TECHNIQUES. REPORT 2: A MEANS OF PREDICTING LITTORAL SEDIMENT TRANSPORT SEAWARD OF THE BREAKER ZONE,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
A. W. Garcia, and F. C. Perry.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-032 349, Price codes: A04 in paper copy, A01 in microfiche. Technical Report No H-76-13, October 1976. 64 p, 11 fig, 71 ref.

Descriptors: *Sediment transport, *Hydraulics, *Water quality, Baseline studies, Resources development, *Outer Continental Shelf, Beach nourishment, Longshore currents, Spoil disposal, Breaker zone.

A method of determining, as a function of water depth, the amount of sediment entrained into the longshore current regime seaward of the breaker zone is developed and presented, the objective being the nourishment of beaches by offshore dumping of sediment such as by hopper dredge. A summary and general description of previous related investigations are included. Wave hindcast data compiled by National Marine Consultants for the years 1956, 1957, and 1958 were used as input to the method for verification purposes. The site of verification was Point Pedernales, California. Figures showing the computed and measured longshore sediment transport are included for comparative purposes. (Sinha-OEIS)
W78-06534

THE INTERTIDAL FAUNA OF SANDY BEACHES. A SURVEY OF THE SCOTTISH COAST,
Aberdeen (Scotland). Marine Lab.
A. Eleftheriou, and A. D. McIntyre.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 959, Price codes: A04 in paper copy, A01 in microfiche. 1976. 65 p, 23 tab, 15 ref.

Descriptors: *Beaches, *Aquatic life, *Intertidal areas, *Ecology, Baseline studies, Resources development, Environmental effects, *Outer Continental Shelf, *Intertidal fauna, *Scotland, Environmental conditions.

The study of a number of sandy beaches covering a range of environmental conditions revealed faunistic variation which reflected the different species' tolerance of or preference for the conditions prevailing on particular beaches. Whenever a balanced situation in the environmental conditions existed, especially between shelter and exposure, a typical marine north-temperate water community characterized by the bivalve Tellina tenuis was present. This community included a basic faunistic complement consisting of polychaetes (both sessile and errant) such as Nerine cirratulus and Ophelia rathkei in the middle beach and Paraonis fulgens, Arenicola marina, Spio filicornis, Scoloplos armiger, Nephtys cirrosa and N. hombergi at the lower levels and a few crustaceans (Talitrus saltator, Haustorius arenarius, Bathyporeia pilosa, and Eurydice pulchra on the upper beach and Bathyporeia pelagica, B. elegans, Pontocrates norvegicus and P. arenarius on the lower foreshore). (Sinha-OEIS)
W78-06535

LECTURES ON ESTUARINE CIRCULATIONS AND MASS DISTRIBUTIONS,
Johns Hopkins Univ., Baltimore, MD. Dept. of Earth and Planetary Sciences; and Johns Hopkins Univ., Baltimore, MD. Dept. of Mechanics and Materials Sciences.
R. R. Long.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-034 119, Price codes: A05 in paper copy, A01 in microfiche. Technical Report No 9 (Series C), December 1976. 98 p, 8 fig, 54 ref. ONR-N00014-75-C-0805.

Descriptors: *Estuarine environment, *Circulation, *Mixing, *Saline water intrusion, Baseline studies, Pollution abatement, Resources development, Turbulence, *Outer Continental Shelf, *Mass distribution, Pollutant transport, Transfer processes, Estuarine characteristics, Density distribution.

A detailed discussion is presented to explain the characterization and characteristics of bodies of water identified as estuaries. A group of estuaries are classified in part on the relative strength of the turbulence that causes the mixing of waters of different salinity (density). Under discussion is the relevance of the source of fresh water to the variety of processes within such bodies of water. (Sinha-OEIS)
W78-06538

OIL SPILL AND OIL POLLUTION REPORTS NOVEMBER 1976 - JANUARY 1977,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06539

OIL SPILL AND OIL POLLUTION REPORTS AUGUST 1976 - OCTOBER 1976,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06540

OIL SPILL AND OIL POLLUTION REPORTS MAY 1976 - JULY 1976,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06541

OIL SPILL AND OIL POLLUTION REPORTS MAY 1975 - JULY 1975,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06545

PROCESSES, PROCEDURES AND METHODS FOR CONTROL OF POLLUTION FROM SALT WATER INTRUSION.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-06547

WAVE CLIMATE AT SELECTED LOCATIONS ALONG U.S. COASTS,
Coastal Engineering Research Center, Fort Belvoir, VA.
E. F. Thompson.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 904, Price codes: A16 in paper copy, A01 in microfiche. Technical Report No. TR-77-1, January 1977. 366 p, 18 fig, 7 tab, 23 ref, 2 append.

Descriptors: *Waves(Water), *Baseline studies, *Ocean waves, Water resources, Resources development, Sediments, Erosion, Sedimentation, *Outer Continental Shelf, *Wave measurements, *Wave climate, *Pollutant transport, *Transfer processes, U.S. East Coast, U.S. West Coast, U.S. Gulf Coast, Nearshore processes.

Summaries of nearshore wave measurements from 19 locations along the Atlantic, Gulf, and Pacific coasts is published to provide coastal engineers and coastal researchers aid in planning coastal operations, estimating coastal sediment movement, designing coastal structures and for other applications. However, because recording and analyzing reliable wave climate data are expensive and time consuming, there is a paucity of field wave data, thus a secondary purpose of this report is to provide details and a perspective on the various wave measurement, recording, and analysis systems used by the Beach Erosion Board (BEB) and CERC. Three basic wave gages have been used in the BEB-CERC wave data collection program: two staff gages (the step-resistance gage and the continuous-wire gage) and an underwater pressure-sensitive gage. Data recording and analysis techniques are discussed including the different methods used by CERC for analyzing pen and ink records. (Sinha - OEIS)
W78-06548

POLLUTANT TRANSFER TO THE MARINE ENVIRONMENT.
Rhode Island Univ., Kingston; and Texas Univ. at Austin. Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 5B.
W78-06549

FUNDAMENTAL ANALYSIS OF THE LINEAR MULTIPLE REGRESSION TECHNIQUE FOR QUANTIFICATION OF WATER QUALITY PARAMETERS FROM REMOTE SENSING DATA,
Old Dominion Univ., Norfolk, VA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-06550

MICROWAVE RADIOMETRIC SENSING OF SURFACE TEMPERATURE AND WIND SPEED FROM SEASAT,
Radiometric Technology, Inc., Wakefield, MA.
R. A. Porter, and P-T. Ho.
Final Report, Feb. 1977. (Prepared for National Oceanic and Atmospheric Administration, Dept. of Commerce) 155 p, 92 fig, 11 tab, 14 ref, 5 append.

Descriptors: *Oceans, *Water temperature, *Wind velocity, Effects, Sea water, Algorithms, Solar radiation, Brightness temperatures, Ocean surfaces, Mathematical models, Systems analysis, Equations, *Seasat, *Microwaves, *Remote sensing.

A comprehensive study has been performed to determine accuracy with which sea surface temperatures and wind speeds can be derived from brightness temperatures to be sensed by the SEASAT SMMR microwave radiometer. This work was based on the use of a 2-scale ocean roughness model, developed during the course of previous studies. Also, an improved 2-section ocean foam model, consisting of whitecaps and foam streaks, was applied to work performed in the study. Eleven microwave frequencies were used, together with ten atmospheric models, covering Sub-Polar, Mid-Latitude and Tropical regions. Wind velocities ranged from 4/msec., to 20 m/sec. All computations were performed at a single antenna beam incidence angle of 48.9 degrees, which is the SEASAT viewing angle. The seawater salinity was fixed at 34 deg/oo. The final operating frequencies, recommended for use on SEASAT, are 6.6, 10.69 and 18 Ghz. An evaluation was performed on the effects of scattered solar radiation on sea surface brightness temperatures to be measured with a 6.6 GHz radiometer. It is estimated that the solar contribution will range from 0.4 to 11 deg K, depending on the wind speed. An algorithm, for deriving sea surface temperatures, has been developed for use on SEASAT. Computer simulations resulted in a derived surface temperature within 0.7 deg K and a wind speed within 0.3 m/sec., of the correct value, in the presence of 6 mm/hr. rain. A set of concentrations and recommendations is presented. The real and imaginary parts of the dielectric permittivities of model whitecaps and foam streaks behave similarly, as a function of frequency, to those of sea water, as a consequence of the modeling. (Bell-Cornell)
W78-06551

SALTWATER INTRUSION IN THE SHALLOW AQUIFER IN PALM BEACH AND MARTIN COUNTIES, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06584

ELUTRIATION STUDY OF WILLAMETTE RIVER BOTTOM MATERIAL AND WILLAMETTE-COLUMBIA RIVER WATER,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 5C.
W78-06592

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

ELECTRO-REGENERATED ION-EXCHANGE DEIONIZATION OF DRINKING WATER,
Southern Research Inst., Birmingham, AL.
For primary bibliographic entry see Field 5F.
W78-06281

FIFTH INTERNATIONAL SYMPOSIUM ON FRESH WATER FROM THE SEA,
Office of Naval Research, London (England).
R. H. Nunn.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 625, Price codes: A02 in paper copy, A01 in microfiche. ONR Report No. C-17-76, July, 1976. 14 p, 1 fig, 1 tab.

Descriptors: *Water quality, Oceans, *Desalination, *Desalination apparatus, *Desalination processes, Economics, Technology, Energy, Waste water treatment.

The subject coverage of the Fifth International Symposium on Fresh Water from the Sea, held May 16-20, 1976, Alghero, Sardinia, Italy, is reviewed. Sessions on regional reviews, economis, and the use of fluidized beds in evaporative systems are highlighted. Economy was emphasized in the conference, with implications for the future of multi-stage flash evaporation systems in the presence of rising fuel costs discussed. Topics for papers presented at the conference included: regional reviews, economic consideration, agro-industrial complexes, recovery of chemicals, distillation processes, heat and mass transfer, scale formation/prevention, construction materials, corrosion, multi-stage flash fluidized bed evaporators, vertical tube evaporators, horizontal tube evaporators, vapor compression, effluents from desalting plants, desalination and power generation, geothermal desalination, solar evaporation, ion-exchange, ion-exchange membranes, electrodialysis, piezodialysis, ice formation, freezing processes, hydrates, reverse osmosis membranes, reverse osmosis processes, and hollow fibers. The conference consensus was that desalination has reached a point of high technology; however, future implementation is contingent upon the energy market. (Wares-IPA)
W78-06301

DESALINATION TECHNIQUES FOR CONVERSION OF BRACKISH WATER INTO POTABLE WATER FOR SMALL COMMUNITIES,
A. V. Rao, and D. J. Mehta.
In: Desertification and Its Control, Indian Council of Agricultural Research, New Delhi, 1977, 1 fig, 7 tab, p 149-154.

Descriptors: *Desalination, *Desalination processes, *Desalination apparatus, *Solar stills, *Potable water, Water supply, Saline waters, Brackish water, *Water treatment, Arid lands, Semiarid climates, Osmosis, Electrodialysis, *India.

Various techniques for supplying potable water to small communities in India that presently have saline or brackish water are presented. Three desalination techniques developed by the Central Salt & Marine Chemicals Research Institute are discussed: (1) use of solar stills, (2) reverse osmosis, and (3) electrodialysis. Solar stills are ideal for small isolated communities where the water requirement is low, the needed power is not available, and the water is saline. Solar stills are simple to construct and the operating and maintenance costs are small. The operation of a solar still is briefly explained. Reverse osmosis employs semipermeable non-ionic membranes for the purification of water. Its advantages are presented. Electrodialysis employs perm selective membranes for the desalination of brackish water. Its operating procedure and advantages are discussed. The estimated capital costs and the operating costs for plants of 5,000 liter-per-day capacity of solar stills and 10,000 liter-per-day of the other two types are presented. (Jamail-Arizona)
W78-06340

ORANGE COUNTY AUGMENTS WATER SUPPLY WITH RECLAMATION SYSTEM.
For primary bibliographic entry see Field 5D.
W78-06487

METHOD AND APPARATUS FOR CONVERTING SALINE WATER TO FRESH WATER,
P. S. Roller.
U.S. Patent No. 4,054,493, 6 p, 1 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 963, No 3, p 986, October 18, 1977.

Descriptors: *Patents, *Desalination apparatus, *Demineralization, *Saline water, Descaling, Separation techniques, Flash distillation, Sea water.

Preheated saline water, typically sea or brackish water, is further heated by quanta of steam, passed to it at differential temperatures and pressures and condensed in the saline water. Scale compounds are precipitated and scale-forming bicarbonates decomposed, with the evolution of carbon dioxide, which is gathered and expelled by steam accessory to the quanta of steam. Post-thermal saline water, which is formed, is multi-stage flash vaporized while self-cooling. The flashed vapors are compressed to form the quanta of steam. After being further cooled while preheating saline water, post-thermal saline water is evaporated in a multistage vapor compression evaporator, producing brine at a high concentration factor. Relative to equilibrium in scale-compound precipitation between 302 deg. F and 347 deg F, the recovery of fresh water is 70% to 80% for sea water, and 80% to 90% for brackish waters over a wide range of salinity. (Sinha-OEIS)
W78-06660

3B. Water Yield Improvement

THE ADAPTIVE CHARACTERISTICS OF DESERT PLANTS,
Harvard Univ., Cambridge. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-06337

DRIP IRRIGATION TO REVEGETATE MINE WASTES IN AN ARID ENVIRONMENT,
ASARCO, Inc., Tucson, AZ.
S. A. Bengson.
Journal of Range Management, Vol. 30, No. 2, p 143-147, March 1977. 12 fig, 2 ref.

Descriptors: *Irrigation practices, *Revegetation, *Irrigation systems, *Mine wastes, Irrigation design, Water conservation, Arid lands, Arizona, *Drip irrigation.

A study was made of several different drip irrigation methods and available equipment, and advantages and disadvantages noted. The project, still underway in 1977, resulted in the successful revegetation of the previously mine-wasted Asarco Sacaton mine in southern Arizona. Drip irrigation offered many advantages over other methods on steep slopes. There was less hazard of runoff and erosion with this method, excessive salt and phytotoxins were leached from the root zones, it was adaptable to remote areas wihtout pressurized water systems, it conserved water, and it helped promote deep root growth and better plant development. (Castricone-Arizona)
W78-06339

HYDRAULIC FRACTURING OF DRILLED WATER WELLS IN CRYSTALLINE ROCKS OF NEW HAMPSHIRE,
New Hampshire Dept. of Resources and Economic Development, Concord. State Geologists Office.
For primary bibliographic entry see Field 4B.
W78-06372

WEATHER MODIFICATION ACTIVITIES IN KANSAS 1972-1977,
Kansas Water Resources Board, Topeka.
D. F. Kostecki.
Bulletin 22, Special Report to the Governor and Legislature, 1977. 18 p, 2 tab.

Descriptors: *Weather modification, *Rainfall, *Projects, *Kansas, Cloud seeding, Silver iodide, Salts, Evaluation, Rain gages, Radar, Data collections, Data processing, Cloud physics, Meteorology.

The State of Kansas entered the field of weather modification in 1972 when the Kansas Water Resources Board began a series of three field experiments during the summer months. With the passage of the Kansas Weather Modification Act in 1974, the Board was given broad responsibilites, including the issuing of licenses and permits to conduct weather modification or cloud seeding activities, and the encouragement of research and development projects. Since early 1975, the Board has been working partner with the U.S. Bureau of Reclamation in the High Plains Cooperative Program (HIPLEX), a multi-year intensive research effort to remove critical scientific uncertainties about the effectiveness and reliability of cloud seeding. The Board has sponsored several research projects related to, and in support of, the HIPLEX. During this same period, groundwater management districts and several counties in parts of western Kansas have sponsored and conducted operational cloud seeding projects. The Board has attempted to assist these operational projects, primarily by enhancing their data collection capability as a first step toward quantitative evaluation of effects. (Sims-ISWS)
W78-06382

AN EXPERIMENTAL EVALUATION OF THE EFFECTIVENESS OF ANTITRANSPIRANTS ON SELECT PLANT SPECIES,
Colorado Univ., Boulder. Dept. of Chemical Engineering.
F. Kreith, and J. E. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 579, Price codes: A03 in paper copy, A01 in microfiche. Supplement to Completion Report, September, 1975. 23 p, 8 fig, 4 tab, 13 ref. Submitted jointly to Bureau of Land Management. OWRT B-099-COLO(3). 14-31-0001-4065.

Descriptors: *Antitranspirants, Phreatophytes, Water conservation, *Water yield improvement, *Chemcontrol, *Tamarix, *Photosynthesis, *Transpiration control, Phytotoxicity, Soil moisture, Measurement, Roadways.

The objective was to evaluate the potential of using chemical antitranspirants on phreatophyte communities to increase watershed runoff and streamflow. More specifically, the research included (1) laboratory evaluation of the effects of the most promising antitranspirants currently available on transpiration and photosynthesis of Tamarix sp. (2) phytotoxicity trials in the laboratory and in the field, and (3) field evaluation of one antitranspirant on Tamarix at the U. S. Bureau of Reclamation Evapotranspirometer Site at Bernardo, New Mexico. The original work plan was modified to include antitranspirant screening studies for the U. S. Bureau of Land Management (BLM) to evaluate in the laboratory the effects of two antitranspirants on transpiration and photosynthesis of several species representative of roadside vegetation. Transpiration and net photosynthesis were measured with an open, gas exchange system. The results indicate that Mobileaf, Wilt Pruf, or similar antitranspirant formulations will effectively reduce transpiration of herbaceous species on the laboratory. Antitranspirant effectiveness, when corrected for growth of controls, appears to be satisfactory for 10-14 days after spraying. The similarity of antitranspirant effects on four species suggests that similar laboratory results could be expected with most herbaceous range or roadside species. Several commercial growth retardants have been reported to have antitranspirant properties. Samples were obtained of two (Alar, a UNIROYAL product, and Atrazine, from CIBA-GEIGY Corp.) for laboratory trials singly and in combination with film-forming antitranspirants. The initiation of a small scale field study is recommended to attempt to quantify the magnitude of actual water savings along roadways by various antitranspirant treatments, including mowing. Comparing soil moisture on clipped and unclipped roadside stands should indicate the maximum potential for water savings and provide a good baseline to which values from areas treated with chemical antitranspirants could be compared.
W78-06411

3C. Use Of Water Of Impaired Quality

UTILIZATION OF BRACKISH WATER IN COAL GASIFICATION,
New Mexico State Univ., University Park. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 3E.
W78-06204

LEVEL OF CHEMICAL SUBSTANCES IN FARM CROPS GROWN ON SOIL IRRIGATED BY WASTE WATERS FROM BY-PRODUCT COKING PLANTS (ROUGH DRAFT),
Scientific Research Inst. for Foods Sanitation, Kiev (USSR). Physico-Chemical Lab.
N. M. Barabanova, L. P. Polushchuk, and L. Stemikovskaya.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-tr-2957, Price codes: A02 in paper copy, A01 in microfiche. Report ORNL-tr-2957, (1975). Translation from Voprosy Pitaniya, No. 5, p 76-79, 1973. 4 p, 4 tab, 6 ref.

Descriptors: *Irrigation effects, *Plant growth, *Crop response, *Crop production, Soil chemical properties, Water reuse, Corn(Field), Potatoes, *Coke-chemical plant waste irrigation, *Waste water irrigation.

The quality of potatoes and corn grown on land irrigated with coking-chemical plant waste waters which contain various chemicals was investigated. Basic chemical ingredients in the wastewaters included: phenols, pyridine, napthaline, benzene, iron, ammonia, nitrites, nitrates, chlorides, sulfates, sulfites, sulfides, cyanides, and thiocyanates. Crop lands were irrigated with dilutions of waste waters; irrigation with undiluted waste water and waste water diluted 1:4 resulted in significant depression of plant growth, and further irrigation was discontinued. Both corn and potatoes grown on soil irrigated with waste waters from by-product coke plants accumulated nitrates, ammonia, sulfates, and chlorides. In the potato tubers, the monoatomic phenols (when irrigated with undiluted waste waters) and nitrates (irrigated 5 times with a 1:8 dilution) were high compared to controls. The other organic substances (sulfides, cyanides, and thiocyanates) in the materials studied were absent; this is probably due to their destruction in the soil and in the plants. (Seip-IPA)
W78-06272

DESERTIFICATION IN THE UNITED STATES,
International Center for Arid and Srmi-Arid Lands Studies, Lubbock, TX.
For primary bibliographic entry see Field 4D.
W78-06333

EFFECT OF SULFURIC ACID ON AMMONIA VOLATILIZATION UNDER FIELD CONDITIONS,
Arizona Univ., Tucson. Dept. of Soil, Water and Engineering.
T. A. Yahia.
Ph.D. Dissertation, 1977. 71 p, 8 fig, 14 tab, 45 ref.

Descriptors: *Irrigation water, *Ammonia, *Ammounium compounds, *Nitrogen, *Fertilizers, Nitrogen compounds, Arid lands, Semiarid climates, *Hydrogen sulfide, Calcium, Alkaline soils, Irrigation.

Anhydrous ammonia was applied in irrigation water along with and without adding sulfuric acid. Ammonia losses by volatilization were measured indirectly by measuring nitrogen in soils, plant tissues, and irrigation water at two field locations. The study showed that adding sulfuric acid with irrigation water reduced the loss of nitrogen through ammonia volatilization. The acid is effective in reducing NH 3 losses under alkaline soil conditions in arid and semiarid climates, especially when the irrigation water contains high levels of sodium relative to calcium. It is recommended that sulfuric acid which is produced as an industrial by-product be used as an aid to reduce ammonia volatilization losses under field conditions. (Jamail-Arizona)
W78-06335

METHODS FOR AN INVESTIGATION OF UREA-N LOSS IN ARIZONA AGRICULTURAL WATERS DUE TO UREASE ACTIVITY,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W78-06336

QUALITY OF PERCOLATE BELOW THE ROOT ZONE OF SELECTED VEGETABLES GROWN IN NORTHERN GUAM,
Guam Univ., Agana. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-06582

USE OF WARM WATER AFTER COOLING COMPRESSORS AND CONDENSERS (ISPOL'ZOVANIE V PROIZVODSTVE TEPLOI VODY POSLE OKHLAZHDENIYA KOMPRESSOROV I KHOLODIL'NIKOV),
Solikamskii Tsellyulozno-Bumazhnyi Kombinat (USSR).
V. A. Kokh, P. A. Zagorodskikh, N. N. Naimushin, and P. M. Cherepov.
Tsellyuloza Bumaga i Karton Referativnaya Informatsiya, No 20, p 5-6, 1977. 1 fig.

Descriptors: *Cooling water, *Water reuse, *Industrial water, Pulp and paper industry, Effluents, Wastes, Industrial wastes, Water pollution sources, Heated water, Water, Rivers, Pumps, Valves, Water distribution(Applied), Water pressure, Oily water, Water pollution treatment, Soviet Union(USSR).

Purified river water is used for cooling compressors and terminal condensers at the Solikamsk pulp and paper mill (USSR). The water is then dumped into a sewer system. A separate pump and water line were installed in the existing fire-dousing system. Through the use of valves and pumps, various water pressures can be directed to either system. In the case of fire, pressure in the water supply system is increased by a special pump, and water from the compressors is pumped into the sewer system for use. When pressure in the fire system is lowered, water from the compressors is automatically pumped back into their water supply system. Oil in the water from the oil-cooled condensers is also expelled by the use of pumps and a separator. (DuVall-IPC)
W78-06638

GEOTHERMAL POWER SYSTEM,
For primary bibliographic entry see Field 8G.
W78-06659

EFFECT OF CHLOROCHOLINE CHLORIDE ON THE RESISTANCE OF WHEAT TO AN EXCESS AND DEFICIENCY OF THE WATER SUPPLY DURING THE CRITICAL PERIOD (IN RUSSIAN),
Komsomolskii-na-Amure Gosudarstvennyi Pedagogical Inst. (USSR).
G. A. Vorobeikov.
Fiziol Rast (MOSC) 23(3), p 573-578, 1976.

Descriptors: *Chlorides, *Wheat, Water supply, *Chlorocholine chloride.

The effect of CCC (chlorocholine chloride) on the resistance of wheat plants, cultivar 'Dalnevostochnaya', to excess and deficient water supply was studied in vegetation experiments during the critical period. Spraying of the leaves with the preparation or its introduction into the soil 5 days prior to drought or inundation, as well as moistening the seeds, decreased negative consequences of unfavorable water supply on plants. Treatment of the plants with CCC is also effective when soil humidity changes sharply (drought and inundation). Physiological processes (growth, water regime, permeability and viscosity of the protoplasm, the content of chlorophyll and protein N) are less interfered with in the treated plants and more viable pollen grains in the ears are formed in these plants. Drought resistance decreased if they had been treated with CCC 2 days after irrigation was stopped; this seems to be a result of the primary depression of physiological processes during the first 2-3 days after the treatment and in the course of drought. Treatment of the plants with CCC is recommended prior to inundation or drought to decrease damage.--Copyright 1977, Biological Abstracts, Inc.
W78-06692

3D. Conservation In Domestic and Municipal Use

MANAGEMENT OF URBAN RUNOFF AND WASTEWATER IN THE OSLOFJORD AREA,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5G.
W78-06214

AN EXAMPLE OF EXCESS URBAN WATER CONSUMPTION,
Calgary Univ. (Alberta). Dept. of Civil Engineering.
M. Gysi, and G. Lamb.
Canadian Journal of Civil Engineering, Vol 4, No 1, p 66-71, March 1977. 4 tab, 4 ref.

Descriptors: *Municipal water, *Water consumption(Except consumptive use), Effects, *Pricing, *Metering, *Canada, Summer, Winter, Water supply, Benefits, Costs, Prairie cities, Water utilization.

A study of urban water consumption in the prairie cities is being undertaken to determine what effect metering or pricing policies can have on summer and winter consumption, and eventually on the long run benefits and costs of supply. Of particular interest is the comparison of consumption patterns in Calgary and Edmonton, the two 'twin' cities of Alberta. These two cities are very similar in size, industrial-residential mix, and climate, but Calgary uses more than twice as much water in the residential sector, where over 80% of the customers are unmetered. Initial analysis of the data indicates that the increased consumption is due mainly to the difference in pricing policies used by the two cities. (Bell-Cornell)
W78-06575

3E. Conservation In Industry

UTILIZATION OF BRACKISH WATER IN COAL GASIFICATION,
New Mexico State Univ., University Park. Dept. of Chemical Engineering.
J. A. McNeese, and D. B. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 146, Price codes: A04 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, WRRI Report No 063, January 1976. 48 p, 16 fig, 6 tab, 13 ref. OWRT A-051-NMEX(1).

Descriptors: *Coal gasification, *Brackish water, *Industrial water, Water utilization, Corrosion, Impaired water quality, *Leaching, *Leachates, Salts, *Salt deposition(Industrial), Sodium chloride, Sodium sulfate, Potassium chloride, *Chlorides, *Sulfates, Water pollution sources, Aquifers.

When coal is utilized for production of synthetic natural gas, approximately 11,000 acre feet a year will be required for the daily production of 300 million cubic feet (STP) of gas. A major advance would occur in gasification development if part of the required water could be supplied from brackish water sources. The main consideration in the use of brackish water as process water is the deposition of the salts from the brackish water. Three salt systems supplied from a synthetic saline solution were analyzed for salt deposition during the gasification of a coal-salt solution paste. The salts studied were sodium chloride, potassium chloride, and sodium sulfate. The study examined the leachability of these salts from the product coal-ash; most of the salts introduced into the reactor system were leachable either from the product mixture or from the reaction vessel. The salt material balance could be closed by accounting for salts carried from the system either as mist or as particulate. While not a definite deterrent to the use of brackish water in an in-situ gasification process, the leaching of these salts into ground water and subsequent deterioration of the ground water aquifer would have to be considered. In the case of the Lurgi reactor system, brackish water could not be used until corrosion considerations had been examined. Conclusions were: Common brackish water salts are leachable from the spent reaction zone products in a packed bed gasification reactor. Ash fusion may occur at temperatures well below expected high silica ash fusion points. Potential damage to aquifers could result from salt migration from a spent in-situ reaction bed. In a packed bed reactor salts tend to migrate out the bed interior to the reactor wall.
W78-06204

LIQUIDATION OF THERMAL ELECTRIC POWER STATION WASTE WATERS - ACTUAL TECHNICAL PROBLEMS (ROUGH DRAFT),
For primary bibliographic entry see Field 5D.
W78-06271

MERCURY RECOVERY FROM CONTAMINATED WASTE WATER AND SLUDGES,
Georgia-Pacific Corp., Bellingham, WA. Bellingham Div.
For primary bibliographic entry see Field 5D.
W78-06286

SYMPOSIUM PROCEEDINGS: ENVIRONMENTAL ASPECTS OF FUEL CONVERSION TECHNOLOGY, II (DECEMBER 1975, HOLLYWOOD, FLORIDA).
Research Triangle Inst., Research Triangle Park, NC.
For primary bibliographic entry see Field 5D.
W78-06302

WASTE MANAGEMENT OF FUELS PROCESSING EFFLUENTS,
Exxon Research and Engineering Co., Florham Park, NJ.
For primary bibliographic entry see Field 5D.
W78-06306

WATER REQUIREMENTS FOR AN INTEGRATED SNG PLANT AND MINE OPERATION,
Water Purification Associates, Cambridge, MA.
D. J. Goldstein, and R. F. Probstein.
In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology, II (December 1975, Hollywood, Florida), p 307-332. 5 fig, 21 tab, 41 ref, 1 append. SIA74-19080-A01, 68-03-2207.

Descriptors: *Fuels, *Mining, *Water requirements, *Water supply, Land reclamation, Evaporation, Waste disposal, Economics, Geographical regions, Facilities, Coals, *Synthetic natural gas, Lurgi process, Fuel conversion.

A summary of water requirements for an integrated synthetic natural gas (SNG) plant and mine operation is given from estimates derived from illustrated data on process net consumption of water consistent with the Lurgi process design. The water consumed includes not only water for the conversion process, but also water evaporated for cooling and consumed in mining, land reclamation, and solids disposal. Since published information on these water requirements by type varies by more than fourfold, details of a procedure for determining such water requirements are given. The determination of the cost of not evaporating water for cooling, but of using air cooling and condensing is also described. It is shown that water requirements are dependent on process design, mine location, and climate, and that generalized assessments that are not site-specific and design-specific are of limited value. It is also shown that the published water requirements for integrated

SNG plants and mine operations in the West may be too high, and that the actual requirements could (depending on location) be half the lowest estimates to date. It is concluded that determination of water requirements for such facilities is particularly important in the Western U.S. where coal is available but water is scarce. The appendix contains representative formulae and data for calculating costs of cooling methods. (See also W78-06302) (Wares-IPA)
W78-06307

TECHNOLOGICAL ECONOMICS APPLIED TO WASTE RECOVERY AND TREATMENT PROCESSES,
Aston Univ., Birmingham (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W78-06327

COST MINIMIZATION FOR COAL CONVERSION POLLUTION CONTROL: A MIXED INTEGER PROGRAMMING MODEL,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W78-06359

PROJECTIONS OF ECONOMIC DEVELOPMENT ASSOCIATED WITH COAL-RELATED ACTIVITY IN MONTANA,
Montana State Univ., Missoula. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6D.
W78-06364

CHLORIDES IN THE KRAFT RECOVERY SYSTEM,
Institutet for Vatten- Och Luftvardsforskning, Stockholm (Sweden).
For primary bibliographic entry see Field 5D.
W78-06374

WATER REQUIREMENTS FOR FUTURE ENERGY DEVELOPMENT IN THE WEST: STATE PERSPECTIVES,
EG and G Idaho, Inc., Idaho Falls.
For primary bibliographic entry see Field 6D.
W78-06375

OZONATION OF MAKE-UPWATER FOR SALMONIC FISH REARING FACILITIES,
Idaho Univ., Moscow. Dept. of Bacteriology and Biochemistry.
For primary bibliographic entry see Field 5D.
W78-06579

PROBLEMS WITH REUSE OF VETRNI PAPER MILL EFFLUENTS IN THE PULP MILL CONSIDERING THE CONCENTRATION OF SULFATE IONS (PROBLEMATIKA RECIRKULACIE VOD MEDZI PAPIERNOU A CELULOZKOU VO VETRNI Z HL'ADISKA OBEHU SIRANOVYCH IONOV),
Vyskumny Ustav Papiera a Celulozy, Bratislava (Czechoslovakia).
L. Balhar, P. Buchler, and J. Schmied.
Papir a Celuloza, Vol 32, No 7-8, p 195-198, 1977. 2 fig, 2 tab.

Descriptors: *Water reuse, *Pulp wastes, *Water pollution control, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Foreign countries, Europe, Water conservation, Sulfur compounds, Computer models, Ions, Sulfates, Recycling, Aluminum, Newsprint mills, Sulfite pulp mills, Czechoslovakia.

The Vetrni integrated pulp and paper factory in Czechoslovakia includes sulfite as well as sulfate mills, a groundwood production facility, and a paper mill containing several paper machines and a modern newsprint machine. A study of freshwater usage potential showed that it would be advantageous to reuse the newsprint machine effluent, after mechanical treatment, in the sulfite pulp mill. The only problem might be the contamination of the sulfite pulp mill system, mainly the spent liquor evaporators, with sulfate ions originated in the paper mill. To answer the question about the sulfate ion concentration, a computer simulation of the proposed recycle was carried out. The results showed that the sulfate ion concentration would not reach a dangerous level when the newsprint paper mill effluent is used in the pulp separation section of the sulfite pulp mill. (Trubacek-IPC)
W78-06627

USE OF WARM WATER AFTER COOLING COMPRESSORS AND CONDENSERS (ISPOL'ZOVANIE V PROIZVODSTVE TEPLOI VODY POSLE OKHLAZHDENIYA KOMPRESSOROV I KHOLODIL'NIKOV),
Solikamskii Tsellyulozno-Bumazhnyi Kombinat (USSR).
For primary bibliographic entry see Field 3C.
W78-06638

PLANT CLOSES LOOP ON ITS WASTEWATER TREATMENT.
For primary bibliographic entry see Field 5D.
W78-06641

EVALUATION OF BIRD CHILLER WATER FOR RECYCLING IN GIBLET FLUMES,
Richard B. Russell Agricultural Research Center, Athens, GA.
For primary bibliographic entry see Field 5D.
W78-06644

NON-CLOG WATER DISTRIBUTION NOZZLE,
Ecodyne Corp., Lincolnshire, IL. (Assignee).
J. M. Schwinn.
U.S. Patent No. 4,055,305, 4 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 963, No 4, p 1265, October 25, 1977.

Descriptors: *Patents, *Cooling water, *Water cooling, *Industrial water, *Spraying, Cooling towers, Nozzles, Application equipment, Dispersion.

In some cooling towers liquid to be cooled is pumped up to an open-topped hot water distribution basin extending over most of the upper surface of the tower. Solid objects which fall on the tower collect in such a basin and pass with the liquid being cooled into the nozzles which spray the liquid over the cooling tower fill. To ensure efficient use of all of the fill in a cooling tower, the liquid being cooled should be evenly distributed over the fill. Even distribution of the liquid can be economically achieved by using baffle-type nozzles to spray the hot liquid in essentially circular patterns. Prior art spray nozzles have not been satisfactory because the structure supporting the spray creating baffles, and the baffles themselves, often become clogged by solid objects in the liquid being cooled. Such clogging disrupts the circular spray patterns and thus prevents even distribution of liquid over the fill. It is the object of this invention to provide a clog-free nozzle for spraying hot liquid over the fill in a cooling tower and that creates a circular spray pattern in an unpressurized system by using a single baffle supported by a single arm. The liquid flows through the nozzle solely under the influence of gravity. The spray nozzle is durable, relatively lightweight, corrosion-resistant, and inexpensive. (Sinha-OEIS)
W78-06670

3F. Conservation In Agriculture

ANALYSIS OF PRIORITY WATER RESOURCES PROBLEMS FOR THE SOUTHERN PLAINS REGION,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W78-06207

SOIL, WATER, AND VEGETATION CONDITIONS IN SOUTH TEXAS,
Agricultural Research Service, Weslaco, TX.
For primary bibliographic entry see Field 7B.
W78-06240

EFFECT OF SULFURIC ACID ON AMMONIA VOLATILIZATION UNDER FIELD CONDITIONS,
Arizona Univ., Tucson. Dept. of Soil, Water and Engineering.
For primary bibliographic entry see Field 3C.
W78-06335

METHODS FOR AN INVESTIGATION OF UREA-N LOSS IN ARIZONA AGRICULTURAL WATERS DUE TO UREASE ACTIVITY,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W78-06336

DRIP IRRIGATION TO REVEGETATE MINE WASTES IN AN ARID ENVIRONMENT,
ASARCO, Inc., Tucson, AZ.
For primary bibliographic entry see Field 3B.
W78-06339

EFFICIENT UTILIZATION OF IRRIGATION WATER AND EQUIPMENT. PART I: DRIP AND SPRINKLER IRRIGATION OF CARROTS AND ONIONS. PART II: ANALYSIS OF MULTIPLE PIVOT IRRIGATION ON A DROUGHTY SOIL,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
D. W. DeBoer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 501, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, November 1977. 60 p, 5 fig, 21 tab, 27 ref. OWRT A-043-SDAK(1), 14-31-0001-5042.

Descriptors: Irrigation, *Drip irrigation, *Irrigation efficiency, *Crop response, Application equipment, Water management(Applied), Water utilization, Soil water, Carrots, Onions, *Sprinkler irrigation, *Center pivots, Water demand, Irrigation operation and maintenance, Irrigation systems, Irrigation design, *North Dakota.

Results from a two year drip and sprinkler irrigation study on carrots and onions are reported. The experimental field site was near Brookings, South Dakota on a 45 cm deep Fordville loam soil; one sprinkler and three drip treatments were investigated in the study. For the first year approximately equal gross amounts of irrigation water were supplied to all experimental plots. The carrot and onion sprinkler yields were smaller than the drip yields. Average carrot and onion yields were approximately 105,000 kg ha-1 and 60,000 kg ha-1, respectively. The water management program for the second year resulted in overirrigation on the sprinkler treatment and adequate irrigation on the drip treatment. While crop yields were similar, the drip produce was larger on the average than sprinkler produce, and tended to have fewer culls and splits. A field plot study was conducted to simulate the use of one center pivot irrigation machine on one and/or two adjacent fields. The soil in the ex-

perimental area had a depth of 46 cm and an available moisture storage of 6.1 cm. Corn and alfalfa were the experimental crops. Corn yields were significantly reduced when one irrigation machine was used to irrigate two fields of corn instead of one field; however, alfalfa yields were not reduced. Corn yield, for the situation where the irrigation machine is first used on an alfalfa field and then moved to the corn field in early July, was equal to single field corn yield. The alfalfa yield for the July move situation was more than the dryland yield but less than the full season irrigation yield. An economic feasibility study indicated that one irrigation machine on one field of corn or on two fields of alfalfa was most economical when corn or alfalfa were exclusively grown. When combinations of corn and alfalfa were considered, commodity prices were a dominant factor.
W78-06413

INFLUENCE OF SOIL TYPE, PH, MOISTURE AND TEMPERATURE ON PHYTOTOXICITY AND EFFECTIVENESS OF THE FUNGICIDES OF THE PCNB AND TMTD GROUPS IN THE CONTROL OF ONION SMUT (UROCYSTIS MAGICA PASS.), (IN POLISH),
Szkola Glowna Gospodarstwa Wiejskiego Warsaw (Poland).
J. Kochman, and W. Macias.
Acta Agrobot 27(1), p 85-104, 1974.

Descriptors: *Soil types, Hydrogen ion concentration, Seedlings, Moisture content, *Phytotoxicity, *Pentachloronitrobenzene, *Dissulfide compounds, *Benzene compounds, *Fungicides, Nasienna, *Onion smut, Sulfides, Temperature, Terrafun, Thiuram, Toxicity, Urocystis-magica, Zaprawa, Plant diseases, Plant fungi.

Onion seedlings were sown in a variety of soils, sandy, peat, clay, compost and in a soil of varying pH and another of varying capillary moisture, and their growth was observed before and after the introduction of fungicides at a concentration of 60 kg/ha. Fungicides of the pentachloronitrobenzane group (PCNB), namely, Terrafun 20, Terrafun 75, Brassicol and Liro PCNB-50 were studied, as well as one of the bis(dimethylthiocarbamoyl)-disulfide group (TMTD), namely, Zaprawa Nasienna T (ZNT). All of the PCNB fungicides inhibited plant germination in all the soils except peat, while ZNT permitted germination of 50-76% of the seedlings compared to controls and in compost permitted growth of 95%. When the seedlings were infected with onion smut (Urocystis magica Pass.) at levels where none of the seedlings grew, ZNT considerably increased plant growth by reducing smut, particularly at pH 6-7 and in compost where it was least phytotoxic. Temperature and moisture content of the soil greatly affected the infectivity of the fungus. Highest infection was observed at 15C and at soil moisture contents below 40% and above 75%. Infectivity was minimal at 25C and at 60% capillary moisture capacity. In all types of soil, the fungicides of the PCNB group were highly phytotoxic, especially at low moisture levels and higher temperatures. The phytotoxicity of ZNT was not much affected by temperature and was less toxic in dry soils. However, all of the fungicides were effective in controlling infection with the smut fungus but ZNT was the least toxic to the onion plant.--Copyright 1977, Biological Abstracts, Inc.
W78-06505

AN EVALUATION OF THE POTENTIAL FOR USING DRAINAGE CONTROL TO REDUCE NITRATE LOSS FROM AGRICULTURAL FIELDS TO SURFACE WATERS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W78-06578

MOISTURE DETECTION APPARATUS,
W. G. Lohoff.
U.S. Patent No. 4,055,200, 8 p, 8 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 963, No 4, p 1229, October 25, 1977.

Descriptors: *Patents, *Irrigation, *Soil moisture, *Moisture content, Irrigation efficiency, Soil-water-plant relationships, Water supply, Valves, Application equipment.

The variability and unpredictablity of the amount of water needed by a specific plant is difficult to forecast. Water should be supplied to the plant in response to the plant's need for water and not in response to an arbitrary standard such as time. A soil moisture detector is described for incorporation between a timer controller and an electrical water supply valve. The detector includes a pneumatic diaphragm apparatus whereby a pressure level is maintained or released between a pair of diaphragms in response to a moisture sensing valve buried in the ground. The pneumatic condition of the detector permits the slug of a solenoid valve, responsive to the timing sequence of the timer controller, to open or close a switch for supplying voltage to the water supply valve. (Sinha-OEIS)
W78-06668

AUXILIARY BRAKING MEANS FOR IMPACT ARM SPRINKLERS,
Rain Bird Sprinkler Mfg. Corp., Glendora, CA. (Assignee).
R. L. Munson.
U.S. Patent No. 4,055,304, 6 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 963, No 4, p 1265, October 25, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation efficiency, Irrigation practices, Application equipment, Water delivery.

An impact type rotary sprinkler includes a rotatable body and nozzle, an impact arm which oscillates responsive to the kinetic energy of the fluid discharge stream and a primary spring called an arm spring. The sprinkler is adapted for uniform water distribution over a range of discharge stream kinetic energies in excess of design limits by the provision of a secondary spring. The auxiliary spring is carried on the body of the sprinkler and has a free end placed in the path of arm rotation for engagement with the arm after it has rotated through a predetermined arc. Once the free end of the auxiliary spring has been engaged by the impulse arm further rotation of the arm is restricted by the auxiliary spring in cooperation with the armspring, both springs acting together against the arm to reverse its direction of rotation. (Sinha-OEIS)
W78-06669

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

VALIDATION AND IMPLEMENTATION OF A SIMPLIFIED STREAMFLOW SIMULATOR,
Nebraska Univ., Lincoln. Dept. of Computer Science.
For primary bibliographic entry see Field 2E.
W78-06205

OPTIMAL OPERATION OF A FLOOD CONTROL RESERVOIR,
Iowa State Univ., Ames. Dept. of Civil Engineering.
T. D. Glanville.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 099, Price codes: A06 in paper copy, A01 in microfiche Master of Science Thesis, 1976. 107 p, 18 fig, 8 tab, 28 ref, 2 append. OWRT B-049-IA(1).

Descriptors: *Flood control, *Reservoir operation, *Model studies, *Computer models, Planning, Programs, Cost analysis, *Iowa, *Dynamic programming, *Computer optimization model, *Des Moines River(IA), *Red Rock Reservoir(IA), *Saylorville Reservoir(IA).

Flood control reservoir operating policies which balance both upstream and downstream damage potentials during large magnitude floods are described. The formulation and operation of a dynamic programming optimization model which is used to determine the effects of various operating schemes that limit the damage in certain areas upstream of a flood control structure are detailed. The Red Rock-Saylorville Reservoir System, located on the Des Moines River up-and downstream of Des Moines, Iowa, is analyzed. (Seip-IPA)
W78-06208

FLOOD ROUTING BY THE MUSKINGUM METHOD,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06211

A MONTHLY WATER BALANCE MODEL INCLUDING DEEP INFILTRATION AND CANAL LOSSES,
Vrije Univ., Brussels (Belgium). Lab. of Hydrology.
For primary bibliographic entry see Field 2A.
W78-06220

HYDROGRAPH SYNTHESIS USING LANDSAT REMOTE SENSING AND THE SCS MODELS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06236

POTAMOLOGY INVESTIGATION, RELATIONSHIP BETWEEN CALCULATED HYDRAULIC PARAMETERS AND PHYSICAL FEATURES OF THE CHANNEL.
Water and Environment Consultants, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 8B.
W78-06237

POTAMOLOGY INVESTIGATION, A STUDY OF THE SHIFT IN THE STAGE-DISCHARGE RELATIONSHIP OF THE MISSOURI RIVER AT SIOUX CITY, IOWA.
Water and Environment Consultants, Inc., Fort Collins, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 717, Price codes: A03 in paper copy, A01 in microfiche. Prepared by Army Engineer District, Omaha, Nebraska, May 1976. 42 p, 9 fig, 9 tab, 1 ref. Army DACW45-75-D-0003.

Descriptors: *Stage-discharge relations, *Missouri River, *Iowa, *Degradation(Stream), *Channel morphology, Suspended solids, Sediments, Flow, Streamflow, Dams, Control structures, Flow control, Discharge(Water), Water levels, Degradation(Slope), Rivers, Channels, Channel improvement, Geomorphology, Erosion, Hydraulics, Potamology, *Sioux City(Iowa).

Over the past 10 years, the Missouri River has experienced a large downward shift in its stage-discharge relationship at the Sioux City, Iowa, gaging station. The stage for a given discharge, in the range of 10,000 to 40,000 cfs, has decreased 5-8

feet in this time. A study of related data showed that the combined interaction of geologic, hydrologic, geometric, and hydraulic factors influenced this change. The major changes which combined to cause a general degradation in the river reach near Sioux City include a reduction in suspended sediment load, a shortening of the river channel in the area, construction of river training works, and a recent (7 year) increase in the mean yearly flow as well as increased peak flows. The resulting degradation and increase in total channel area below the high bank elevation have lowered the stage for a given discharge at Sioux City. This study illustrated the changes which have occurred in the river since 1950. (Sims-ISWS)
W78-06238

SOIL, WATER, AND VEGETATION CONDITIONS IN SOUTH TEXAS,
Agricultural Research Service, Weslaco, TX.
For primary bibliographic entry see Field 7B.
W78-06240

INTERACTION OF URBAN STORMWATER RUNOFF, CONTROL MEASURES AND RECEIVING WATER RESPONSE,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 5B.
W78-06309

HISTORICAL STREAMFLOW SUMMARY, MANITOBA, TO 1976.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W78-06310

HISTORICAL STREAMFLOW SUMMARY, SASKATCHEWAN, TO 1976.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 7C.
W78-06311

MAGNITUDE AND FREQUENCY OF FLOODS IN SOUTHERN ONTARIO,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2E.
W78-06312

THE REDISTRIBUTIONAL CONSEQUENCES OF PUBLIC RECREATION PROVISION AT THE POTHOLES RESERVOIR - COLUMBIA BASIN PROJECT, WASHINGTON,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W78-06349

CHARACTERIZATION OF URBAN RUNOFF - NEW YORK,
Cornell Univ., Ithaca, NY. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-06352

BUOYANCY EFFECTS IN THERMALLY STRATIFIED OPEN-CHANNEL FLOW,
Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
For primary bibliographic entry see Field 8B.
W78-06371

INFLOW AND WITHDRAWAL CHARACTERISTICS OF STRATIFIED FLUIDS,
Catholic Univ. of America, Washington, DC. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W78-06394

METHODS FOR REFINING SAMPLE ESTIMATES OF THE PARAMETERS OF HYDROLOGIC SERIES,
For primary bibliographic entry see Field 2E.
W78-06403

REGIONAL WORKING FORMULA OF MAXIMUM RUNOFF IN THE SYRIAN ARAB REPUBLIC,
N. I. Maslov.
Soviet Hydrology, Selected Papers, Vol 15, No 2, p 102-105, 1976. 3 fig, 1 tab, 2 ref. Translated from Trudy IV Vsesoyuznogo Gidrologicheskogo S'yezda, Vol 3, p 68-75, 1975.

Descriptors: *Floods, *Maximum probable flood, *Probable maximum precipitation, Rainfall, Precipitation(Atmospheric), Runoff, Foreign countries, Model studies, Foreign research, Mathematical models, Surveys, Watersheds(Basins), Arid lands, Arid climates, Meteorology, Hydrology, *Syrian Arab Republic.

The Syrian Arab Republic (SAR) has an area of 185,000 sq km. In the west it borders on the mediterranean Sea and changes to the Syrian Desert in the east. Most of the country is a plateau, ranging in elevation from 200 to 700 m above sea level, almost void of vegetation. At the present time, there are sufficient data on precipitation, obtained by the Meteorological Service of the SAR, and field observations of surface runoff, performed by Soviet specialists, to develop a sounder unified method for computing maximum runoff with allowance for regional conditions. There are 234 active meteorological stations in the SAR with precipitation observation records from 10 to 43 years. The purpose of this investigation was to establish from questionnaires the maximum flood stages, estimate their empirical probability of being exceeded, and then to compute the maximum discharges from morphometric cross sections and longitudinal channel profiles taken in the field. I was concluded that the parameters of heavy precipitation in regions with a poorly developed precipitation station network can be refined on the basis of data on daily precipitation maxima and monthly precipitation totals. The network of meteorological stations that record these data is denser, as a rule, and the observation period is much longer. It is also necessary to analyze available pluviograph records for shorter time intervals. This will increase the reliability of hydrologic computations considerably. (Sims-ISWS)
W78-06404

THE IMPACT OF STREAM RECONSTRUCTION AND A GABION INSTALLATION ON THE BIOLOGY AND CHEMISTRY OF A TROUT STREAM,
Lehigh Univ., Bethlehem, PA. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-06410

VEGETATION MANIPULATION - A CASE STUDY OF THE PINYON-JUNIPER TYPE,
Utah State Univ., Logan. Coll. of Natural Resources.
For primary bibliographic entry see Field 2I.
W78-06526

APPLICATION OF COMPUTER MODELING FOR CAPACITY STAGING OF DENVER, COLO., WATER-TREATMENT FACILITIES,
Colorado School of Mines, Golden. Dept. of Basic Engineering.
For primary bibliographic entry see Field 5F.
W78-06559

CALIBRATION OF HYDROLOGICAL MODEL USING OPTIMIZATION TECHNIQUE,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 2A.
W78-06561

OPTIMAL DESIGN OF WATER DISTRIBUTION NETWORKS,
Rome Univ. (Italy). Ist. di Aerodinamica.
A. Cenedese, and P. Mele.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 104, No. HY2, p 237-247, February 1978. 9 fig, 1 tab, 9 ref.

Descriptors: *Water distribution(Applied), *Optimization, Hydraulics, *Pipes, *Design, *Cost minimization, *Iterative method, Networks, Computer models, Constraints, Economic efficiency, Equations, Systems analysis.

A method for the optimal design of water distribution networks is presented. It defines the least-cost solution for a closed network using standard diameters on the market. It can account for the branches whose diameter values are assigned (existing); the range of velocities in the pipes and of the hydraulic heads can be imposed. Moreover, the desired solution is obtained with acceptable computer time. The basic hydraulic laws and the other constraints are introduced into the objective function to be minimized. Thus, all constraint equations are eliminated, and the problem is to determine the minimum function (even if complex). The solution is found using an iterative method which considers that the most economical distribution system is always an open network. The method has been applied to a complex network with many loops. (Bell-Cornell)
W78-06562

SUITE OF MATHEMATICAL FLOOD PLAIN MODELS,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
H. W. Weiss, and D. C. Midgley.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 104, No. HY3, p 361-376, March 1978. 9 fig, 33 ref.

Descriptors: *Flood routing, *Flood damage, *Economics, *Risks, *Damage patterns, Flood plains, Management, *Model studies, Benefit-cost comparisons, Frequency, Flood control, Uncertainty principle, Systems analysis.

Described is a compendium of mathematical models for use in flood plain management. The models make it possible to establish the steady-state water surface profile or to generate for a given flood event the time graphs of flow depth and average flow velocity on elemental areas of the flood plain and thus to determine the depth and duration of inundation, as well as the degree of sediment deposition, erosion, and violence of the floodwaters anywhere on the flood plain. Given the flood frequency distribution, it is possible to establish the frequency distribution of flood damages and thus to compare the economic merits of alternative flood mitigation measures. (Bell-Cornell)
W78-06563

A STOCHASTIC MODEL OF THE OPERATION OF A STREAM-AQUIFER SYSTEM,
New Mexico Inst. of Mining and Technology, Socorro.
E. Z. Flores, A. L. Gutjahr, and L. W. Gelhar.
Water Resources Research, Vol. 14, No. 1, p 30-38, February 1978. 3 fig, 1 tab, 34 ref.

Descriptors: *Reservoir operation, *Stochastic processes, *Linear programming, *Water management(Applied), *Optimization, Aquifers, Streams, Decision making, Effects, Wells, Drawdown, Probability, Chance constraints, Cost minimization, Mathematical models, Operations research, Equations.

A simple lumped parameter stochastic model for optimal water management in a stream-connected aquifer system is examined. The physical system is represented by a linear reservoir model, and a conditional probability approach is used to estimate the effect of parameter variability. A drawdown correction is used to incorporate the local drawdown of the wells and is a crucial part of the model. A management analysis is accomplished by using a linear decision rule to minimize the expected value of the discounted costs with appropriate chance constraints, and the resulting nonlinear optimization problem is solved iteratively using a standard linear programming package. In order to evaluate the limitations of the lumped parameter model in a management context, the results of the management technique are compared with results from Maddock (1974) who used a distributed representation of the aquifer. The conclusions of this analysis indicate that stochastic effects are not very important in arriving at an operating policy but are important in determining the expected cost. (Bell-Cornell)
W78-06566

STRUCTURAL FLOOD CONTROL PLANNING,
Bell Lab., Holmdel, NJ.
M. Ball, W. F. Bialas, and D. P. Loucks.
Water Resources Research, Vol. 14, No. 1, p 62-66, February 1978. 3 fig, 2 tab, 8 ref.

Descriptors: *Flood control, *Structures, *Flood routing, *Optimization, *Branch and bound backtracking, *Alternative planning, *Cost minimization, River basins, Reservoir storage, Design flood, Flood plains, Estimating, Mathematical models, Equations, Systems analysis.

Flood routing methods, together with a branch and bound backtracking optimization routine, are used to evaluate alternative capacities and locations of various flood control structures required to protect a floodplain from a specified design flood. Described is this preliminary planning procedure, and its use for estimating least-cost combinations of flood storage capacities in reservoirs, temporary flood storage basin capacities, levee locations and heights, and increased channel capacities in river basin systems is illustrated. A prime consideration in the development of this method was computational efficiency; it can be altered to estimate the structural flood control plan that maximizes expected annual damage reduction benefits less the total annual cost of flood protection. The model can be extended to include a distribution of floods rather than a single design flood. (Bell-Cornell)
W78-06567

ON LEVEL CROSSINGS AND CYCLES IN DAM PROCESSES,
Utrecht Rijksuniversiteit (Netherlands). Mathematical Inst.
For primary bibliographic entry see Field 8B.
W78-06569

LAND DATA MANAGEMENT SYSTEM FOR RESOURCE PLANNING,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
S. G. Walesh, L. A. Kawatski, and P. J. Clavette.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 103, No WR2, p 177-192, November, 1977. 6 fig, 4 tab, 6 ref.

Descriptors: *Land management, *Land use, *Information retrieval, *Data systems, *Land surveys, Water resources, Natural resources, Graphical methods, Digital computers, Tabulation processes, Urban planning.

Land and water resource planners are increasingly faced with the problem of working with a growing mass of natural resource and man-made features data. A digital computer-based Land Data Management System (Land DMS) intended to resolve this problem by providing an efficient means to store, retrieve, analyze, and display land data is described. 'Land Data' is comprehensive in that it denotes all those types of natural resources and man-made features data having an areal characteristic. A 2.5-acre (1.0 ha) cell is the basic unit in the Land DMS. Five practical applications of Land DMS are described: graphic and tabular display of data; delineation of environmental corridors; formulation of diffuse source pollution abatement alternatives; assembly of input data for hydrologic-hydraulic models; and preparation of report artwork. Systems such as the Land DMS can optimize the use of the available data base and thereby substantially contribute to the quality of the decision making process in land and water resources planning. (Bell-Cornell)
W78-06570

FLOOD MANAGEMENT FOR SMALL URBAN STREAMS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol 103, No WR2, p 315-324, November 1977. 3 fig, 6 ref.

Descriptors: *Flood control, *Flood forecasting, *Runoff, *Erosion, *Aesthetics, *Floods, Detention reservoirs, Regulation, Flood plains, Urban development, Streams, *New Jersey, Princeton(NJ).

Experiences in Princeton, New Jersey are used to analyze flood problems of small urban streams, including building in flood plains, increased floods due to urbanization, and accentuated erosion tendencies. A detailed survey and flood analysis were very beneficial, followed by flood plain zoning and a requirement for flood detention storage by developers. Culverts now too small to handle increased floods constitute a defense against erosion also caused by the floods. Reconsideration of criteria for culvert design in such situations would be valuable. Federal programs fall short of meeting the rather complex problems in small urbanizing watersheds. (Bell-Cornell)
W78-06571

A SIMULATION MODEL FOR SCREENING A SYSTEM OF RESERVOIRS FOR ENVIRONMENTAL IMPACT,
MacLaren (James F.) Ltd., Willowdale (Ontario). Water Resources Group.
D. B. Hodgins, P. E. Wisner, and E. A. McBean.
Canadian Journal of Civil Engineering, Vol 4, No 1, p 1-9, March 1977. 9 fig, 1 tab, 11 ref.

Descriptors: *Simulation analysis, *Screening model, *Reservoirs, *Environmental effects, Man-made impoundments, Water quantity, Water quality, Hydrology, *Canada, Operating policy, Systems analysis.

Analysis of the potential impact of development alternatives is becoming increasingly complex with the imposition of more and more constraints, many of which are environmental. As well, restricted planning budgets require that a rapid indentification be made of the most promising alternatives to avoid unnecessary expenditures. A screening model to quickly isolate the most promising alternatives is thus becoming considerably important. Described is a computer model that satisfies these concerns in applications involving a series of reservoirs. The model, with both hydrologic and water quality components, simulates and thereby indicates probable changes in downstream flows, reservoir surface fluctuations, and temperature and dissolved oxygen changes in the reservoirs and streams. Through easily adjusted operating policies, reservoir sizes, etc., the model can rapidly determine the potential impact of alternative possible developments. This information is then available to biologists, wildlife, forestry, and social disciplines as an aid in the determination of environmental impact assessments. A case study application of the model that reflects eastern Canadian conditions is described. (Bell-Cornell)
W78-06576

PROBLEMS ASSOCIATED WITH MAINTENANCE OF CHANNEL CAPACITY BELOW FEDERAL RESERVOIRS IN KANSAS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 2E.
W78-06580

WATER RESOURCES OF THE CLARK FORM BASIN UPSTREAM FROM ST. REGIS, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
A. J. Boettcher, and A. W. Gosling.
Montana Bureau of Mines and Geology, Butte Bulletin 104, 1977. 28 p, 7 fig, 2 plates, 12 tab, 31 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater resources, *Water quality, *Water users, *Montana, Water supply, Irrigation, Municipal water, Water wells, Water yield, Aquifer characteristics, Hydrogeology, Precipitation(Atmospheric), Snowmelt, Base flow, Surface-groundwater relationships, Western Montana, *Clark Fork Basin(Mont).

The water resources of the Clark Fork basin are among Montana's most important assets. About 60,000 acre-feet of ground water and 600,000 acre-feet of surface water are withdrawn from the 10,700 square-mile system annually. Most of the population obtains water from municipal systems, but about 23 percent live in rural areas and depend on individual wells. About 70 percent of the total surface-water outflow is runoff from snowmelt of precipitation, which is most intense from April through July. The rest is ground-water contribution to the streams. Water is used mainly for irrigation, industrial, and municipal purposes. The water quality is good to excellent. Most of the ground water is withdrawn from the Quarternary valley-fill aquifers, which yield as much as 1,000 gallons per minute to wells. The Tertiary sedimentary rocks also yield as much as 1,000 gallons per minute to wells. The consolidated bedrock deposits yield small amounts of water to domestic and stock wells.
W78-06588

TIME-OF-TRAVEL AND DYE-DISPERSION STUDIES OF SELECTED STREAMS AND LAKES IN THE OSWEGO RIVER BASIN, NEW YORK, 1967-75,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06589

TECHNIQUE FOR ESTIMATING THE MAGNITUDE AND FREQUENCY OF FLOODS IN TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
E. E. Schroeder, and B. C. Massey.
Water-Resources Investigations 77-110 (open-file report), 1977. 22 p, 13 fig, 9 ref.

Descriptors: *Flood forecasting, *Flood frequency, *Flood discharge, *Regression analysis, *Texas, Natural flow, Streamflow forecasting, Equations, Analytical techniques, Flood recurrence interval.

Drainage area, slope, and mean annual precipitation were the only factors that were statistically significant at the 95-percent confidence level when the characteristics of the drainage basins were used as independent variables in a multiple-regression flood-frequency analysis of natural, unregulated streams in Texas. The State was divided into six regions on the basis of the distribution of the residuals from a single statewide regression of the 10-year flood. Equations were developed for predicting the magnitude of floods with recurrence intervals of 2, 5, 10, 25, 50, and 100 years in each of the six regions. These equations are applicable to unregulated rural streams with drainage basins ranging in area from 0.3 square mile to about 5,000 square miles in some regions. Regression equations were not developed for several areas, particularly in south Texas, because of the lack of definition of the flood-frequency characteristics. (Woodard-USGS)
W78-06591

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1976.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06594

WATER RESOURCES DATA FOR MINNESOTA, WATER YEAR 1975.
Geological Survey, St. Paul, MN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06595

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 1. ARKANSAS RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06596

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 2. RED RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06597

APPLICATION OF A RAINFALL-RUNOFF MODEL IN ESTIMATING FLOOD PEAKS FOR SELECTED SMALL NATURAL DRAINAGE BASINS IN TEXAS,
Geological Survey, Austin, TX. Water Resources Div.
B. C. Massey, and E. E. Schroeder.
Open-file report 77-792, December 1977. 23 p, 2 fig, 4 tab, 13 ref.

Descriptors: *Flood forecasting, *Streamflow forecasting, *Peak discharge, *Model studies, *Texas, Simulation analysis, Small watersheds, Rainfall-runoff relationships, Flood frequency, Regression analysis, Analytical techniques.

A parametric rainfall-runoff simulation model was used to synthesize long-term records of annual peak discharges for small natural drainage basins in Texas. Optimum model-parameter values were determined for each of the 40 basins studied by using short-term rainfall, evaporation, and discharge data. The calibrated model was used in conjunction with long-term records of rainfall and evaporation to synthesize a record of annual peaks for each site. Because the frequency curves of the simulated peaks had flatter slopes than those of the observed peaks, the synthetic frequency curves were adjusted for the loss of variance inherent in the modeling process. (Woodard-USGS)
W78-06602

WATER RESOURCES ALONG THE TAPS ROUTE, ALASKA, 1970-74,
Geological Survey, Anchorage, AK. Water Resources Div.
J. M. Childers, J. W. Nauman, D. R. Kernodle, and P. F. Doyle.
Open-file report 78-137, 1977. 136 p, 24 fig, 8 ref.

Descriptors: *Hydrologic data, *Streamflow, *Water quality, *Alaska, *Pipelines, Hydrographs, Water analysis, Benthos, Invertebrates, Gaging stations, Flow rates, *Trans-Alaska pipeline route, *Pre-construction water data.

The U.S. Geological Survey installed 10 stream-gaging and water-quality stations along the trans-Alaska pipeline route (TAPS) starting in 1970. These stations, mostly north of Fairbanks, add to the historical network of gaging stations and provide records of hydrologic conditions along the TAPS route. Selected data from 23 gaging stations along the TAPS route for the period 1970-74 (prior to construction of the pipeline) are compiled in graphic form. The data include annual hydrographs of daily mean or instantaneous values of a standard set of parameters which are indicative of physical, chemical and biological conditions of the streams. The hydrographs facilitate comparisons of data, both in time and between stream sites. Thus, they are a tool for evaluating streamflow characteristics along the TAPS route during the preconstruction period. (Woodard-USGS)
W78-06603

HYDROLOGIC DATA FOR LITTLE ELM CREEK TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06604

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06605

4B. Groundwater Management

ANALYSIS OF PRIORITY WATER RESOURCES PROBLEMS FOR THE SOUTHERN PLAINS REGION,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W78-06207

DETERMINATION OF UNCONFINED AQUIFER PARAMETERS USING PARTIALLY PENETRATING WELLS,
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soil and Water Engineering.
For primary bibliographic entry see Field 2F.
W78-06209

ANALYTIC SOLUTIONS FOR DRAWDOWNS IN WEDGE-SHAPED ARTESIAN AQUIFERS,
Birmingham Univ. (England). Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 2F.
W78-06210

MICROWAVE INTERFERENCE DETECTION OF SUBSURFACE WATER,
Drexel Univ., Philadelphia, PA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-06225

LOW RIVER RUNOFF,
For primary bibliographic entry see Field 2E.
W78-06227

GROUND WATER RECHARGE TO THE AQUIFERS OF NORTHERN SAN LUIS VALLEY, COLORADO: A REMOTE SENSING INVESTIGATION,
Colorado School of Mines, Golden, Dept. of Geology.
For primary bibliographic entry see Field 2F.
W78-06242

A COMPARISON OF ALUMINUM SULFATE AND ACTIVATED CARBON FOR ORGANIC COLOR REMOVAL FROM GROUNDWATERS,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5F.
W78-06348

THE EFFECT OF SEEPAGE ON THE DESIGN OF STORM WATER PONDS IN FLORIDA,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-06369

HYDRAULIC FRACTURING OF DRILLED WATER WELLS IN CRYSTALLINE ROCKS OF NEW HAMPSHIRE,
New Hampshire Dept. of Resources and Economic Development, Concord. State Geologists Office.
G. W. Stewart.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 247, Price codes: A09 in paper copy, A01 in microfiche. Completion Report, (1978). 161 p, 66 fig, 22 tab, 32 ref, append. OWRT C-4374(No. 9055)(1).

Descriptors: *Hydraulic fracturing, *Water wells, *New Hampshire, *Crystalline rocks, Drilling, *Logging(Recording), *Borehole geophysics, *Pumping tests, Groundwater resources, *Water yield improvement, Water supply.

During May 1973, hydraulic fracturing methods were used successfully to stimulate the yield of two drilled water wells in crystalline rocks at the Horticultural Farm, University of New Hampshire. This method attempts to reduce the risk of recovering an adequate water supply from drilled water wells in crystalline rocks. Pumping tests began immediately after the fracturing and similar rates and periods of pumping were used in both wells for comparison. The deeper well yielded a minimum of 24 gpm after hydraulic fracturing, an increase of 20 gpm over the yield before fracturing. The 300 foot well was also stimulated by fracturing; from less than 4 gpm to 15 gpm. If the costs of transportation and the elimination of the fine sand as a propping agent could be eliminated or if a central location for the service office could be established in New England, this method of stimulating drilled wells in crystalline rocks might become economically competitive to (1) drilling to greater depths to obtain more water, or (2) drilling another well.
W78-06372

A STOCHASTIC MODEL OF THE OPERATION OF A STREAM-AQUIFER SYSTEM,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 4A.
W78-06566

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1976 TO SPRING 1977,
Geological Survey, Tucson, AZ. Water Resources Div.

For primary bibliographic entry see Field 7C.
W78-06583

SALTWATER INTRUSION IN THE SHALLOW AQUIFER IN PALM BEACH AND MARTIN COUNTIES, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06584

MAP SHOWING GROUND-WATER CONDITIONS IN THE LOWER VERDE RIVER AREA, MARICOPA, YAVAPAI, AND GILA COUNTIES, ARIZONA-1976,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06585

GROUND-WATER QUALITY NEAR THE WATER TABLE IN SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06586

THE CLINTON STREET-BALLPARK AQUIFER IN BINGHAMTON AND JOHNSON CITY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
A. D. Randall.
New York State Department of Environmental Conservation, Albany Bulletin 73, 1977. 87 p, 19 fig, 8 plates, 10 tab, 58 ref, append.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Urban hydrology, *Water level fluctuations, *Water quality, Water supply, Pumping, Water yield, Drawdown, Groundwater recharge, Hydrogeology, Groundwater movement, Natural recharge, Precipitation(Atmospheric), Streams, Rivers, Artificial recharge, Induced infiltration, *New York, Aquifer management, Binghamton(NY), Johnson City(NY), Susquehanna River basin(NY), *Clinton Street-Ballpark aquifer(NY).

This report describes and evaluates the Clinton Street-Ballpark aquifer that extends from the western part of Binghamton through the central part of Johnson City, New York. The aquifer underlies 3 square miles of urban land in the Susquehanna River Valley and consists chiefly of permeable sand and gravel. Transmissivity generally exceeds 10,000 feet squared per day. Lenses of silt locally restrict water movement. A combination of dry weather and relocation of pumping centers caused water levels to decline as much as 23 feet during the 1960's. These factors and increased use of chemicals for snow removal are thought to be responsible for increases in hardness and chloride concentrations in water from heavily pumped wells. The principal sources of recharge are (1) induced recharge from the Susquehanna and Chenango Rivers at the west and east ends of the aquifer--estimated annual potential is 7.6 billion gallons; (2) precipitation on the aquifer and on thin sand and gravel bordering 85--estimated average annual rate is 22 inches or 1.5 billion gallons; and (3) infiltration from small streams crossing the aquifer-estimated average annual rate is 0.24 billion gallons. Urban land use and ground-water development together seem to have reduced evapotranspiration more than they have reduced recharge. Annual pumpage in 1967 was about 4 billion gallons. (Woodard-USGS)
W78-06587

WATER RESOURCES OF THE CLARK FORM BASIN UPSTREAM FROM ST. REGIS, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06588

APPRAISAL OF THE WATER RESOURCES OF DEATH VALLEY, CALIFORNIA-NEVADA,
Geological Survey, Menlo Park, CA. Water Resources Div.
G. A. Miller.
Open-file report 77-728, December 1977. 68 p, 9 fig, 5 tab, 54 ref.

Descriptors: *Groundwater resources, *Deserts, *California, *Nevada, *Water quality, Groundwater availability, Projections, Springs, Water yield, Test wells, Water analysis, Chemical analysis, *Death Valley National Monument(Calif Nev).

The hydrologic system in Death Valley is probably in a steady-state condition--that is, recharge and discharge are equal, and net changes in the quantity of ground water in storage are not occurring. Recharge to ground water in the valley is derived from interbasin underflow and from local precipitation. The two sources may be of the same magnitude. Ground water beneath the valley moves toward the lowest area, a 200-square-mile saltpan, much of which is underlain by rock salt and other saline minerals, probably to depths of hundreds of feet or even more than 1,000 feet. Some water discharges from the saltpan by evaportranspiration. Water beneath the valley floor, excluding the saltpan, typically contains between 3,000 and 5,000 milligrams per liter of dissolved solids. Water from most springs and seeps in the mountains contains a few hundred to several hundred milligrams per liter of dissolved solids. Water from large springs that probably discharge from interbasin flow systems typically contains between 500 and 1,000 milligrams per liter dissolved solids. Present sites of intensive use by man are supplied by springs, with the exception of the Stovepipe Wells Hotel area. Potential sources of supply for this area include (1) Emigrant Spring area, (2) Cottonwood Spring, and (3) northern Mesquite Flat. (Woodard-USGS)
W78-06593

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1976.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06594

WATER RESOURCES DATA FOR MINNESOTA, WATER YEAR 1975.
Geological Survey, St. Paul, MN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06595

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 1. ARKANSAS RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06596

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 2. RED RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06597

GROUND-WATER DATA FOR MICHIGAN, 1976,
Geological Survey, Lansing, MI. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06598

EFFECTIVENESS OF PILOT CONNECTOR WELL IN ARTIFICIAL RECHARGE OF THE FLORIDAN AQUIFER, WESTERN ORANGE COUNTY, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
F. A. Watkins, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 054, Price codes: A04 in paper copy, A01 in microfiche. Water Resources Investigations 77-112, November 1977. 28 p, 11 fig, 2 tab, 8 ref.

Descriptors: *Artificial recharge, *Groundwater recharge, *Aquifer characteristics, *Water management(Applied), *Florida, Water quality, Water transfer, Aquifers, Water wells, Hydrogeology, Evaluation, Floridan aquifer(Fla), *Pilot connector well, *Western Orange County(Fla).

A connector well pilot installation, in continuous operation in western Orange County since December 4, 1970, was transferring water from the lower of two shallow sand aquifers to the Floridan aquifer at a rate of 13 gallons per minute when measured on September 23, 1971. The recharge water is untreated and analyses show it to be chemically and physically compatible with the water in the Floridan aquifer. The temperatures of the recharging and receiving waters were identical, 23 deg C. The transfer of water from the lower sand aquifer to the Floridan aquifer caused only a small buildup of artesian pressure in the Floridan aquifer but it lowered the artesian head 4 feet in the lower sand aquifer near the well which supplied the recharge water. Water levels in the upper sand aquifer were not affected, probably because of the low permeability of an intervening hardpan layer. However, after six auger holes back-filled with sand connected the two sand aquifers on April 5, 1972, a rise of water levels in the lower sand aquifer was noted. The principal chemical and physical effects on the water in the Floridan aquifer were a general improvement in chemical quality and an increase in color. The color may decrease as more water moves through the sand aquifer and the material responsible for the high color is removed by flushing. (Woodard-USGS)
W78-06599

DIGITAL-MODEL EVALUATION OF THE GROUND-WATER RESOURCES IN THE OCOTILLO-COYOTE WELLS BASIN, IMPERIAL COUNTY, CALIFORNIA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06600

DIGITAL COMPUTER SIMULATION MODEL OF THE ENGLISHTOWN AQUIFER IN THE NORTHERN COASTAL PLAIN OF NEW JERSEY,
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06601

APPRAISAL OF GROUND-WATER CONDITIONS IN MERCED, CALIFORNIA, AND VICINITY,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06606

PEATLAND AND WATER IN THE NORTHERN LAKE STATES,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 4D.
W78-06639

GROUND WATER DIFFERENCES ON PINE AND HARDWOOD FORESTS OF THE UDELL EXPERIMENTAL FOREST IN MICHIGAN,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 2F.
W78-06640

4C. Effects On Water Of Man's Non-Water Activities

ENERGY RELATED ACTIVITIES AND AN ASSESSMENT OF THE WATER RESOURCE MANAGEMENT ALTERNATIVES IN SOUTH LOUISIANA,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 6B.
W78-06201

THE 1976 DROUGHT IN FRANCE: CLIMATOLOGICAL ASPECTS AND CONSEQUENCES (LA SECHERESSE 1976 EN FRANCE: ASPECTS LIMATOLOGIQUES ET CONSEQUENCES),
Direction de la Meteorologie, Boulogne-Billancourt (France).
For primary bibliographic entry see Field 2B.
W78-06221

DEVELOPMENT OF A HYDROPHOBIC SUBSTANCE TO MITIGATE PAVEMENT ICE ADHESION,
Ball Bros. Research Corp., Boulder, CO.
G. H. Ahlborn, and H. C. Poehlmann, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 653, Price codes: A10 in paper copy, A01 in microfiche. Report EPA-600/2-76-242, December 1976. 218 p, 28 fig, 25 tab, 71 ref, 4 append. EPA 68-03-0359.

Descriptors: *Highways, *Paving, *Ice, *Deicers, *Water pollution control, Materials, Materials testing, On-site investigations, Laboratory tests, Environmental effects, Water pollution, Salts, Coatings, Economics, Costs, Evaluation, Ice control, Ice breakup, Hydrophobic materials, Pavement deicers.

This research was undertaken to investigate the feasibility of the use of hydrophobic substances on highway and bridge deck surfaces to reduce ice adhesion. Such a coating could reduce or eliminate the possibility of pollution of groundwater by currently used deicing chemicals and the multi-billion dollar yearly cost of automotive frame, bridge deck, and highway surface deterioration caused by such chemicals. The research program herein described was conducted in four phases and, in addition to the basic technical evaluation, included consideration of all aspects of prospective coatings such as cost effectiveness, pollution potential, application techniques, effective life, and detailed characterization of the formulations and chemicals employed. The feasibility of this approach was demonstrated with three coatings showing practical promise. Specific recommendations were presented to optimize the concepts developed in this program. (Sims-ISWS)
W78-06241

DESERTIFICATION IN THE UNITED STATES,
International Center for Arid and Srmi-Arid Lands Studies, Lubbock, TX.
For primary bibliographic entry see Field 4D.
W78-06333

EFFECTS OF GULLY PLUGS AND CONTOUR FURROWS ON EROSION AND SEDIMENTATION IN CISCO BASIN, UTAH,
Utah State Univ., Logan. Coll. of Natural Resources.
For primary bibliographic entry see Field 4D.
W78-06334

FISHERIES PROBLEMS ASSOCIATED WITH THE DEVELOPMENT OF THE LOWER COLORADO RIVER,
For primary bibliographic entry see Field 6G.
W78-06341

CONTROL OF DITCH EROSION USING FIBERGLASS ROVING (TYPE B STUDY),
California State Dept. of Transportation, Sacramento. Transportation Lab.
For primary bibliographic entry see Field 4D.
W78-06381

URBANIZATION: HYDROLOGIC-HYDRAULIC-DAMAGE EFFECTS,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
S. G. Walesh, and R. M. Videkovich.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY2, Proceedings Paper 13553, p 141-155, February 1978. 8 fig, 1 tab, 4 ref, 1 append.

Descriptors: Urbanization, *Wisconsin, *Flood damage, *Flood discharge, *Model studies, Mathematical models, Flood plains, Flood plain zoning, Flood stages, Flood peak, Channel improvement, Channeling, Channels, Rivers, Runoff, Economics, Systems analysis, Hydrology, Hydraulics, *Urbanization effects, Urban development.

An effective conceptual approach to determining the consequences of land-use changes on flood flows, stages, and damage involves partitioning the watershed land surface into floodland and nonfloodland areas. A hydrologic-hydraulic-flood damage model consisting of a combination of continuous process and steady-state computer programs was presented as a potentially effective analytic tool. The model was used to assess the impact of seven combinations of floodland and nonfloodland development on a 136-sq mile (352-sq km) urbanizing watershed in southeastern Wisconsin. Under conditions of complete urbanization of the presently undeveloped floodland and nonfloodland areas in the watershed, the 100-yr flood discharge may be expected to increase, relative to existing conditions, by a median factor of 1.9; the predicted median increase in 100-yr flood stages is 4.5 ft (1.4-m); and average annual flood damage for four flood-prone reaches may be expected to increase by factors of 2.4 to 8.5. (Sims-ISWS)
W78-06385

PARALLEL CASCADES MODEL FOR URBAN WATERSHEDS,
Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Civil Engineering.
For primary bibliographic entry see Field 4D.
W78-06386

ESTIMATES OF NONPOINT SOURCE POLLUTION BY MATHEMATICAL MODELING,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-06405

ECONOMIC EVALUATION OF ALTERNATIVE USES OF RIVERS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 6B.
W78-06552

A SURVEY AND ANALYSIS OF RECREATIONAL AND LIVESTOCK IMPACT ON THE RIPARIAN ZONE OF THE RIO GRANDE IN BIG BEND NATIONAL PARK,
Texas Agricultural Experiment Station, College Station.
For primary bibliographic entry see Field 6B.
W78-06554

SIMULATION MODELING AS A TOOL FOR MANAGING RIVER RECREATION,
Montana Univ., Missoula. School of Forestry.
For primary bibliographic entry see Field 6B.
W78-06555

A MARKOV-BASED LINEAR PROGRAMMING MODEL OF TRAVEL IN THE BOUNDARY WATERS CANOE AREA,
Northwestern Univ., Evanston, IL. Technological Inst.
For primary bibliographic entry see Field 6B.
W78-06556

CAMPSITE CHOICE BEHAVIOR IN THE RIVER SETTING: A PILOT STUDY ON THE ROGUE RIVER, OREGON,
Victoria Univ. (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 6B.
W78-06557

MANAGING WILDERNESS TRAVEL: A MARKOV-BASED LINEAR PROGRAMMING MODEL,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-06564

QUANTITATIVE ASSESSMENT OF NATURAL VALUES IN BENEFIT-COST ANALYSIS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 6B.
W78-06572

IMPACT OF POTENTIAL PHOSPHATE MINING ON THE HYDROLOGY OF OSCEOLA NATIONAL FOREST, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06590

THE MACROPHYTE VEGETATION OF THE DANUBE WATER-BODIES IN BULGARIA AND ITS CHANGE UNDER THE EFFECT OF HUMANS AND CONSERVATION, (IN RUSSIAN),
Bulgarian Academy of Sciences, Sofia. Inst. of Botany.
For primary bibliographic entry see Field 2I.
W78-06675

4D. Watershed Protection

EROSION AND SEDIMENT CONTROL AUDIOVISUAL TRAINING PROGRAM, WORKBOOK,
Hittman Associates, Inc., Columbia, MD. Environmental and Geosciences Dept.
T. R. Mills, M. A. Nawrocki, G. R. Squire, H. T. Hopkins, and M. L. Clar.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 471, Price codes: A16 in paper copy, A01 in microfiche. Report No. EPA-600/8-76-001-b, June 1976. 350 p. EPA S-800854.

Descriptors: *Erosion control, *Sediment control, Education, *Water quality control, Erosion, Sedimentation, Sediments, Construction, Runoff, Precipitation(Atmospheric), Soil stabilization, Vegetation, Vegetation establishment, Rainfall-runoff relationships, Hydrology, Training, Publications.

A series of technical presentations and a certification plan for erosion and sediment control specialists were presented. Thirteen lessons complete with visual aids, student handouts and, audiovisual handouts consisting of slides, videotape and tape narration, workbooks and instructor's manuals, were developed. These materials were designed to provide an effective education program for qualifying construction personnel and others to pass a certification examination. The list of the lessons was as follows: (1) Goals, Objectives and Principles of Erosion and Sediment Control; (2) Soils; (3) Rainfall-Runoff Relationships; (4) Erosion and Sedimentation; (5) Plant Materials; (6) Control of Runoff During Construction; (7) Vegetative Soil Stabilization; (8) Stream Erosion Control; (9) Temporary Soil Stabilization; (10) Control of Sediment Generated on Construction Sites; (11) Erosion and Sediment Control Planning; (12) Wooded Site Development; and (13) Foreman-Inspector Responsibilities. (See also W77-012815) (Sims-ISWS)
W78-06228

AOIPS WATER RESOURCES DATA MANAGEMENT SYSTEM,
Earth Satellite Corp., Washington, DC.
For primary bibliographic entry see Field 7C.
W78-06239

DESIGNING FOR BANK EROSION CONTROL WITH VEGETATION,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-06249

RUNOFF FROM A PASTURED WATERSHED IN LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-06332

DESERTIFICATION IN THE UNITED STATES,
International Center for Arid and Srmi-Arid Lands Studies, Lubbock, TX.
H. E. Dregne.
Nature and Resources, Vol. 13, No. 2, p 10-13, April-June, 1977.

Descriptors: *Deserts, *Deterioration, *Droughts, Desert plants, *Salinity, *Wind erosion, Ranges, Arid lands, Semiarid climates, Grasslands, Grazing, Sagebrush, Vegetation establishment, Erosion, Mesquite, New Mexico, Arizona, Texas, Range management, Irrigated land, *Desertification.

Desertification is a process of land degradation that is the result of an often complex interaction among people, plants, animals, land and climate. Three instances of widespread desertification in the United States during the past one hundred years are described: (1) overgrazing in the desert grasslands, (2) salinization of irrigated lands, and (3) wind erosion in the Great Plains during the protracted drought of the 1940's. The overgrazing resulted in severe erosion. Salinization and waterlogging began to affect large areas shortly after a rapid expansion of irrigation began in the arid west at the end of the 19th century. The problems of Colorado River project storage and increasing salinization are discussed. The lack of resilience in arid lands makes it essential that signs of desertification be recognized before degradation has assumed major proportions. (Jamail-Arizona)
W78-06333

EFFECTS OF GULLY PLUGS AND CONTOUR FURROWS ON EROSION AND SEDIMENTATION IN CISCO BASIN, UTAH,
Utah State Univ., Logan. Coll. of Natural Resources.
G. E. Gifford, D. B. Thomas, and G. B. Colthart.
Journal of Range Management Vol. 30, No. 4, p 290-292, July 1977. 2 fig, 2 tab, 8 ref.

Descriptors: *Erosion control, *Sedimentation, *Surface runoff, Gully erosion, Watershed management, Basins, Soil stabilization, *Utah, Colorado River Basin, Contour furrows, Gully plugs, Cisco Basin(Utah).

The effects of contour furrows and gully plugs on erosion and sedimentation within the Cisco Basin, Utah, were evaluated. Soils studied were less than 10 cm deep and had developed from Mancos shale and sandstone. When combined, contour furrows and gully plugs held all runoff and sediment. Contour furrows alone were only able to hold a portion of the runoff and sediment. Expected life of the contour furrows ranges from 6 to 12 years, while that of the gully plugs is from 14 to 33 years. (Castricone-Arizona)
W78-06334

CLIMATIC AND ECOLOGICAL ASPECTS OF DESERTIFICATION,
New South Wales Univ. (Australia). School of Geography.
For primary bibliographic entry see Field 2B.
W78-06338

A REVIEW OF THE CORPS OF ENGINEERS' DRAFT ENVIRONMENTAL IMPACT ON THE FIRE ISLAND INLET TO MONTAUK POINT, NEW YORK, BEACH EROSION CONTROL AND HURRICANE PROTECTION PROJECT,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
E. Duvernoy, and D. Mackay.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 363, Price codes: A04 in paper copy, A01 in microfiche. February, 1977. 65 p, 6 fig, 13 ref, 7 append. OWRT A-056-NY(3).

Descriptors: *Environmental effects, *Reviews, *Beach erosion, *Hurricanes, Evaluation, Communication, Planning, Estimated benefits, Engineering, Environmental effects, *Montauk(NY), *Environmental Impact Statement, Public interest.

The EIS, prepared by the New York District, Army Corps of Engineers, on the Fire Island Inlet to Montauk Point, New York, Beach Erosion and Hurricane Protection project (BEHUR), is reviewed; facts and judgments are examined, and an evaluation is made. Corps regulations define a planning process for civil works projects including environmental impact statements and interaction between engineering studies. However, basic information and engineering analyses needed to prepare a complete EIS were either unavailable or outdated during preparation, the result is an incomplete analysis of the proposed project and its reasonable alternatives. Some information included in the EIS is inapplicable, misleading, or missing. Conclusions indicate that public interest groups should request additional engineering and environmental analyses of the BEHUR project before the Corps makes a final decision on it and prior to any additional project construction. The appendices contain information on review chronology, Corps of Engineers and other relevant regulations, Corps of Engineers organization, scope of work, how to read an EIS, and parameters of impact. (Wares-IPA)
W78-06368

CONTROL OF DITCH EROSION USING FIBERGLASS ROVING (TYPE B STUDY),
California State Dept. of Transportation, Sacramento. Transportation Lab.
M. E. Nolan, M. M. Hatano, R. B. Howell, and E. C. Shirley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 914, Price codes: A04 in paper copy, A01 in microfiche. Report FHWA-CA-76-41, Prepared for Federal Highway Administration, Washington, D.C., July 1976. 52 p, 48 fig, 2 ref, 4 append. FHWA F-5-16.

Descriptors: *Erosion control, *Highways, *California, *Vegetation establishment, Soils, Vegetation, Grasses, On-site investigations, Ditches, Drainage, Erosion, Fiberglass, Fiberglass roving, Ditch erosion, Drainage ditches.

The use of fiberglass roving with vegetation for erosion control in drainage ditches is demonstrated. Three sites in California were treated which had various soil types and different climatological conditions. The test sites were monitored with photographs, field observations, and precipitation measurements during the period Fall 1975 to Spring 1976. The fiberglass roving with vegetation was effective in reducing erosion at all three locations. Grasses planted prior to treatment emerged through the fiberglass mat with little or no difficulty. The treatment cost varied from $1.13 to $2.27 per square yard. This study was a follow-up to a study that used fiberglass roving for erosion control at Ponderosa Road Interchange and Highway 50 during the winter of 1973-1974. (Sims-ISWS)
W78-06381

PARALLEL CASCADES MODEL FOR URBAN WATERSHEDS,
Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Civil Engineering.
M. H. Diskin, S. Ince, and K. Oben-Nyarko.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY2, Proceedings Paper 13569, p 261-276, February 1978. 10 fig, 3 tab, 10 ref, 2 append.

Descriptors: *Hydrographs, *Arizona, *Hyetographs, *Urban runoff, *Model studies, Mathematical models, Rainfall, Runoff, Watersheds(Basins), Urbanization, Surface runoff, Reservoirs, Drainage, Flood protection, Hydrology, Urban development.

The conversion of rainfall to surface runoff in urbanized watersheds was represented by a model composed of three main elements. The first element receives the total rainfall hyetograph as input and produces two rainfall excess hyetographs as output. These are used as inputs to the other two elements which are in parallel. The two elements, representing the impervious and the pervious portions of the watershed, were taken to be composed of cascades of linear reservoirs. The elements produce as their outputs two hydrographs that are added to produce the direct surface runoff hydrograph of the watershed. The first element of the model is nonlinear, but the other two are linear. The model, viewed as one unit converting total rainfall to runoff, is nonlinear. Data from a semiarid urban watershed in Arizona were used to demonstrate the use of the model. (Sims-ISWS)
W78-06386

USING TOPOGRAPHIC CHARACTERISTICS TO PREDICT TOTAL SOLUTE CONCENTRATIONS IN STREAMS DRAINING SMALL

FORESTED WATERSHEDS IN WESTERN MONTANA,
Montana Univ., Missoula.
For primary bibliographic entry see Field 2K.
W78-06407

SOIL EROSION AND DUST CONTROL ON ARIZONA HIGHWAYS, PART II, LABORATORY TESTING PROGRAM,
Arizona Univ., Tucson. Dept. of Civil Engineering.
H. A. Sultan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 601, Price codes: A07 in paper copy, A01 in microfiche. Report ADOT-RS-10-141-II, Prepared for Federal Highway Administration, Washington, D.C., October 1974. 146 p, 14 fig, 9 tab, 9 ref, 3 append.

Descriptors: *Erosion, *Arizona, *Erosion control, *Soil stability, *Laboratory tests, Soil erosion, Wind erosion, Erosion rates, Dusts, Highways, Construction, Soils, Winds, Simulated rainfall, Rainfall simulators, Traffic erosion, Dust control.

Forty-six commercially available chemicals were tested in this study. Laboratory testing included subjecting specimens of a dune sand, treated with spray-on chemicals, to simulated wind velocities up to 90 mph. Specimens of compacted granitic soil, treated with either a spray-on or a mixed-in application of the chemicals, were subjected to simulated traffic abrasive forces under simulated tire pressures up to 60 psi. Selected chemical treatments were subjected to various environmental-durability conditions before testing. Durability conditions included freeze-thaw cycles, wet-dry cycles, rainfall-dry cycles, and variation of curing temperatures. Based upon the results of this laboratory testing phase, several chemical stabilizers were selected for applications in a large-scale field testing program. (See also W78-01658 and W78-06525) (Sims-ISWS)
W78-06524

SOIL EROSION AND DUST CONTROL ON ARIZONA HIGHWAYS, PART III, PROGRESS REPORT-FIELD TESTING PROGRAM,
Arizona Univ., Tucson. Dept. of Civil Engineering.
H. A. Sultan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 602, Price codes: A04 in paper copy, A01 in microfiche. Report ADOT-RS-10-141-III, Prepared for Federal Highway Administration, Washington, D.C., October 1974. 47 p, 13 fig, 4 tab, 6 ref, 2 append.

Descriptors: *Erosion, *Arizona, *Erosion control, *Soil stability, *On-site investigations, Soil erosion, Wind erosion, Erosion rates, Dusts, Highways, Construction, Soils, Winds, Chemicals, Dust control, Chemical stabilization, Traffic erosion, Dust collection.

Several chemical stabilizers were selected for use in a large-scale field application, based on a laboratory testing program. Spray-on application of chemicals to control dust and wind erosion on untrafficable areas was made using 11 chemicals. Five chemicals were used on an unpaved road using a spray-on application to control erosion and dust behind traffic. Three chemicals also were used on the unpaved road using a mixed-in application. Methods of field application were given. Details on monitoring techniques, including HiVol dust collection, dust fall collection in cups, and extraction tests, were discussed. Preliminary observations comparing the chemical applications among themselves and as compared to control sections, where water was used, were given. Evaluation will continue for approximately 12 months more. (See also W78-01658 and W78-06524) (Sims-ISWS)
W78-06525

VEGETATION MANIPULATION - A CASE STUDY OF THE PINYON-JUNIPER TYPE,
Utah State Univ., Logan. Coll. of Natural Resources.
For primary bibliographic entry see Field 2I.
W78-06526

FLOOD MANAGEMENT FOR SMALL URBAN STREAMS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 4A.
W78-06571

ESTABLISHING LOCAL WATER QUALITY MANAGEMENT PRIORITIES,
Washington Univ., St. Louis, MO. Dept. of Technology and Human Affairs.
For primary bibliographic entry see Field 5G.
W78-06573

HYDROLOGIC DATA FOR LITTLE ELM CREEK TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06604

PEATLAND AND WATER IN THE NORTHERN LAKE STATES,
North Central Forest Experiment Station, St. Paul, MN.
D. H. Boelter, and E. S. Verry.
U.S. Department of Agriculture, Forest Service, General Technical Report NC-31, 24 p. 1977. 17 fig, 63 ref, 6 tab.

Descriptors: *Bogs, *Fen, *Great Lakes Region, *Water quality, Hydrology, Organic soils, Water chemistry, Water pollution sources, Streamflow, Precipitation(Atmospheric), Water sources, Nutrients, Rain, Snow, Dusts, Soils, Watersheds(Basins), Color, Groundwater, Mosses, Forest watersheds, Water pollution effects, Water pollution, Water chemistry.

The North Central Forest Experiment Station expanded its watershed research program in 1960 to include basic peatland studies. This report reviews and summarizes basic principles developed from these studies of peatland hydrology, organic soil characteristics, and streamflow chemistry. Peatland is broadly classed into two groups: ombrotrophic (ion-poor) peatland (bog) receives precipitation as its primary water source; minerotrophic (ion-rich) peatland (fen) receives large groundwater supplies as well as precipitation. Contrary to popular belief, neither bogs nor fens maintain an even distribution of annual streamflow. The water chemistry of streams draining peatland depends primarily on water source. Nutrients in rain, snow, and dust, modified by organic soils and spagnum moss, play a major role in the composition of on-site water in ombrotrophic peatland, but the do not greatly affect the ionic compositon of streams draining large areas of land. The water composition of streams draining minerotrophic peatland is primarily determined by the solution of groundwater aquifer and overburden parent materials. The downstream influence of peatland in large watersheds is only seen in color values and perhaps some organically derived anions. Concentrations of these materials decrease with distance from the peatland. (Witt-IPC)
W78-06639

WATER EROSION,
Agricultural Research Service, Lafayette, IN.
W. C. Moldenhauer.
Agricultural Research Service Publications, No. 57, p 47-51, October 1977. 21 ref.

Descriptors: *Soil erosion, *Erosion control, *Sediment transport, *Soil conservation, *Water pollution control, *Cultivation, Mulching, Erosion, Pollution abatement, Model studies, Forecasting, Planning, Contour farming, Crop production, Runoff, Agricultural runoff, Reviews, Research priorities, Universal Soil Loss Equation(USLE).

A brief review of past and present research on soil erosion control includes a discussion of research needs and approaches, expected benefits, and the potential for a predictive model. Some four billion tons of sediment annually enter surface waters in the United States according to a 1967 estimate, compared with three billion tons 30 years earlier. The first soil erosion research plots were established in 1917. Beginning in 1928 research stations were created to monitor precipitation, runoff, and soil loss; most have now been discontinued. In recent years most research has been conducted with rain simulators, and deals with erosion control aspects of surface residue tillage. Methods for prediction of soil and water loss from cropping systems have been successfully developed, including the Universal Soil-Loss Equation. Seeded backslope terrace experiments were initiated in Iowa in 1964-65. Surface residue tillage, the best method for combined wind and water erosion control, nevertheless gives only limited protection. On long or steep slopes runoff may undercut mulch or carry it away, with resulting high soil erosion. Research is needed on tillage-mulch-soil interrelationships to design a tilled zone for minimum runoff. Erosion control could eliminate pollution of surface waters by phosphorus-laden sediment. (Lynch-Wisconsin)
W78-06679

NUTRIENT LOSS RESEARCH,
Agricultural Research Service, Columbia, MO.
R. E. Burwell.
Agricultural Research Service Publications, No. 57, p 28-34, October 1977. 21 ref.

Descriptors: *Nutrients, *Soil erosion, *Sediment transport, *Water pollution control, *Erosion control, Path of pollutants, Model studies, Reviews, Fertilizers, Cultivation, Contour farming, Nitrogen, Phosphorus, Runoff, Agricultural runoff, Research priorities, Nutrient flux, Percolation, Permeability.

A review of recent investigations of nutrient loss covers research needs and approaches, expected benefits, and requisites for developing a chemical transport model are discussed. Nutrient research in the last decade has reemphasized the need to control erosion from agricultural land because sediment constitutes a major transport agent of nitrogen and phosphorus. Research has also shown that soluble nitrogen movement is closely related to the hydraulic characteristics of soils; amounts of soluble nitrogen lost in surface runoff and concentration levels have been low for moderately permeable soils, but high in slowly permeable soils such as claypans. When nitrogen fertilizers are applied at recommended rates, little movement of nitrate nitrogen has been noted below the rooting depth for moderately and slowly permeable soils. Cropping practices which provide good soil cover during the critical erosion period greatly reduce soil erosion and associated nitrogen and phosphorus losses. Terracing is an effective control measure, but contouring alone is not sufficient. Research is needed to characterize effects of tillage-induced physical parameters on soil chemistry and biology as they influence nitrogen mineralizton and denitrification transformations. Little is known of the effects of tillage on soil insects and crop diseases. A potential benefit of nutrient loss research would be improved use efficiency of fertilizer. (Lynch-Wisconsin)
W78-06689

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

THE USE OF REMOTE SENSING TECHNIQUES FOR DETECTION AND IDENTIFICATION OF POLLUTANT DISCHARGES,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
L. E. Link, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A017 727, Price codes: A13 in paper copy, A01 in microfiche. Miscellaneous Paper M-73-11, August 1973. 287 p, 29 fig, 65 tab, 34 plate, 49 ref, 1 append.

Descriptors: *Remote sensing, *Pollutant identification, *Computer models, Model studies, Mathematical models, Water quality, River basins, Water pollution, Photography, *Pollutant discharge.

The purpose of this study was to evaluate photographic remote sensing techniques for detecting and identifying pollutant discharges. A number of investigations were conducted to examine the utility of remote sensing techniques for application to water quality problems. These studies were largely qualitative, but, however, they showed that photographic remote sensing techniques have considerable potential in this area. A more definitive evaluation of this potential awaits a quantitative evaluation scheme. This study consisted of (1) the development of a computerized remote sensing simulation model to provide a quantitative, systematic means to rapidly assess the capabilities of photographic remote sensing techniques for application to specific problems; and (2) the use of the remote sensing simulation model to evaluate the utility of these techniques for the detection and identification of pollutant discharge. The remote sensing simulation model included mathematical relations that describe atomspheric attenuation of electromagnetic (EM) radiation, reflection of EM radiation from materials, and the interaction of EM radiation with photographic remote sensing systems. The model provided a means of determining if photographic remote sensors are applicable to a specific problem and, if so, which sensors have the most potential. Spectral reflectance curves for pollutants and water bodies were obtained from the literature and used as inputs to the remote sensing techniques for detection and identification of pollutant discharges. The results of this study indicated that selected photographic remote sensing techniques were theoretically capable of detecting pollutant discharges for each of the pollutant types used in this study. In addition, the feasibility of using photographic remote sensing techniques for identifying pollutant types from among a limited number of possible pollutants was established. (Froehlich-ISWS)
W78-06230

ANALYTICAL QUALITY ASSURANCE FOR TRACE ORGANICS ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY,
Environmental Monitoring and Support Lab., Cincinnati, OH.
J. W. Eichelberger, W. M. Middleton, and W. L. Budde.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 823, Price codes: A02 in paper copy, A01 in microfiche. Report No EPA - 600/4-75-007, September, 1975. 12 p, 4 fig, 2 tab, 7 ref.

Descriptors: *Potable water, *Mass spectrometry, *Gas chromatography, *Analytical techniques, *Pollutant identification, Water quality, Liquid-liquid extraction.

The application of analytical quality assurance (AQA) concepts to the qualitative analysis of drinking water samples for trace organics is described. The concentration isolation, and identification procedures used were liquid-liquid extraction and gas chromatography-mass spectrometry (GC/MS). Some of the analytical concepts are applicable to other methods of analysis including: (1) the entrainment of volatiles in an inert gas stream followed by trapping and GC/MS, and (2) carbon or resin adsorption, extraction, and GC/MS. The data used to illustrate the AQA were obtained from five drinking water samples taken during January and February 1975 and collected from Miami, Seattle, Philadelphia, Cincinnati, and Ottumwa, Iowa. Emphasis was placed on pollutant identification rather than on concentration. The guidelines based on spectrum similarity and the quality of the ions found in the measured mass spectrum are a reasonable basis for evaluating the reliability of an identification. (Seip-IPA)
W78-06267

AEROSOL PRODUCTION BY WASTE WATER SPRAY NOZZLES,
Brookhaven National Lab., Upton, NY.
G. S. Raynor.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL-20246, Price codes: A03 in paper copy, A01 in microfiche. Report BNL-20246, (1975). Presented at the Second National Conference on Complete WateReuse, Chicago, IL, May 4-8, 1975. 27 p, 12 fig, 6 ref.

Descriptors: *Aerosols, *Air pollution, *Spraying, *Irrigation, *Sewage disposal, Tracers, Analytical techniques, *Waste water irrigation, *Land application, *Uranine, Sodium fluorescein.

The size distribution and concentration of aerosol-producing droplets, generated by selective types of agricultural irrigation equipment under a range of operating pressures and meteorological conditions, were studied. Dilute untreated sewage was sprayed through several types of systems on experimental plots. Because of the obstacle presented by evaporation to making accurate droplet size field measurements, the water-soluble fluorescent dye - uranine (sodium fluorescein) - was used as a tracer in the test aerosol. Original drop size distribution was calculated from the tracer aerosol size distribution. Deposition tests were conducted at another test site, and actual sewage spray aerosol test data were compared to tracer aerosol data. The nozzles tested lost only a small portion of their liquid output to spray droplets but all produced large quantities of small aerosols. The number of particles produced is related to wind speed and the length of time the liquid stream is exposed to wind. Although fewer aerosols are produced at low wind speeds from low spraying nozzles, concentrations may be higher due to less dilution by airflow. If fixed amounts of liquid must be emitted, fewer aerosols may be produced at greater flow rates due to shorter operating time and shorter exposure to wind. (Seip-IPA)
W78-06270

WATER QUALITY MONITORING IN DISTRIBUTION SYSTEMS,
National Sanitation Foundation, Ann Arbor, MI.
N. I. McClelland, and K. H. Mancy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 328, Price codes: A10 in paper copy, A01 in microfiche. Report No. EPA-600/2-77-074, March, 1977. 193 p, 82 fig, 27 tab, 47 ref, 3 append. 68-03-0043.

Descriptors: *Potable water, *Water quality, *Monitoring, Computers, *Pollutant identification, Hydrogen ion concentration, Temperature, Dissolved oxygen, Alkalinity, Calcium carbonate, Cadmium, Copper, Conductivity, Hardness(Water), Nitrates, Chlorides, Turbidity, Corrosion, Chlorine, Fluorides, *Free chlorine.

In order to facilitate the monitoring of public drinking water quality during transmission through distribution systems, a mobile laboratory with 18 integrated, computer-controlled parametric systems was developed and field-evaluated at ten locations in four cities: Chicago, Ann Arbor, Detroit, and Philadelphia. Commercially available and newly developed sensor systems were used to measure temperature, conductivity, pH, chloride, dissolved oxygen, free and total residual chlorine, turbidity, corrosion rate, free and total fluorides, alkalinity, hardness, nitrate, copper, cadmium, lead, and calcium carbonate deposition rate. Recommendations for operating improvements and for planning second generation equipment intended for field use include: (1) computer capabilities can and should be greatly expanded; (2) with the availability of a mini-computer, a commercial potentiostat is entirely adequate for DAVS measurements; (3) liquid junction ion-selective electrodes, i.e., hardness and nitrate should not be used when advanced technology provides more reliable electrodes; (4) use of an electrode multiplexer should be considered; (5) better provision for external grounding, replacing the plastic adapter for intake water supply, and acquiring a pump for use in low line pressure areas in the field are suggested changes in the NSF/EPA mobile laboratory. Considerable savings in time and cost can be anticipated as a result of this study. (Seip-IPA)
W78-06284

BIOLOGICAL AND ECOLOGICAL STUDIES ON THE INTERACTION OF BDELLOVIBRIO AND ENTEROBACTERIACAE,
Auburn Univ., AL.
For primary bibliographic entry see Field 5C.
W78-06289

FLUORIDE EMISSIONS FROM PHOSPHORIC ACID PLANT GYPSUM PONDS,
North Carolina State Univ. at Raleigh.
W. R. King, and J. K. Ferrell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-241 144, Price codes: A15 in paper copy, A01 in microfiche. Report No. EPA-650/2-74-095, October, 1974. 316 p, 34 fig, 19 tab, 29 ref, append. 21AFA-075, R-800950.

Descriptors: *Air pollution, *Fluorine, *Industrial wastes, *Fertilizers, *Ponds, *Phosphates, Standing waters, Gypsum, Pollutant identification, *Phosphate fertilizers, *Receiving ponds, *Fertilizer manufacture wastes, Phosphoric acid, Emissions.

An estimation and verification method was developed for predicting the fluorine emissions from ponds which receive process water from wet-process phosphoric acid plants. A pond-to-air mass transfer coefficient is developed and the vapor pressure of fluorine over pond water is estimated. These estimates were tested by measurements of ambient-air, fluorine-compound concentrations downwind from the ponds. Comparing the measured ambient air concentrations with concentrations predicted from the emission estimates and a standard atmospheric pollutant dispersion model demonstrated the validity of the emission estimates. Based on these statistical conclusions, emissions estimates for the two ponds studied were calculated. A number of pond emission estimates were made from an optimal computer simulation output. A table compares the average of these predictions for the two ponds with proposed State of Florida regulations. (Seip-IPA)
W78-06292

COAL CONVERSION PROCESS WASTEWATER CONTROL,
McKee (Arthur G) and Co., Cleveland, OH.
For primary bibliographic entry see Field 5D.
W78-06303

FATE AND BEHAVIOR OF SELECTED HEAVY METALS IN INCINERATED SEWAGE SLUDGE,
Rutgers - The State Univ., New Brunswick, NJ.
R. T. Dewling.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-24,969. PhD Thesis, 1977, 224 p.

Descriptors: *Pollutant identification, *Treatment facilities, *Path of pollutants, *Heavy metals, *Sludge disposal, *Air pollution, Incineration, Sewage sludge, Industrial wastes, Waste water treatment, Municipal wastes.

Physical properties and heavy metal concentrations were measured for sludge and ash from eight waste water treatment plants hadling up to 50% industrial waste. The median particle size of fluidized bed incinerator ash averaged 18.8 microns, and the median diameter of multiple hearth ash was 47.5 microns. Copper, chromium, cadmium, lead, nickel and zinc were preferentially concentrated with decreasing ash particle size. This relationship was attributed to the form of the metals in the sludge, non-discriminate precipitation and adsorption of the metals during drying in the incinerator, and collapse during combustion of the metal-containing sludge matrix. Over 97% of the mercury contained in raw sludge was released to the atmosphere at combustion temperatures over 1350 F. Copper, chromium, cadmium, lead, nickel, and zinc emissions were under 1% of the total weight of metal contained in the sludge. The ash metal content ranged 78-95%, depending on the metal, of the total content in raw sludge. (Snyder-FIRL)
W78-06315

MONTHLY VARIATION IN THE CHEMICAL COMPOSITION OF MANGROVE OYSTERS IN THE LAS MARITAS LAGOON (VENEZUELA), (IN SPANISH),
Universidad de Oriente, Cumana (Venezula). Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W78-06330

THE MARINE GEOLOGY AND SEDIMENTOLOGY OF HAWAII KAI, KUAPA POND, AND ADJACENT MAUNALUA BAY,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 2L.
W78-06345

CHARACTERIZATION OF URBAN RUNOFF - NEW YORK,
Cornell Univ., Ithaca, NY. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W78-06352

SOME COMMON ASPECTS OF PHYSICAL-CHEMICAL INDICES OF TOXIC SUBSTANCES AND THEIR PERMISSIBLE CONCENTRATIONS IN ATMOSPHERIC AIR, AIR OF WORKING AREAS AND WATER (IN RUSSIAN),
Nauchno-Issledovatelskii Inst. Gigieny Truda i Professionalnykh Zabolevanii, Leningrad (USSR).
For primary bibliographic entry see Field 5G.
W78-06354

CONCENTRATION AND MODES OF TRANSPORT FOR TRACE METALS IN THE HAW RIVER, NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5B.
W78-06356

THE URANIUM-SERIES RADIONUCLIDES AS TRACERS OF GEOCHEMICAL PROCESSES IN LONG ISLAND SOUND,
Yale Univ., New Haven, CT. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2L.
W78-06379

HYDROCARBONS IN CORES OF NORTHWESTERN ATLANTIC COASTAL AND CONTINENTAL MARGIN SEDIMENTS,
Woods Hole Oceanographic Institution, MA. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W78-06384

ENVIRONMENTAL ISOTOPIC STUDY OF THE CAMPI FLEGREI (NAPLES, ITALY) GEOTHERMAL FIELD,
Comitato Nazionale per le Ricerche Nucleari, Pisa (Italy). Lab. di Geologia Nucleare.
For primary bibliographic entry see Field 2K.
W78-06387

SURVEY OF TRACE METAL CONTENTS OF SUSPENDED MATTER IN THE ST. LAWRENCE ESTUARY AND SAGUENAY FJORD,
Quebec Univ., Rimouski. Inst. National de la Recherche Scientifique.
D. Cossa, and S. A. Poulet.
Journal of the Fisheries Research Board of Canada, Vol 35, No 3, p 338-345, March 1978. 5 fig, 2 tab, 26 ref.

Descriptors: *Trace elements, *St. Lawrence Seaway, *Estuaries, *Water analysis, *Suspended solids, Chemical properties, Water chemistry, Sediments, Oceanography, Saline water-freshwater interfaces, Manganese, Zinc, Lead, Cadmium, Pollutants, Water quality, *Saguenay Fjord.

Trace metal contents (Mn, Zn, Pb, and Cd) of suspended particulte matter were measured in the upper St. Lawrence estuary and Saguenay fjord. In the estuary, elution of the trace metal fraction adsorbed on particles seems to be responsible for the significant differences in concentrations observed at the freshwater-saltwater boundary. In the Saguenay fjord, particles from deep waters are enriched with trace metals, especially Mn, compared with those from surface waters. This enrichment probably is due to Mn oxidation and simultaneous scavenging of the other trace elements. High Pb and Cd levels in particles of surface waters of the fjord seem to depend mostly on their high affinity for the rich organic matter. (Henley-ISWS)
W78-06401

USING TOPOGRAPHIC CHARACTERISTICS TO PREDICT TOTAL SOLUTE CONCENTRATIONS IN STREAMS DRAINING SMALL FORESTED WATERSHEDS IN WESTERN MONTANA,
Montana Univ., Missoula.
For primary bibliographic entry see Field 2K.
W78-06407

THE TOXICITY TO GOLDFISH OF MIXTURES OF CHLORAMINES, LAS AND COPPER, (TOXIC CONSTITUENTS AND GROSS TOXICITY OF WASTE TREATMENT EFFLUENT TO FISHES),
Maryland Univ., College Park. Inland Environmental Lab.
For primary bibliographic entry see Field 5C.
W78-06408

DIVERSITY OF STREAM COMMUNITIES UNDER CONDITIONS OF POLLUTIONAL STRESS,
Kansas Univ., Lawrence. Dept. of Geology.
R. L. Kaesler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 500, Price codes: A03 in paper copy, A01 in microfiche. Kansas Water Resources Research Institute, Lawrence, Contribution No. 193, February 1978. 38 p, 4 fig, 7 tab, 55 ref. OWRT C-6007(No. 5200)(5).

Descriptors: *Diversity index, *Stream surveys, *Brillouin's index, *Hierarchical diversity, *Biological communities, Water pollution, *Bioindicators, Costs, Sampling, *Systematics, *Pollutant identification, Streams, Ecology, *Ecological distribution.

Indices of species diversity, which are often used to assess the state of the aquatic environment, are single values that combine the number of species in a sample with evenness of their distribution. They are convenient for expressing the state of the environment to nonecologists, but because of this simplicity they are easily misapplied, leading to erroneous interpretation. The purposes of this research were to find the index of diversity most appropriate for stream surveys; to find, if possible, ranges of diversity indicative of healthy streams, moderate pollution, and heavy pollution; and to develop and test means of reducing the cost of stream surveys by considering taxonomic categories above the species level, such as families and genera, the value of small samples, and non-taxonomic hierarchies. By using Brillouin's index, one may reduce the size of samples collected and, hence, the cost of the field survey and the time needed to collect data in the laboratory. Moreover, some purposes of applied aquatic ecolgy are served by working with families or genera rather than species, again with appreciable savings of time and money. Sufficient knowlege of functional miorphoogy and trophic structure has accumulated to allow ecologists to base environmental studies on them. One may thus gain better understanding of the structure of an aquatic community than with traditional taxonomic data.
W78-06409

THE IMPACT OF STREAM RECONSTRUCTION AND A GABION INSTALLATION ON THE BIOLOGY AND CHEMISTRY OF A TROUT STREAM,
Lehigh Univ., Bethlehem, PA. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-06410

MEASURING AND PREDICTING FLOTATION PERFORMANCE,
Toronto Univ., (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-06418

AUTOMATIC MONITORING TECHNIQUES OF EUTROPHICATION SUBSTANCES IN COASTAL SEA WATER (FY 1976-1978), (SANGYO HAISUI NO FUEIYOKASEIBUN NO SHORI NI KANSURU KENKYU-KENSHUTAU-KI HAIHATSU NI KANSURU KENKYU),
Government Industrial Research Inst., Osaka (Japan).
K. Hiiro, T. Tanaka, A. Kawahara, and K. Hagiwara.

Tsusansho kogyo gijutsuin sangyo kogai kenkyu kaihatsu choseikyoku 51 nendo kogai tokubetsu kenkyu hokoku, Report of the 1976 Pollution Special Research Industrial Research Coordination Bureau of Agency of Industrial Science and Technology), No. 47, p 1-6, July, 1977. 4 fig, 3 tab, 8 ref.

Descriptors: Pollutant identification, *Eutrophication, *Phosphorus, *Nitrogen, *Red tide, *Analytical techniques, Electrodes, Nitrates, Nitrites, Phosphates, Carbon, Organic matter, Absorption, Sea water, *Monitoring, Water quality, Waste water.

A two year eutrophication study of coastal sea water vulnerable to red tide monitored nitrate ion, phosphate ion, and organic substance concentrations. Selective ion sensitive electrodes and absorbence differentials for concentration calculations were developed. Nitrate nitrogen concentrations ranging 1.4-1,400 ppm were detected by two types of electrodes developed for the study. An Urushi matrix membrane in a liquid ion exchanger produced a linear nitrate-nitrogen calibration curve similar to that produced by the polyvinyl chloride membrane in a liquid ion exchanger. Phosphate-phosphorus was monitored by a lead sulfide membrane electrode with a sensitivity range of 0.31-3,100 ppm phosphate-phosphorus at pH 7-9. Correlation coefficients for total nitrate and nitrite ions in sea and river water samples were calculated according to absorbence differences between 223 and 232 mm. The 14 sea water and 18 river water samples yielded correlation coefficients of 0.81 and 0.94, respectively. Absorbence differences between 250 and 280 nm produced a correlation factor of 0.96 to total organic carbon in the sea water samples. Fluorescence was used to measure the organic content of the sea water samples; the correlation coefficient was calculated at 0.96 for the organic and total carbon fluosescence intensities. Ion exchange and precipitation methods for enrichment of nitrate-nitrogen and phosphate-phosphorus were implemented; an automatic monitoring station is planned. (Lisk-FIRL)
W78-06469

RESEARCH ON HYGIENIC CONDITIONS OF THE OLIVERI-TINDARI LAKE COMPLEX (MESSINA),
Messina Univ. (Italy). Inst. of Hygiene.
O. C. Grillo, G. Milici, and F. Loggini.
Riv Ital Ig 36(1-3): 14-25. 1976. (In Ital. with Ital. and Engl. summ.).

Descriptors: Lakes, *Public health, *Bacteriology, *Surveys, Chemicals, Water pollution, Pollutant identification, *Bacteria, *Italy(Tyrrhenian Coast), Messina province(Italy).

A chemical and bacteriological survey is reported on the hygienic conditions of the 3 small lakes on the Tyrrhenian coast of Messina province, Italy. On the basis of the obtained results the waters of these lakes apparently are good for swimming.-Copyright 1978, Biological Abstracts, Inc.
W78-06499

FILTER MEDIA FOR SAMPLING AND MONITORING.
Water and Waste Treatment, Vol. 20, No. 10, p 54, October, 1977.

Descriptors: *Pollutant identification, *Filters, *Filtration, *Suspended solids, *Ion exchange, *Resins, Analytical techniques, Monitoring, Radioactive wastes, Magnesium, Chemical precipitation, Gravimetric analysis, Specific conductivity, Aquatic bacteria, Salmonella, Waste water treatment, Sludge treatment.

A review of filter media products, manufactured by Whatman of England for analytical and filtration processes, is presented. A glass microfiber filter that does not contain binders and can be ignited for gravimetric analysis is used in the measurement of total suspended solids in waste water. Industrial waste water in Japan is analyzed with a thick glass microfiber filter that has a high loading capacity. A paper developed by Whatman with an ion-exchange resin coating is used in the detection of metal ions in water. A glass micro-fiber filter is also used in the gravimetric analysis of rutheniun-106 in sea water. Whatman cotton cellulose thimbles are used in conjunction with a solvent to remove animal or mineral fats, greases, and oils from sludge. Specific resistance of sludge to filtration is measured with Whatman No. 1 filter papers or No. 17 chromatography paper. A glass microfiber filter with a high flow rate and 1.6 micrometer retention is used to identify Salmonella and Pseudomonas aeroginosa in water supplied. Bacteria analysis of potable water is also conducted with No. 17 filter pads. Whatman produces five glass micro-fiber filter grades and 28 cellulose filter varifies. (Lisk-FIRL)
W78-06509

TWO COMPLEMENTARY ULTRASONIC SYSTEMS.
Water and Waste Treatment, Vol 20, No 10, p 42, 44, October, 1977.

Descriptors: *Pollutant identification, *Flowmeters, *Dissolved oxygen, *Channel flow, *Ultrasonics, *Electrodes, Ions, Permselective membranes, Conductivity, Flow measurement, Analog models, Equipment.

An ultrasonic effluent sampler and monitor, produced by Endress and Hauser, provides pH, dissolved oxygen, water level, and flow data. The sampling system monitors pH and dissolved oxygen levels; the level monitor utilizes an echo gauge; and the flow metering is performed in open channels by an ultrasonic sensor. PH monitoring for short of long distances is accomplished by a constant meter reference electrode and a glass electrode that galvanically charges the effluent with a voltage dependent upon the ion concentration of the water. Dissolved oxygen levels in the waste water are measured by a gold and silver elecrtrode covered by a plastic membrane pervious only to oxygen. Flow proportional or time proportional water sampling is conducted by a glass cylinder with a air pump and a pinch valve. The level monitoring device is used for the measurement of grit, sump pump, sludge-water interfaces, and digestors. Flow measurements in open channels are accomplished by an ultrasonic gauge that monitors elapsed time of echoes between the surface of the water and the gauge. The measurement is converted into an analog signal proportional to the flow within the open channel. (Lisk-FIRL)
W78-06510

A STUDY ON THE LOADING AND PERFORMANCE OF SEWAGE TREATMENT PLANTS,
T. Stones.
Effluent and Water Treatment Journal, Vol 17, No 7, p 352-353, July, 1977. 3 tab, 11 ref.

Descriptors: *Biochemical oxygen demand, *Oxygen demand, *Nitrogen, *Carbon, *Activated sludge, Biological treatment, Biological treatment, Biological membranes, Filters, Analytical techniques, Treatment facilities, Waste water treatment.

The measurement of oxidizable load on a waste water treatment facility according to BOD and permanganate values was evaluated for the effective calculation of biological filter and activated sludge capacities. BOD and permanganate values provide only partial measurement of total carbonaceous oxygen demand and did not reflect nitrogenous oxygen demand. A comparison of BOD reduction by biological filtration and activated sludge indicated higher reduction rates by the activated sludge treatment. However, the biological filter reduced the nitrogenous oxygen demand by 73%, the dichromate value by 77.8%, and the total ozygen demand by 76.6%. The activated sludge method achieved reductions in nitrogenous oxygen demand of 23.1%, dichomate value of 69.2%, and total oxygen demand of 56.1%, reductions that were significantly lower than with biological filtration. The activated sludge method was considered better for reducing BOD than the filtration technique. For total oxygen demand, a 76% reduction was achieved by biological filtration and a 56.1% reduction by activated sludge. The analysis of total oxygen demand reduction, consisting of carbonaceous and nitrogenous oxygen demand, was considered superior to BOD and permanganate analyses for the calculation of treatment plant loading and performance. (Lisk-FIRL)
W78-06512

DETERMINATION OF COD USING A SEALED-TUBE METHOD,
Yorkshire Water Authority (England). Office of Scientific Services.
D. G. Best, and K. E. de Casseres.
Water Pollution Control, Vol 77, No 1, p 138-140, 1978. 7 tab, 3 ref.

Descriptors: *Pollutant identification, *Chemical oxygen demand, *Analytical techniques, *Oxidation, *Standards, *Volumetric analysis, Colorimetry, Chemical analysis, Instrumentation, Waste water treatment, Municipal wastes.

A sealed-tube techniques using titration or colorimetry for COD analysis of standard and oxidation-resistant compounds was compared to the conventional reflux COD method. A solution contained 10.126 g of potassium dichromate, 167 ml of sulfuric acid, and 33.3 g of mercuric sulfata was mixed in a sealed glass tube with a catalyst solution containing 22 g of silver sulfata and 2.5 liters of sulfuric acid. The mixture was rotated and heated to 150C in a block thermostat unit. The reaction mixture was then diluted and fed to a colorimeter or a titrator. This tube method was capable of recovering 100.4% of potassium hydrogen phtalate, 99.9% of glucose, and 97.4% of glutamic acid. Ethanol and sodium dodecyl benzene sulfonate, considered difficult to oxidize, were recovered more efficiently with the sealed tube method than with the standard reflux technique. The two analytical procedures were comparable in precision analyses with synthetic potassium hydrogen phthalate standard solutions and waste water samples. When compared to the reflux technique, the sealed tube process required 75% less testing space and saved an estimated 70% of the cost of chemicals for analysis. (Lisk-FIRL)
W78-06514

AIRBORNE ENTERIC BACTERIA AND VIRUSES FROM SPRAY IRRIGATION WITH WASTEWATER,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
B. Teltsch, and E. Katzenelson.
Applied and Environmental Microbiology, Vol 35, No 2, p 290-296, February 1978. 7 fig, 2 tab, 15 ref.

Descriptors: *Coliforms, *Viruses, *Sprinkler irrigation, *Return flow, *Air pollution, Air environment, Air temperature, Humidity, Solar radiation, E. coli, Waste water treatment, Waste water disposal.

Aerosolized bacteria and viruses were monitored in an agricultural area spray irrigated with sewage effluents. Marker strains of mutant E. coli, introduced into the irrigation effluent, were present in the air only when the E. coli concentration in the waste water exceeded 1,000/ml. Monitoring of temperature, solar irradiation, relative humidity, and wind velocity was conducted simultaneously with the air sampling. Peak solar irradiation coin-

cided with the minimum relative humidity level and aerosolized bacterial density. Samples obtained at night yielded bacterial concentrations 10 times higher than for corresponding daytime measurements. The correlation coefficient between bacteria and relative humidity was calculated at 0.80; the correlation coefficient with solar irridiation was -0.50. Wind velocity and temperature did not indluence bacterial density. Four out of 12 air samples collected at a distance of 40 m downwind from the irrigation site contained echovirus 7. Coliforms were detected in air samples obtained as far as 350 m downwind of the spray irrigatin lines. (Lisk-FIRL)
W78-06515

NOVEL COMBINATION METHOD ASSESSES SEWAGE ODORS,
Battelle Pacific Northwest Labs., Richland, WA.
P. M. Molton, and D. Cash.
Water and Wastes Engineering, Vol 15, No 2, p 47-48, 50, 52, February, 1978. 3 fig, 1 tab.

Descriptors: *Pollutant identification, *Odor, *Gas chromatography, *Organoleptic properties, *Sewage sludge, *Sludge digestion, Chemical degradation, Irradiation, Sludge treatment, Waste dilution, Sewage treatment, Waste water treatment, Municipal wastes.

Odor analysis of municipal sewage and sludge was accomplished by a combined method of organoleptic testing and gas chromatography. Threshold odor numbers were defined for sludge treated by digestion, irradiation, and heat, and untreated sludge in a series of tests by a six member panel. An electron capture detector was employed in the gas chromatogrophy analysis of sewage and sludge odor. Gas chromatography indicated that digestion of sludge significantly reduced the odor of the effluent. The results of the organoleptic and gas chromatography analyses indicated that odors very with time; peak odor levels were followed by odor decreases. Odor development patterns were useful in predicting maximum odor levels. Chemical treatment of minor odorous compounds was suggested as a possible means of reducing odor significantly. (Lisk-FIRL)
W78-06516

LIMITATIONS OF SINGLE WATER SAMPLES IN REPRESENTING MEAN WATER QUALITY, III. EFFECT OF VARIABILITY IN CONCENTRATION MEASUREMENTS ON ESTIMATES OF NUTRIENT LOADINGS IN THE SQUAMISH RIVER, B. C.,
Department of the Environment, Vancouver (British Columbia). Inland Waters Directorate (Pacific Region).
P. Kleiber, and W. E. Erlebach.
Technical Bulletin No 103, 1977. 9 p, 9 fig, 5 ref, 1 tab.

Descriptors: *Sampling, *Water sampling, *Water quality, *Nutrients, Variability, Measurement, Load distribution, Estimating, *Canada, *Pollutant identification, *Squamish River, British Columbia, Monte Carlo techniques.

An examination of the effect of variability in concentration measurements on estimates of nutrient loadings in the Squamish River and its tributaries has shown the limitations that result from the use of data derived from infrequent single grab samples. By the use of Monte Carlo techniques, the precision and accuracy of various measurement approaches were assessed. Correlations between discharge, measured continuously, and nutrient concentration, measured intermittently, provide a means of generating precise and accurate loading estimates. (WATDOC)
W78-06523

SHIPBOARD OIL IN WATER MONITOR.
Nucor Corp., Denville, NJ.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-027 635, Price codes: A02 in paper copy, A01 in microfiche. Report to Naval Ship Systems Command, July 1974. 24 p, 8 fig. N00024-74-C-5444.

Descriptors: *Oil pollution, *Monitoring, *Water pollution, Baseline studies, Pollution abatement, Laboratory tests, Vapor pressure, *Pollutant identification, *Outer Continental Shelf, *Flame emission techniques.

Laboratory studies were conducted to determine the feasibility of the flame emission technique for the monitoring of oil in water samples. The technique is useful for the detection of high vapor pressure oils; however, the lower vapor pressure materials were not detected reliably. The technique was investigated using steam stripping and vaporization to remove the oil from the sample. (Sinha-OEIS)
W78-06531

POLAROGRAPHIC DETECTION OF CD(II) AND CU(II) IONS IN BILGE WATER,
Naval Academy, Annapolis, MD. Dept. of Chemistry.
F. J. Gomba, M. M. Oldham, and W. D. Pennington.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-028 526, Price codes: A02 in paper copy, A01 in microfiche. Report USNA-EPRD-19, 19 February 1976, Prepared for Naval Material Command, Washington, D.C., Office of Support Technology for Period 1 July 1975 to 1 September 1975. 18 p, 3 fig, 4 ref, append.

Descriptors: *Water pollution sources, *Polarographic analysis, *Heavy metals, *Pollutant identification, Waste disposal, Toxicity, Ships, Copper, Cadmium, Nickel, *Outer Continental Shelf, Bilge water.

The detection of copper, cadmium, and nickel ions in bilge water is presented. The work extends that started in February 1974 where d.c. polarography was used to detect certain heavy metal ions in sea water. The toxicity of Cd(II) and Cr(VI) has been demonstrated in respect to mammalian cells and synergistic toxicity of Cu(II) and Zn(II) has been noted. Copper, of course, is a constituent of many alloys used in ship piping systems and corrosion in such systems would place the copper ion in bilge water discharge as a contaminant. The bilge water composition may vary greatly, but it may include oil, miscibly dispersed, which may interfere with any polarographic analysis. (Sinha-OEIS)
W78-06537

FUNDAMENTAL ANALYSIS OF THE LINEAR MULTIPLE REGRESSION TECHNIQUE FOR QUANTIFICATION OF WATER QUALITY PARAMETERS FROM REMOTE SENSING DATA,
Old Dominion Univ., Norfolk, VA. Dept. of Civil Engineering.
C. H. Whitlock, III.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-20546, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. Dissertation, May 1977. 176 p, 34 fig, 23 tab, 56 ref, 3 append.

Descriptors: *Remote sensing, *Water quality, *Linear multiple regression, Data collections, Least squares, Evaluation, Analytical techniques, Equations, *Regression analysis, *Pollutant identification.

Inconsistent results have been obtained from previous experiments which have applied linear multiple regression techniques to remote sensing data for quantification of water quality parameters. The study objective is to define optical physics and/or environmental conditions under which the linear multiple regression should be applicable. An investigation of the signal response equations is conducted and the concept is tested by application to both analytical test cases and actual remote sensing data from a laboratory under controlled conditions. It is found that the exact solution for a number of optical physics conditions is of the same form as a linearized multiple regression equation, even if nonlinear contributions are made by such factors as surface reflections, atmospheric constituents, or other water pollutants. Limitations on achieving this type of solution are defined. From analytical test case results, it is concluded that constituents with linear radiance gradients with concentration may be quantified from signals which contain nonlinear atmospheric and surface reflection effects for both homogeneous and non-homogeneous water bodies, provided accurate data can be obtained and nonlinearities are constant with wavelength. The effect of error in upwelled radiance measurements is to reduce the accuracy of the least-squares fitting process and to increase the number of points required to obtain a satisfactory fit. (Bell-Cornell)
W78-06550

GROUND-WATER QUALITY NEAR THE WATER TABLE IN SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, NY. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06586

THE CLINTON STREET-BALLPARK AQUIFER IN BINGHAMTON AND JOHNSON CITY, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06587

WATER RESOURCES OF THE CLARK FORM BASIN UPSTREAM FROM ST. REGIS, MONTANA,
Geological Survey, Helena, MT. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06588

APPRAISAL OF THE WATER RESOURCES OF DEATH VALLEY, CALIFORNIA-NEVADA,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06593

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1976.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06594

WATER RESOURCES DATA FOR MINNESOTA, WATER YEAR 1975.
Geological Survey, St. Paul, MN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06595

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 1. ARKANSAS RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06596

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 2. RED RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06597

WATER RESOURCES ALONG THE TAPS ROUTE, ALASKA, 1970-74,
Geological Survey, Anchorage, AK. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06603

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06605

APPRAISAL OF GROUND-WATER CONDITIONS IN MERCED, CALIFORNIA, AND VICINITY,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06606

AQUATIC TOXICOLOGY AND HAZARD EVALUATION: PROCEEDINGS OF FIRST ANNUAL SYMPOSIUM ON AQUATIC TOXICOLOGY SPONSORED BY ASTM COMMITTEE E-35 ON PESTICIDES, 25-26 OCTOBER 1976, MEMPHIS, TENNESSEE.
American Society for Testing and Materials, Philadelphia, PA. Committee E-35 on Pesticides.
For primary bibliographic entry see Field 5C.
W78-06608

DETERMINATION OF TOXICITY LOADS FOR BLEACH PLANT EFFLUENTS,
B. C. Research Ltd., Vancouver.
A. Bruynesteyn.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 364-1, Final Report to February 29, 1976. 33 p, 9 fig, 8 ref, 2 tab, append.

Descriptors: *Bleaching wastes, *Toxicity, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Canada, Foreign countries, Biochemical oxygen demand, Chlorination, Water pollution, *Kraft mills, Alkaline extraction, Washing(Pulp), Wash waters.

A toxicity balance was made of the first 2 bleaching stages (chlorination and alkali extraction) of a kraft mill in the interior of British Columbia. The toxic loading of each process stream and effluent was calculated from its volume, stock flow, and number of toxic units. Excellent agreement was obtained around the pulp washers and seal boxes. The additive nature of toxic loadings of process streams entering the vat side to two washers was confirmed to within 7% and 2.5%, respectively. Of the toxic loading entering pulp washer No. 15, 96.6% was accounted for in the washer filtrate and the sheet; of that entering washer No. 25, 102.8% was accounted for in its filtrate and sheet. Of the discharged (sewered) toxic loadings, 40.2% was in the chlorination effluent and 50.8% in the alkaline extraction effluent. The bleach plant produced 20.5 kg of 5-day BOD/oven-dry ton, of which 63.9% was sewered with the chlorination effluent and 26.1% with the caustic extraction waste water. (Brown-IPC)
W78-06616

EVALUATION OF THE EFFECTS OF EFFLUENTS FROM THE PULP AND PAPER INDUSTRY ON THE PRODUCTIVITY OF MARINE ALGAE,
Nova Scotia Research Foundation, Dartmouth.
For primary bibliographic entry see Field 5C.
W78-06617

IDENTIFICATION OF TOXIC MATERIALS IN SULFITE PULP MILL EFFLUENTS,
B.C. Research Ltd., Vancouver.
R. W. Lockhart, and J. M. Leach.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 407-1, Annual Progress Report, June 1, 1975 - March 31, 1976. 65 p, 13 fig, 28 ref, 8 tab.

Descriptors: *Sulfite liquors, *Pulp wastes, *Toxicity, Wastes, Industrial wastes, Pulp and paper industry, Effluents, Fish, Water pollution sources, Foreign countries, Canada, Resin acids, *Sulfite pulp mills, *Wood extractives, Eugenols, Juvabione, Juvabiol, Spent sulfite liquor, Fatty acids.

Waste liquors from 4 low-yield Na-base sulfite mills in eastern Canada were analyzed to isolate and identify those nonvolatile constituents responsible for fish toxicity. Predominant toxic factors (accounting for 50-95% of sample toxicity) were identified as 5 resin acids (abietic, dehydroabietic, pimaric, isopimaric, and sandaracopimaric acids). Juvabione and juvabiol were minor toxicants, and three samples contained toxic levels of eugenols. Other potentially toxic constituents detected were oleic and linoleic acids and todomatuic acid. Waste liquor from a sodium-base sulfite mull on the West Coast contained low concentrations of resin acids, juvabione, and juvabiol which were responsible for only a small fraction of effluent toxicity. (Brown-IPC)
W78-06620

CONTROL OF CHEMICAL OXYGEN DEMAND IN PULP AND PAPER MILL EFFLUENTS (CONTROL DE LA DEMANDA QUIMICA DE OXIGENO EN LOS VERTIDOS DE CELULOSA Y PAPEL),
Instituto Nacional Investigaciones Agrarias, Madrid (Spain).
D. Garcia Martin, R. M. Caminos Muruzabal, and C. Garcia Vallejo.
Investigacion y Tecnica del Papel, Vol 14, No 53, p 643-666, July, 1977. 24 ref, 2 tab. English summary.

Descriptors: *Pulp wastes, *Chemical oxygen demand, Wastes, Industrial wastes, Water pollution sources, Oxygen demand, Biochemical oxygen demand, Organic compounds, Carbon, Pulp and paper industry, Effluents, Water quality.

The various parameters of waste water quality coming under the generic name of oxygen demand are reviewed, including COD (oxygen demand by autoxidation, total oxygen demand, total organic carbon) and BOD. This is followed by a discussion of the determination of the permanganate index (acid and alkaline methods), which is the oldest of the current procedures for determining COD, and of the determination of dichromate COD (Moore, AFNOR, ASTM, Leithe, and Shaw methods). Finally, a 5-day BOD, chromate COD, and acid and alkaline permanganate indices are compared as measures of the oxidizability of organic solutes of known chemical composition and of compounds in kraft mill effluents. The comparative levels of BOD and COD in pulp and paper mill effluents are also briefly considered. (Speckhard-IPC)
W78-06625

MATHEMATICAL MODELS USEFUL IN EVALUATION OF ORGANIC WASTEWATER,
Chulalongkorn Univ., Bangkok (Thailand).
For primary bibliographic entry see Field 5D.
W78-06643

ANALYSIS OF CYANIDES IN COKE PLANT WASTEWATER EFFLUENTS,
Envirodyne Engineers, Inc., St Louis, MO.
P. J. Barton, C. A. Hammer, and D. C. Kennedy.
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 234-239, February, 1978. 1 fig, 6 tab, 12 ref.

Descriptors: *Analytical techniques, *Nitrogen compounds, *Chemical wastes, *Sulfides, *Chemical precipitation, Testing procedures, Cadmium, Magnesium compounds, Copper compounds, Waste water treatment, Industrial wastes.

A sulfide interference-free method for the analysis of cyanide in coke plant waste water is described. Cyanides are present in coke plant effluent as simple cyanides, complex cyanides or ferrocyanides, and thiocyanate. Sulfide concentrations in the samples after distillation by standard methods originate from the decomposition of thiocyanate. The use of magnesium chloride during distillation is recommended to reduce complex cyanides to simple cyanides when thiocyanate is present in the sample. The American Society for Testing and Materials suggests the use of a cuprous chloride reagent during distillation. Both analytical procedures produce sulfides in the distillates, significantly interfering with the measurement of cyanides. The procedure is modified to include the precipitation of sulfide with cadmium carbonate, followed by filtration. The removal of sulfide also allows for titration and ion-selective electrode analysis. Measurements obtained with magnesium chloride distillation are reported to higher than those obtained with cuprous chloride. Results indicate that cuprous chloride reacts with oxygen, producing lower readings, and that measurement with magnesium chloride distillation is more accurate in the presence of oxygen. (Lisk-FIRL)
W78-06647

TLM TEST OF TANNERY WASTE WATERS BY USING FISH,
Showa Women's Univ., Tokyo (Japan).
H. Ikamura, and K. Shirai.
Journal of the American Leather Chemists' Association, Vol 73, No 2, p 80-85, 1978. 1 fig, 4 tab.

Descriptors: *Tannery wastes, *Killfishes, *Resistance, *Carp, *Mercury, Sodium chloride, Sulfides, Waste water disposal, Waste water treatment, Laboratory tests, Toxicity, Industrial wastes.

The median tolerance limits of cyprindonts or killfish reared in tannery effluents from the various processing stages were calculated in laboratory experiments. Fish were reared for a seven-day period in waste water samples from the tannery processes, including presoaking, soaking, liming, reliming, deliming, bating, pickling, chrome tanning, neutralization, retanning, and fatliquoring-dyeing. The liming effluent contained large quantities of sulfide; the chrome tanning wastes had high concentrations of chromium salts; and the presoaking waters contained large amounts of sodium chloride. Fish survival over periods of 24 and 48 hours was assessed for concentrations of 100, 10, 5, 2, 1, and 0.5%. Killfish survival was highest, 74% for 24 hr and 47.6% for 48 hr retention times, in the deliming-bating effluent. Soaking effluent yielded the lowest survival rate at low concentrations, followed by liming, chrome tanning, pickling, and presoaking waste waters. Similar experiments conducted with guppies, carp, goldfish, and mudfish demonstrated that presoaking, chrome tanning, and liming waste water were also toxic to these fish. (Lisk-FIRL)
W78-06653

PHYTOPLANKTONIC ASSOCIATIONS OF SWEDISH LAKES,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-06683

SOME MESOTROPHIC PHYTOPLANKTON INDICATORS,
Lund Univ. (Sweden). Limnological Inst.
For primary bibliographic entry see Field 5C.
W78-06684

THE FRESH AIR--CLEAN WATER EXCHANGE,
For primary bibliographic entry see Field 5G.
W78-06693

MERCURY IN THE LAKE POWELL ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
D. R. Sandiford, L. D. Potter, and D. E. Kidd.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 672, Price codes: A03 in paper copy, A01 in microfiche. Report NSF-RA-E-73-451, Lake Powell Research Project Bulletin, No. 1, June 1973. 7 fig, 4 tab, 34 ref. NSF GI-29422 and GI-34831.

Descriptors: *Pollutant identification, *Lake Powell(UT AZ), *Mercury, *Water pollution effects, *Path of pollutants, Pollutants, *Utah, Water pollution sources, Ecosystems, Lakes, Reservoirs, Impoundments, Fish, Algae, Aquatic plants, Crayfish, Heavy metals, Power plants, Coals, Bioaccumulation, Organic matter, *Atomic absorption.

Samples of organic and inorganic components of the Lake Powell ecosystem in Utah and northern Arizona colected during 1971-72 were analyzed for mercury content by flameless atomic absorption. Mercury levels were: fish muscle, 232 ppb; plant debris, 145 ppb; plant leaves, 34 ppb; bottom sediments, 30 ppb; algae, 29 ppb; crayfish, 10 ppb; shoreline substrates, 10 ppb; and lake water, 0.01 ppb. Bioamplification and a mercury-organic matter association were evident in this relatively-unpolluted reservoir created in 1963 by impoundment of the Colorado River. Mercury levels in the larger predatory fish approach or exceed current safe-consumption standards. An estimated mercury budget was formulated for the upper Colorado River Basin, which suggests that 1360-5440 kg mercury are released annually by natural weathering; impoundment may lead to accumulation of about 800 kg mercury in the lake system per year. Planned coal-burning power plants may produce 4600 kg mercury annually, significantly augmenting mercury levels in alek sediments, and through bioamplification increase mercury levels in large game fish by up to 150 ppb. The extent of actual mercury level increases depends on the mercury content of the coal, the degree to which the mercury enter lake drainage, and movement and bioamplification in the system. (Lynch-Wisconsin)
W78-06694

PREIMPOUNDMENT STUDY: CEDAR CREEK DRAINAGE BASIN: EVANS COUNTY WATERSHED: EVANS, TATTNALL, AND CANDLER COUNTIES, GEORGIA,
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.
H. C. Vick, D. W. Hill, H. A. True, and R. J. Bruner, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 940, Price codes: A05 in paper copy, A01 in microfiche. Report EPA-904/9-77-006, March 1977. 52 p, 5 fig, 13 tab, 16 ref, 6 append.

Descriptors: *Cedar Creek(GA), *Impoundments, *Multiple-purpose reservoirs, *Nutrients, *Coliforms, *Water quality control, Reservoirs, *Georgia, Baseline studies, Watersheds(Basins), Rivers, Streams, Model studies, Hydrocomp Simulation Programming model, Eutrophication, Agricultural runoff, Livestock, Coliforms, Salmonella, Fertilizers.

Twelve sampling stations on Cedar Creek near Claxton in southeastern Georgia were monitored May 1974-January 1975 to obtain baseline water quality data prior to constructing a multipurpose impoundment. The proposed impoundment will have a normal pool area of 387 acres and will drain 29,658 acres. Agricultural and livestock production and natural conditions are the only pollution sources; potential pollution problems are foreseen in the E-5 and E-6 arms. Fecal coliform densities ranged from 130-5600/100 ml in May and 100-2200/100 ml in August. Salmonella were isolated at four of five stations sampled in May. Nitrogen and phosphorus concentrations were occasionally high. Postimpoundment water quality was predicted by the Hydrocomp Simulation Programming model; no major violations of Georgia water quality standards were forecast. Major conclusion: (1) High fecal coliform densities plus Salmonella isolations represent stormwater runoff under free-flowing stream conditions; following impoundment retention, time will decrease both parameters and should produce water quality suitable for body contact recreation. (2) Eutrophication potential will depend on such nutrient source control factors as assimilation by swampy areas. (3) Attempts should be made to contain runoff from livestock feeding areas and to limit fertilizer use. (Lynch-Wisconsin)
W78-06695

GAS CHROMATOGRAPHIC DETERMINATION OF RESIDUAL AMINE LEVELS IN PLANTS (IN RUSSIAN),
All-Union Research Inst. of Agricultural Use Sewage. Staraya Kupavan (USSR).
S. I. Khramova, and K. S. Bokarev.
Fiziol Rast (MOSC) 23(3), p 625-626, 1976.

Descriptors: Pollutant identification, *Gas chromatography, *Amines, Aniline, Chlorosis, Corn(Field), Effluents, Ethylamine, Fodder, Grass, Industrial wastes, Irrigation, Methylamines, Turgor, Water pollution, Biodegradation, Plant physiology.

The use of industrial effluent water for irrigation may have a negative effect on plants, animals which are raised on fodder consisting of such plants and on the quality of the final animal products. The level of amines, which are natural protein degradation products, and of aromatic amines, used in the paint, drug and other industries, in water are of particular interest. Corn and fodder grass plants were irrigated with water containing 100-300 mg/l of dimethylamine, diethylmine or aniline. Amine levels were determined in the plants and in the rhizosphere by gas chromatography using N2 as the carrier and beta, beta'- hydrozypropionitrile as the solid phase. The water containing even low levels of amines affected the turgor of the plants initially, induced chlorosis-like symptoms and depressed growth. Trace quantities of diethylamine and aniline were found in the plants only within a few hours after irrigation. The quantities of dimethylamine were detected. Products of amine degradation, e.g., formaldehyde, are toxic to plants and animals. The analytical control of amine levels in irrigation water is recommended.--Copyright 1977, Biological Abstracts, Inc.
W78-06699

BIODEGRADATION OF ORGANIC SUBSTANCES BY BIOLOGICAL TREATMENT AND IN NATURAL WATERS (GESUIDO SHORI JO OYOBI KOKYOYO SUIIKI NI OKERU YUKIODOKU BUSSHITSU NO BUNKAI KATEI NI KANSURU KENKYU),
For primary bibliographic entry see Field 5D.
W78-06700

5B. Sources Of Pollution

CHIRONOMIDS (DIPTERA) FROM SEDIMENTS OF LAKE MARTIGNANO (LAZIO), (IN ITALIAN),
Rome Univ. (Italy). Ist. di Zoologia.
Marcello Bazzanti.
Boll Pesca Piscic Idorbiol 30(1), p 139-142, 1975.

Descriptors: *Chironomids, *Diptera, Italy, Lakes, *Martignano Lake(Italy), *Trophic level, *Lake sediments, Distribution, Path of pollutants.

The pattern of distribution and density of the Chironomidae population of Martignano lake (Latium) (Italy) is outlined in relation to the trophic condition of the lake. The biocoenosis shows a clear resemblance to those of other lakes (Bolsena, Vico, Bracciano). Its physiognomy seems typical of oligotrophic basins.--Copyright 1977, Biological Abstracts, Inc.
W78-06203

UTILIZATION OF BRACKISH WATER IN COAL GASIFICATION,
New Mexico State Univ., University Park. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 3E.
W78-06204

CONCENTRATIONS OF NUTRIENTS AND CHLOROPHYLL ON A CROSS-CHANNEL TRANSECT IN JUAN DE FUCA STRAIT, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
A. G. Lewis.
Journal of the Fisheries Research Board of Canada, Vol 35, No 3, p 305-314, March 1978. 9 fig, 4 tab, 9 ref.

Descriptors: *Canada, *Nutrients, *Chlorophyll, *Nitrates, *Phosphates, *Pacific coast region, Nitrogen compounds, Phosphorus compounds, Chemical analysis, Water quality, Analytical techniques, Water analysis, Currents(Water), Oxygen, Temperature, Water circulation, *Juan de Fuca Strait(British Columbia), *Puget Sound(BC), British Columbia.

Nutrient and chlorophyll values were measured hourly at one of four stations on a cross-channel transect, over a 25-h period during each of 5 mo. Nitrate values increased with depth, chlorophyll decreased, and phosphate remained essentially unchanged during most months. Chlorophyll and phosphate values did not show consistent cross-channel trends, while nitrate levels were frequently higher on the southern side of the Strait. The cross-channel nitrate pattern can be explained, at least partially, in terms of geostrophic flow; greater amounts of nitrate-rich oceanic water enter at depth on the southern side of the Strait, while nitrate poor inshore water exists near the surface on the northern side. (Henley-ISWS)
W78-06216

THE 1976 DROUGHT IN FRANCE: CLIMATOLOGICAL ASPECTS AND CONSEQUENCES (LA SECHERESSE 1976 EN FRANCE: ASPECTS LIMATOLOGIQUES ET CONSEQUENCES),
Direction de la Meteorologie, Boulogne-Billancourt (France).
For primary bibliographic entry see Field 2B.
W78-06221

SURVIVAL AND MOVEMENT OF FECAL INDICATOR BACTERIA IN SOIL UNDER CONDITIONS OF SATURATED FLOW,
Oregon State Univ., Corvallis. Dept. of Microbiology.
C. Hagedorn, D. T. Hansen, and G. H. Simonson.
Journal of Environmental Quality, Vol. 7, No. 1, p 55-59, January-March 1978. 2 fig, 3 tab, 8 ref.

Descriptors: *Bioindicators, *Septic tanks, *Soil disposal fields, *Water pollution sources, *Sewage bacteria, Disposal, Domestic wastes, Sewage disposal, Environmental sanitation, Soil contamination, Water pollution, Bacteria, Coliforms, Soil environment, Sewage treatment, Public health, *Groundwater contamination, Tracer bacteria, Survival time.

Antibiotic-resistant fecal bacteria were used to monitor the degree of movement and subsequent groundwater contamination by septic tank effluent discharged into a drainfield under saturated conditions. Two pits of different depths were constructed to simulate drainfield beds, and groundwater samples were removed during 32-day sampling intervals from sampling wells installed at set distances from each inoculation pit. The bacteria added to the deep pit were released into a B2t horizon which contained a higher clay content than the A horizon in which the shallower pit was installed. Streptomycin-resistant strains of Escherichia coli and Streptococcus faecalis amended to each pit site moved in a directional manner, required more time to reach sampling wells when inoculated into the deeper of the two pits, and moved relatively long distances when considering that the area where the sites were located had only a 2% slope. Bacterial numbers peaked in the sampling wells in association with major rainfall patterns and the populations required longer periods to peak in the wells furthest from the inoculation pits. The results indicated that antibiotic-resistant bacteria eliminated the problem of differentiating between the amended bacteria and those nonresistant strains already in the soil, and the potential is excellent for including this type of microbiological procedure for assessing the suitability of a soil site for septic tank and waste water drainfield installations. (Henley-ISWS)
W78-06224

THE USE OF REMOTE SENSING TECHNIQUES FOR DETECTION AND IDENTIFICATION OF POLLUTANT DISCHARGES,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 5A.
W78-06230

DEVELOPMENT OF A HYDROPHOBIC SUBSTANCE TO MITIGATE PAVEMENT ICE ADHESION,
Ball Bros. Research Corp., Boulder, CO.
For primary bibliographic entry see Field 4C.
W78-06241

NEARSHORE DISPOSAL: ONSHORE SEDIMENT TRANSPORT,
Coastal Engineering Research Center, Fort Belvoir, VA.
R. K. Schwartz, and F. R. Musialowski.
Army Coastal Engineering Research Center Reprint 78-6, Reprinted from: 'Coastal Sediments '77', 5th Symposium Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 85-101, 8 fig, 7 ref.

Descriptors: *Sediment transport, *Waste disposal, *Shore protection, Beach erosion, North Carolina, Water resources, Outer Continental Shelf, *Pollutant transport, Ocean dumping, Nearshore processes, Dredge-disposal.

During the summer of 1976, relatively coarse sediment was dredged from New River Inlet, NC, moved downcoast, and placed in a 215 m coastal reach between the 2 m and 4 m depth contours. Bathymetric changes on the disposal piles and in the adjacent beach-nearshore area were studied to determine the modification of th surrounding beach-nearshore profile and the net transport direction of the disposal sediment. The sediment piles created an initial local shoal zone with minimum depths of 0.6 m. Shoaling and breaking waves caused rapid erosion of the pile tops and a gradual coalescing of the piles to form a disposal bar located seaward of a naturally occurring surf-zone bar. The disposal bar eventually migrated landward, in some cases at an average rate of 1.8 m/day, although movement appeared to be sporadic and to coincide most directly with periods of increased wave activity. Final surveys showed accretion at the base of the foreshore, complete filing of the trough, a platform or new trough at the initial surf-zone bar position, disappearance of the surf-zone bar, and generally a more seaward surf zone boundary. Profiles adjacent to the disposal area showed slight accretion seaward of the surf zone. The increased width of the platform-disposal bar complex may provide benefits by increasing the amount of wave energy dissipation in the surf zone and hence, less erosion of the beach. (Sinha-OEIS)
W78-06243

IMPLICATIONS OF SUBMERGENCE FOR COASTAL ENGINEERS,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-06244

BEACH AND NEARSHORE PROCESSES IN SOUTHEASTERN FLORIDA,
Coastal Engineering Research Center, Fort Belvoir, VA; and Florida Ocean Sciences Inst. Inc., Deerfield Beach.
For primary bibliographic entry see Field 2L.
W78-06246

SPATIAL AND TEMPORAL CHANGES IN NEW JERSEY BEACHES,
Coastal Engineering Research Center, Fort Belvoir, VA.; and Tetra Tech, Inc., Pasadena, CA.
For primary bibliographic entry see Field 2L.
W78-06247

VISUAL SURF OBSERVATIONS/MARINELAND EXPERIMENT,
Coastal Engineering Research Center, Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-06252

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX C--WATER COLUMN.
Army Engineer District, San Francisco, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-038 310, Price codes: A09 in paper copy, A01 in microfiche. April 1976. 285 p.

Descriptors: *Water quality, *Waste disposal, *Dredging, *Sediments, *Dissolved oxygen, Water pollution effects, Estuaries, California, Dredge disposal, *San Francisco Bay(CA).

Studies were conducted between 1972 and 1975 to assess the influence of local dredging and disposal operation on Bay water quality. Primary attention was given to the characterization of suspended solids loading and dissolved oxygen as modified by the operations. Emphasis was placed on these parameters because of the degree to which dredging and disposal affect concentrations and their importance in impact evaluation. Both the dredging and the disposal operation were found to influence the dissolved oxygen concentration The effects of the dredging operation were considerably less severe than those of the disposal operation. The duration of a dissolved oxygen reduction is controlled by the contact time between sediment and water and by the intensity of its initial demand. The suspended solids concentration during the dredging operation are generally an order of magnitude lower than concentrations during the disposal operation. Another difference is that increases in solids levels during dredging are confined basically to the channel and return to background levels within several hundred meters of the dredge, whereas increases at the disposal site can influence areas outside of the site boundaries. During disposal the release of dredged sediments may result in a complete mounding of the sediments on the bottom or complete dispersion of the sediments over a large area. The evaluation of the physical conditions generated at the disposal site during a release requires information on the engineering properties of the sediment and type of dredging operation. (Sinha-OEIS)
W78-06254

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY, APPENDIX F--CRYSTALLINE MATRIX,
Battelle Pacific Northwest Labs., Richland, WA.
R. J. Serne, and B. W. Mercer.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-037 542, Price codes: A12 in paper copy, A01 in microfiche. Army Corps of Engineers, San Francisco, California, Engineer District, Bay and Estuary. Crystalline Matrix, Appendix F, May 1975. 260 p, 23 fig, 59 tab, 126 ref, append. DACW-7-73-C-0080.

Descriptors: *Heavy metals, *Waste disposal, *Sediments, *Dredging, Basline studies, Estuarine environmental water pollution sources, Water pollution effects, *California, Dredge disposal, *San Francisco Bay(CA).

A study was undertaken to determine the quantity and nature of certain heavy metals (Cd, Cu, Hg, Pb, Zn) that may be released from selected San Francisco Bay sediments as a function of various physical and chemical parameters. Ten sediment sampling stations in San Francisco Bay were selected to represent the range of sediment types and heavy metal concentrations which are involved in routine maintenance dredging and disposal. A batch sorption-desorption experiment was performed to determine the fate of sediment bound heavy metals during simulated dredging activities. It was found that under oxygen rich conditions, statistically-significant larger concentrations of Cd, Cu, Pb, and Zn were found in the water column than were found under oxygen deficient conditions. Higher salinity waters also caused larger released of cadmium and zinc than were found at low salinity. Length of agitation time in oxygen rich waters also affected the magnitude of release of copper, cadmium and zinc. Mechanisms to explain the results are discussed as are relationships of the results to the environmental effects of dredging and disposal in San Francisco Bay. Elutriate trace metal concentration predictor equations and recommendations for future work are presented. (Sinha-OEIS)
W78-06256

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX I--POLLUTANT AVAILABILITY,
California Univ., Berkeley. Lawrence Berkeley Lab.; California Univ., Berkeley. Div. of Energy and Environmental; and California Univ., Bodega Bay. Inst. of Pollution Ecology.
V. C. Anderlini, J. W. Chapman, A. S. Newton, and R. W. Risebrough.

Available from the National Technical Information Service, Springfield, VA 22161 as ADA-038 312, Price codes: A15 in paper copy, A01 in microfiche. Army Corps of Engineers, San Francisco, California, Engineer District, October 1975. 330 p, 10 fig, 61 tab, 112 ref, 2 append.

Descriptors: *Paths of pollutants, *Water pollution sources, *Water pollution effects, *Dredging, Invertebrates, *California, Baseline studies, Waste disposal, Bibliographies, Data collections, Dredge disposal, *San Francisco Bay(CA).

An integrated investigation of the effects of a dredge hopper disposal operation on pollutant availability to local invertebrate fauna and of the pathways (water, sediment, and suspended particulates) by which pollutants may be accumulated by invertebrates was undertaken in San Francisco Bay. The impact of such a spoiling operation in relation to the input of pollutants from a major point source. the East Bay Municipal Utility District's San Francisco Bay sewage outfall, was determined. Water parameters (salinity, temperature, pH, nitrate, and ammonia nitrogen and dissolved oxygen) were monitored before, during, and after the experimental spoiling to provide information on the physical-chemical conditions which may accompany or be associated with fluctuations in pollutant concentrations. The pathways by which pollutants may be accumulated by invertebrates were examined in laboratory studies and in a 'Field Laboratory' experiment in which selected invertebrate species were exposed in sity to altered concentrations of suspended particulates. The amount of trace elements redistributed annually by all dredging activities is much greater than the annual input from the EBMUD outfall, but is almost inconsequential in relation to element redistribution by settling particulated. Water quality conditions as defined by the water chemistry and suspended and settled particulate load data remained stable, without significant longer-term fluctuations, during the period of study. Fluctuations in the concentrations of the twelve elements were highly correlated with each other in sediment, invertebrates, suspended and settled particulates and suggest that only one or a few parameters may control trace element fluxes in San Francisco Bay. (Sinha-OEIS)
W78-06257

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX J--LAND DISPOSAL,
International Engineering Co., Inc., San Francisco, CA.
For primary bibliographic entry see Field 5E.
W78-06258

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX M--DREDGING TECHNOLOGY.
JBF Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 5E.
W78-06259

GAS AND LEACHATE FROM LANDFILLS: FORMATION, COLLECTION, AND TREATMENT,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
E. J. Genetelli, and J. Cirello.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 161, Price codes: A09 in paper copy, A01 in microfiche. Report No EPA-600/9-76-004, March, 1976. 189 p, 102 fig, 51 tab, 101 ref, 2 append. 803663.

Descriptors: *Landfills, *Gases, *Leachate, *Leaching, *Waste disposal, *Waste treatment, *Soils, *Decomposing organic matter, Groundwater, Water pollution, Solid wastes, Management, Soil treatment, Ultimate disposal, Treatment, *Refuse disposal, *Sanitary landfills, Groundwater pollution.

Proceedings of a research symposium held at Rutgers University on March 25-26, 1975, which brought together researchers, administrators, and other personnel to exchange state-of-the-art ideas and findings on sanitary landfills, are reported. Topic areas discussed were gas and leachate and their formation, collection, and treatment. The compilation of papers contained in this symposium presents the Solid and Hazardous Waste Research Division, Municipal Environmental Research Laboratory research on sanitary landfills. Paper topics include: (1) current EPA research activities, (2) current Office of Solid Waste Management programs, (3) current solid waste management activities in New York State and in Puerto Rico, (4) landfill research work in progress at Harwells Hazardous Materials Service (UK), (5) a theoretical approach to gas movement through soils, (6) analytical methodologies for leachate and gas analysis, (7) leachate attenuation in undisturbed and remolded soils, (8) variations in gas and leachate production from baled and non-baled municipal refuse, (9) gas and leachate generation in various solid waste environments, (10) leachate migration through selected clays, (11) organic pollutants contributed to groundwater by a landfill, (12) attenuation mechanisms of pollutants through soils, (13) monitoring toxic chemicals in land disposal sites, (14) assessing synthetic and admixed materials for lining landfills, (15) an overview of landfill management with leachate recycle and treatment, (16) solid waste degradation due to shredding and sludge addition, and (17) case history of landfill gas movement through soils. (Seip-IPA)
W78-06263

INVERTED SIPHONS FOR OIL TRAPPING,
Calspan Corporation, Buffalo, NY.
For primary bibliographic entry see Field 5D.
W78-06268

DISPERSION OF BUOYANT WASTE WATER DISCHARGED FROM OUTFALL DIFFUSERS OF FINITE LENGTH,
California Inst. of Tech., Pasadena.
P. J. W. Roberts.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No 77-20,657. PhD Thesis, 1977. 234 p.

Descriptors: *Outfall sewers, *Dispersion, *Fluid mechanics, *Flow characteristics, *Waste dilution, Mathematical models, Froude number, Reynolds number, Mixing, Stratification, Hydraulic design, Sewerage, Waste water disposal, *Path of pollutants.

Laboratory experiments were used to examine the three-dimensional flow field produced by a line plume analogous to the dispersion of buoyant waste water released from line diffusers in ocean outfalls. Results indicated that the minimum surface dilution was independent of the diffuser length:water depth ratio (L/H) and the Reynold's number (Re) from 1,190 to 12,900. Dilutions were related to a type of Froude number (F) equal to the ratio of the cube of the current velocity (u) to the buoyancy flux per unit length (b). Dilutions were independent of current velocity and current direction for $F<0.1$ and proportional to current velocity for $F>0.1$ when the current direction was perpendicular to the diffuser. At $0.1<F<100$ the development of a vertically stable density profile resulted in dilution which was approximately 60% of that expected under conditions of uniform mixing. Horizontal spreading of the waste field was attributed to buoyancy rather than to ambient turbulence. Initial surface plume spreading was linear and was not affected by L/H and Re for 3.7 L/H 15 and 2,900 L/H 13,000. The plume spreading rate was observed to decrease beyond the initial linear zone. (Schulz-FIRL)
W78-06269

LEVEL OF CHEMICAL SUBSTANCES IN FARM CROPS GROWN ON SOIL IRRIGATED BY WASTE WATERS FROM BY-PRODUCT COKING PLANTS (ROUGH DRAFT),
Scientific Research Inst. for Foods Sanitation, Kiev (USSR). Physico-Chemical Lab.
For primary bibliographic entry see Field 3C.
W78-06272

PHENOL DEGRADATION IN ARTIFICIAL BODIES OF WATER (1970 EXPERIMENTS) (ROUGH DRAFT),
For primary bibliographic entry see Field 5C.
W78-06273

SANITARY AND ONCOLOGICAL ASSESSMENT OF AGRICULTURAL USE OF SEWAGE CONTAINING CARCINOGENIC HYDROCARBONS (ROUGH DRAFT),
Institut Eksperimentalnoi i Klinicheskoi Onkologii, Moscow (USSR).
A. P. Il'nitskii, L. G. Solenova, and V. V. Ignatova.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-tr-2959, Price codes: A02 in paper copy, A01 in microfiche. Report ORNL-tr-2959, (1974). Translation from Kazanskii Meditsinskii Zh. No 2, p 80-81, 1974. 3 p, 2 tab, 3 ref.

Descriptors: *Return flow, *Irrigation, *Aromatic compounds, *Organic compounds, *Waste water disposal, *Water reuse, Absorption, Soils, *Polycyclic aromatic hydrocarbon(PAH), *Benzapyrene(BP), *Carcinogens.

The accumulation of benzapyrene (BP) an environmentally stable, carcinogenic polycyclic aromatic hydrocarbon (PAH), which occurs in soil and crops that have been irrigated with waste water, was investigated. Three wastewater sources were studied: domestic waste water originating from a small village, textile plant waste water, and carpet plant waste water. Selected vegetable crops were subjected to year-round irrigation at a rate averaging 9000 cu m/hectare/year. The BP content was determined in soil samples, plants, and the waste waters; the quantitative determination was based on the Shpolski effect with a spectral-luminescence method. Seventy-seven soil samples and 18 samples of vegetables and fodder grass were analyzed. Domestic waste water BP content varied from 0.16.54 micrograms/l, while the textile plant waters contained 0.15.22 micrograms/l and the carpet plant waters contained 0.016.07 micrograms/l. Results indicate no BP accumulation in soil and BP content in vegetables was at the same level as in control locations. It is theorized that this absence of significant BP levels in soils and crops is due to the presence (in the turf-slight podzol, sandy loam soil) of certain species of bacteria which destroy PAH. Further research is mandated to determine the self-purification method in the soils. (Seip-IPA)
W78-06275

MICROBIAL DEGRADATION OF PHENOLS IN THE PURIFICATION OF PHENOLIC WASTE WATERS WITH ACTIVATED SLUDGE,
Nauchno-Issledovatelskii Inst. Vodosnabdyavane Kanaliz. (Bulgaria).
For primary bibliographic entry see Field 5D.
W78-06276

CARBON AND NITROGEN TRANSFORMATIONS IN SOILS AMENDED WITH SEWAGE SLUDGE,
Purdue Univ., Lafayette, IN.
For primary bibliographic entry see Field 5E.
W78-06282

FLUORIDE EMISSIONS FROM PHOSPHORIC ACID PLANT GYPSUM PONDS,
North Carolina State Univ. at Raleigh.
For primary bibliographic entry see Field 5A.
W78-06292

TRENCH INCORPORATION OF SEWAGE SLUDGE IN MARGINAL AGRICULTURAL LAND,
Agricultural Research Service, Beltsville, MD. Biological Waste Management Lab.
J. M. Walker, W. D. Burge, R. L. Chaney, E. Epstein, and J. D. Menzies.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 561, Price codes: A12 in paper copy, A01 in microfiche. Report No. EPA-600/2-75-034, September, 1975. 231 p, 58 fig, 69 tab, append. IBB043(ROAP21-ASE), 68-01-0162.

Descriptors: *Sludge disposal, *Trenches, Land reclamation, Salmonella, Pollutants, Indicators, Coliforms, Metals, Lime, Soil tests, Pollution indicators, Raw sludge, Digested sludge.

A method was tested for transporting and placing digested and limed raw (undigested) sewage sludges (8 to 20% solids) in trenches in study soil at loadings up to 1,150 dry tons/hectare without odor problems or hazard of surface runoff. Field scale trenching was best achieved by digging the trenches on contour not more than 75 cm deep, 60 cm wide, and from 60 to 75 cm apart. It was indicated that the ideal sludge transport method would employ concrete mixer trucks; trenches could then be filled directly from discharge chutes or indirectly with a peristaltic pump. A tracked trenching machine with a maneuverable rear-mounted digging wheel dug a new trench and simultaneously backfilled a parallel sludged trench. In two years, neither heavy metals nor pollution indicator organisms (coliform and salmonella) have moved more than about 30 cm from entrenched sludge into surrounding soil. Moderate amounts of nitrate nitrogen have moved into underdrainage water, but not into the underground aquifer. The lime in the sludge reduced metal movement into soil and availability to crops; metal uptake was modest. Tested agricultural practices included cross ripping, tilling, and cropping, with grasses recommended for the first year. Entrenchment was concluded to be feasible for sludge disposal and for improving marginal land for agricultural purposes. The appendix contains the report on cooperative research on trenching for May to November, 1974. (Wares-IPA)
W78-06297

INTERACTION OF URBAN STORMWATER RUNOFF, CONTROL MEASURES AND RECEIVING WATER RESPONSE,
Florida Univ., Gainesville.
M. A. Medina, Jr.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-17,043. PhD Thesis, 1976, 324 p.

Descriptors: *Storm water, *Urban runoff, Mathematical models, *Water pollution sources, *Hydrology, Simulation models, Stochastic processes, Synthetic hydrology, Time series analysis, Statistics, Storm runoff, Urban hydrology, Waste water treatment, Autocorrelation analysis.

Mathematical models for the movement, decay, storage, and treatment of storm water runoff pollutants and dry weather waste water flows through the urban environment and receiving waters are presented. Autocorrelation analysis is used to stochastically characterize the precipitation time and urban runoff series produced by a continuous hydrologic simulation model. Minimum dissolved oxygen concentration curves are used to illustrate the effects of waste input from wet and dry weather sources and from points upstream on receiving waters. Frequency distributions are analyzed for input and output concentrations and mass rates during single storm events and storm events recorded during a year-long period. Flow and concentration responses of storage/treatment systems are examined for completely-mixed systems with constant and variable volumes, and for one-dimensional advective systems with and without dispersion. Detention time was found to have the greatest influence on the effect of urban runoff on receiving waters. (Schulz-FIRL)
W78-06309

RUNOFF FROM A LOW-COST MANURE STORAGE FACILITY,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
F. R. Magdoff, J. F. Amadon, S. P. Goldberg, and G. D. Wells.
Transactions of the American Society of Agricultural Engineers, Vol 20, No 4, p 658-660, July-August 1977. 4 fig, 3 tab, 6 ref.

Descriptors: *Manure storage, *Agricultural runoff, *Rainfall-runoff relationships, *Dairy industry, *Fertilizers, Runoff, Water pollution sources, Cattle, Livestock, Agriculture, Crop production, Winter, Costs, Prototype tests.

Runoff volume and quality of a low-cost manure storage facility were monitored for one year (1976) to evaluate its performance in reducing surface water pollution and conserving available nutrients. Results showed high runoff rates January through April (69% of total runoff), nutrient concentrations and amounts high enough to cause water quality deterioration in streams and ponds, and therefore significant loss of fertility value. Annual losses of nitrogen, phosphorus, potassium, and solids were 6.0, 0.4, 8.3, and 82.0 kg/cow. It is recommended that: (1) runoff from such a facility be confined to a lagoon for crop irrigation, or (2) the manure stack be covered to eliminate contaminated runoff. Although using a lagoon with a manure stack involves developing handling procedures for solid and liquid waste, this alternative may prove necessary for most dairy farms with stanchion barns in order to handle both manure and milking center wastes. The study was conducted in response to concern over winter spreading of manure on frozen or snow-covered soil when substantial nutrient losses can occur, especially during a thaw. It is noted, however, that applying manure to frozen soil which has been rough plowed may actually decrease runoff volume and soil loss. The facility, which cost $1300, was 18 x 26 m, with a 2-5% slope and a retaining plank and post wall on the low side. Successive layers of gravel, plastic cushioned with rock fines, and crushed limestone provided the bed. (Lynch-Wisconsin)
W78-06314

A KINETIC MODEL OF STEADY STATE PHOSPHORUS FIXATION IN A BATCH REACTOR I. EFFECT OF SOIL/SOLUTION RATIO,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
A. R. Overman, and R. L. Chu.
Water Research, Vol 11, No 9, p 771-775, 1977. 9 fig, 21 ref.

Descriptors: *Model studies, *Kinetics, *Phosphorus fixation, *Soil-solution ratio, *Hydrogen ion concentration, Soil mass, Phosphorus, Equations, Michaelis-Menten equations, Langmuir adsorption, Batch reactors, Phosphates.

A kinetic model for steady state phosphorus fixation in a batch reactor was developed and, in this study, tested variations in soil-solution ratio at pH 5. The model includes Langmuir type adsorption followed by a chemical reaction for a reactor with a steady phosphorus input. Measurements at pH 5 with the different soil/solution ratios all reach steady state and conform to a Michaelis-Menten type equation as predicted for the catalytic process. Maximum reaction rates show linear correlation with soil mass as expected. Involvement of an addional soil component in the adsorption process is inferred, but not confirmed. A plastic beaker 100 ml in diameter was used for the reactor vessel, and measurements were carried out at 25C. Soil was kept suspended by a stainless steel stirrer. For each run an appropriate quantity of phosphoric acid diluted to 500 ml, and adjusted to pH 5, was placed in the reactor. Phosphate solution of the desired concentration was delivered to the reactor at 3.16 ml/hr. The soil used is Lakeland fine sand collected at 30-60 cm depth in an unpolluted area; it is known to contain < 5% silt, < 5% clay, and a large amount of aluminum and iron. Experiments were conducted with 100, 150, 200, and 250 g soil in 500 ml solution. Four rates of phosphate addition were used with each quantity of soil. (See also W78-06318 and W78-06319) (Lynch-Wisconsin)
W78-06317

A KINETIC MODEL OF STEADY STATE PHOSPHORUS FIXATION IN A BATCH REACTOR II. EFFECT OF PH,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
A. R. Overman, and R. L. Chu.
Water Research, Vol 11, No 9, p 777-778, 1977. 4 fig, 12 ref. EPA S800829.

Descriptors: *Model studies, *Kinetics, *Phosphorus fixation, *Soil-solution ratio, *Hydrogen ion concentration, Phosphorus, Equations, Michaelis-Menten equations, Batch reactors, Phosphates, Soil mass, Langmuir adsorption.

A kinetic model described in another paper for steady state phsophorus fixation in a batch reactor was tested in this study for variations in pH at a constant soil/solution ratio of 250 mg/500 ml. Measurements of phosphorus fixation at pH 2, 3, 5, 7, and 8 reached a steady state and conformed to a Michaelis-Menten type equation as predicted for the catalyric process. Maximum rate of reaction decreases with increasing pH due to the competitive effecr between OH(-) and H2P04(-). The maximum value of 1/K at pH 5 showed H2P04(-) may be required in phosphorus adsorption for some specific-bonding mechanism with soil. The model assumes Langmuir type adsorption followed by a first-order chemical reaction with the solid phase of the soil. All experiments were conducted at 25C in a batch reactor consisting of plastic beaker 100 ml in diameter in which soil was dept suspended by a stainless steel stirrer. For each run a 500 ml solution of an appropriate quantity of phosphoric acid was adjusted to the various pH levels. Then 250 g of Lakeland fine sand taken from an unpolluted area at depths of 30-60 inches was put into the reactor; it contains less than 5% silt, less than 5% clay, and large amounts of aluminum and iron. A concentrated solution of phosphric acid was delivered to the soil-solution mixture at a constant rate of 3.16 ml/hr. Four rates of concentrated phosphate addition were conducted with each constant pH experiment. (See also W78-0317) (Lynch-Wisconsin)
W78-06318

A KINETIC MODEL OF STEADY STATE PHOSPHORUS FIXATION IN A BATCH REACTOR - III. EFFECT OF SOLUTION REACTION,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
A. R. Overman, and R. L. Chu.
Water Research, Vol 11, No 9, p 779-781, 1977. 3 fig, 7 ref. EPA S800829.

Descriptors: *Model studies, *Kinetics, *Phosphorus fixation, *Solution reaction, *Soil-solution ratio, Phosphorus, Equations, Batch reactors, Hydrogen ion concentration.

A kinetic model for phosphorus fixation described in two previous papers is modified to account for

phosphorus reaction in solution as well as adsorption and reaction with the solid phase of the soil. This modification is shown to change the calculated results in the expected direction. The two earlier articles dealt with effects of changing the soil/solution ratio and the pH. In all cases a steady input of phosphorus produces a steady state phosphorus concentration in solution at a particular pH and soil/solution ratio. The model treats the system as heterogeneous catalysis with Langmuir type adsorption. Due to limited number of adsorption sites in the soil, a maximum rate of reaction was calculated for each soil/solution ratio. Extrapolation of these values to zero soil mass infers that reaction occurred even the absence of soil in the reactor. It is thereby deduced that some reaction occurred in solution due to the slight solubility of aluminum and iron phosphates at pH 5. It is assumed that the solution reaction was first order, with a rate coefficient related to pH through the solubility of aluminum and iron hydroxides. An additional soil component postulated to participate in the adsorption step was still apparent. No attempt is made to identify this component. (See also W78-06317) (Lynch-Wisconsin)
W78-06319

TRANSLOCATION AND ATTENUATION OF WASTEWATER PHOSPHORUS IN STREAMS,
Rensselaer Polytechnic Inst., Troy, NY.
G. A. Carlson, Jr.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-23,782. PhD Thesis, 1977, 260 p.

Descriptors: *Pollutant identification, *Phosphorus, Natural streams, *Translocation, *Attenuation, Municipal wastes, Calcerous soils, Waste water disposal, Waste assimilative capacity, Waste water(Pollution), Waste water treatment.

Three small streams in calcareous soil zones in the western part of New York were sampled at points 5-17.5 km below waste discharge sites to assess their ability to assimilate phosphorus contained in the waste water. Stream discharge, dissolved and particulate phosphorus, chloride and calcium in the water column, and available phosphorus in the fixed bed sediments were measured bi-weekly from May to October. Equations describing the variation in these parameters along each stream under mean, high, and low flow conditions were defined using regression analysis. Chloride, used to test a conservative material's behavior, was conserved as load accumulated in a linear manner with reach. The concentration and load of dissolved phosphorus decayed exponentially with stream reach, with phosphorus load decreasing significantly downstream from each waste water outfall. Phosphorus concentration and load decayed exponentially at rates ranging 0.04-0.36/km. Concentration of available phosphorus in sediment and the phosphorus distribution along each stream indicated significant uptake as the waste discharge's impact was ameliorated. The study included that sediments in streams flowing through calcareous soil have a high, long-term assimilative capacity for phosphorus; and phosphorus in the sediments and in the water column approached equilibrium. (Snyder-FIRL)
W78-06320

EFFECTS OF UNRECORDED POLLUTION FROM URBAN STORMWATER RUNOFF ON BENTHIC MACROINVERTEBRATES OF THE GREEN RIVER, MASSACHUSETTS,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5C.
W78-06321

ON THE CONTAMINATION OF SEA WATER WITH SALMONELLA AND FECAL INDICATOR ORGANISMS: I. OCCURRENCE AND DISTRIBUTION OF SALMONELLA AND FECAL INDICATOR ORGANISMS IN COASTAL SEA WATER OF FUKUYAMA, (IN JAPANESE),
Hiroshima Univ. (Japan). Dept. of Food Chem. Tech.
H. Hashimoto, H. Kawakami, M. Murata, H. Ushijima, and M. Nakao.
J Fac Fish Anim Husb Hiroshima Univ 15(2), p 207-218, 1976.

Descriptors: *Bioindicators, Microorganisms, *Seto Inland Sea(Japan), Sea water, Bacteria, Coastal waters, *Coliforms, *Distribution, Enterococci, *E. coli, Fukuyama, Indicators, Inland, Japan, *Salmonella.

As a part of a survey on environmental pollution of the Seto Inland Sea, Japan, a survey on the ecology of Salmonella and fecal indicator organisms in sea water samples, collected at 8 stations on the coast of Fukuyama (Japan), was conducted in June 1972-March 1974. The positive rate for occurrence of Salmonella in the samples was 12.1% (28/232). Positive Salmonella detection rates as high as 21.7-7-25% were observed at 3 stations. A higher positive rate of Salmonella occurrence was observed for samples collected during May-Oct. The incidence of Salmonella in the samples decreased as the sampling stations approached the outer part of the port and the offshore area. S. typhimurium, S. thompson, S. anatum, S. infantis, S. give, S. schleissheim, S. schwarzengrund, S. derby, S. montevideo, S. meleagridis, S. binza and S. senftenberg, and the o-groups, B, C1, D and E1 were among the 42 strains located. Most serotypes isolated in this study were similar to those previously isolated from the river waters in this district. Thus, those Salmonella serotypes contaiminating the terrestrial environment also contaminate the coastal marine environment. Higher MPN (most probably number) values and frequency of occurrence of fecal indicator organisms were observed according to the order coliforms Escherichia coli and enterococci. The coliform incidence was positive in most samples examined. A high incidence of Salmonella recovery was observed in samples having high fecal indicator MPN values and temperatures 19C.--Copyright 1977 Biological Abstracts, Inc.
W78-06331

RUNOFF FROM A PASTURED WATERSHED IN LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Agricultural Engineering.
T. S. Chisholm.
Louisiana Agricultural Experimental Station Bulletin, No. 699, p 3-14, June 1977. 5 fig, 7 ref, 3 append.

Descriptors: *Agricultural runoff, *Pastures, *Storm runoff, *Water pollution sources, *Rainfall-runoff relationships, Rainfall intensity, *Louisiana, Baton Rouge(LA), Runoff, Runoff coefficient, Rural areas, Watersheds(Basins), Model studies, Nonpoint pollution, Data collections.

Rainfall-runoff correlations for a 50-acre pastured watershed in Baton Rouge, Louisiana from 1966-69 showed that: (1) Maximum rainfall for a storm was 6.80 inches, resulting in the maximum runoff of 3.33 inches and the highest peak runoff rate of 0.592 inches/yr; this storm would have a return frequency of 3.9 years. (2) For all 43 storms total rainfall was 56.98 inches, with a total runoff of 19.72 inches (34.6% runoff). (3) October-March storms produced a runoff percent of 60.7; for April-September storms the runoff percent was 25.3. (4) Average rainfall duration for the 43 storms was 8.9 hours, and averae runoff duration was 25.1 hours. (5) Average rainfall duration for October-March storms was 18.3 hours, and for April-September storms 5.5 hours. (6) The longest runoff duration was 152 hours, resulting from rainfall of 2.85 inches and duration of 82.3 hours on very wet soil; the runoff amount was 2.77 inches (97% runoff). The study area was the Ben Hur farm, which has a .3% land slope; all runoff drained through a single outlet. Three recording rain gauges provided information on rainfall amounts and rates, and a recording H-flume gave data on runoff rates and durations. The 43 storms, although not inclusive of all storms which occurred during the study period, are representative of all seasons of the year. Rainfall amounts varied from 0.20-6.80 inches per storm. (Lynch-Wisconsin)
W78-06332

METHODS FOR AN INVESTIGATION OF UREA-N LOSS IN ARIZONA AGRICULTURAL WATERS DUE TO UREASE ACTIVITY,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
A. Fitch.
Master of Science Thesis, 1977. 65 p, 11 fig, 13 tab, 57 ref.

Descriptors: *Irrigation water, *Ureas, *Irrigation effects, Fertilizers, Agriculture, *Arizona, Irrigation, Nitrogen, *Nitrogen compounds, *Methodology, Watt method, Chisp method, Douglas method, Bremmer method, *Urease activity.

Four different methods were analyzed for the study of nitrogen loss from aqueously applied urea due to urease activity in irrigation waters. A review of the literature concerning the decomposition of urea and a review of the four methods to be used, and their results, are presented. The Watt and Chisp method was found to be less sensitive than required. The Douglas and Bremmer Test was found to be variable in the results obtained. A bubbler constructed for lab use assayed nitrogen volatilized from urease activity but is not adaptable for field studies. An acid trap test designed for field studies lacked accuracy. Further research in the field is called for. (Jamail-Arizona)
W78-06336

FACTORS CONDUCIVE TO THE CONTAMINATION OF SOIL WITH OPISTHORCHIS EGGS AND THEIR SURVIVAL IN THE ENVIRONMENT OF THE OB RIVER AREA (IN RUSSIAN),
All-Union Scientific Research Inst. of Medical Parasitology and Tropical Diseases, Moscow (USSR).
V. D. Zavoikin, O. B. Babaeva, A. M. Smirnova, N. A. Romanenko, and S. A. Beer.
Med Parazitol Parazit Bolezni 46(2), p 141-144, 1977.

Descriptors: Soil analysis, Water pollution sources, Soil contamination, *Ob River area(USSR), *Opisthorchis-felineus eggs, Russian-SFSR, Tomsk, USSR.

Examinations of 1563 soil specimens, 40 water samples and 40 bottom deposits in 14 communities of Kargasok and Upper-Keskoye districts of the Tomsk Oblast (Russian SFSR) located in the central part of the Ob-Irtysh (USSR) focus of opisthorchiasis demonstrated that the degree of soil contamination with Opisthorchis eggs reflected the prevalence rate of opisthorchiasis in the human population and regularly decreased in the upstream direction of the tributaries. O. felineus eggs in nature were unstable to the effect of the environmental factors and died in feces and the soil in summer at an average temperature of 26 degrees C within 11 days, and in winter at a temperature of -22 degrees C within 1 day. In the river water in summer, at an average temperature of 19 degrees C, Opisthorchis eggs remained viable for over 70 days. The main role in the epidemiological process is played by the eggs released into the environment in spring, particularly during the flood period.--Copyright 1978, Biological Abstracts, Inc.
W78-06346

CHARACTERIZATION OF URBAN RUNOFF - NEW YORK,
Cornell Univ., Ithaca, NY. School of Civil and Environmental Engineering.
C. D. Gates.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 250, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, May, 1976. 65 p, 22 fig, 12 tab, 23 ref. OWRT C-5341(No. 4239)(3).

Descriptors: *Urban runoff, *New York, *Biochemical oxygen demand, Biodegradation, Land use, Water pollution sources, Pollutant identification, Streamflow, *Urban land runoff, *Nonpoint source pollution, *Pollution transport, *Susquehanna River, *Chenango River, BOD mass fluxes.

The urban runoff of a 20.6 square mile area within the Binghamton, New York Standard Metropolitan Statistical Area was assessed; selection criteria demanded a mix of residential, commercial, and industrial land uses characteristic of older, smaller cities in the State. Sewer overflow discharges and point sources of wastes were located and characterized. Factors influencing the generation and transport of nonpoint source wastes by urban runoff were identified and described. Stream flow data and biological oxygen demand (BOD) concentration data for two stations above the study area (in the Chenango and Susquehanna Rivers) and at one downstream station were used to calculate BOD mass fluxes at the stations on a monthly basis during the summers of 1974 and 1975. The amounts of BOD entering the two river segments in the urban land runoff were calculated from mass balance analyses of the BOD fluxes. The differences in the upstream and downstream fluxes, corrected for point source inputs, were the basis for calculating the non-point urban land runoff loading rates. The BOD urban land runoff loading rates for 1974 and 1975 were 168 and 7,716 BOD5/sq. mi/day, respectively and are compatible with those derived from comparable study areas. Each of the BOD5 loads attributable to runoff exceeded the BOD5 input from the sewage treatment plant for the corresponding period. It is concluded that, relative to point sources, the role of urban land runoff as a nonpoint source of pollution is significant. (Seip-IPA)
W78-06352

CHARACTERIZATION OF THE NON-VOLATILE ORGANIC MATERIAL DURING PHYSICAL-CHEMICAL TREATMENT OF THE DISTRICT OF COLUMBIA RAW WASTE-WATER,
Washington Technical Inst., Washington, DC. Water Resources Research Center.
For primary bibliographic entry see Field 5D.
W78-06353

CONCENTRATION AND MODES OF TRANSPORT FOR TRACE METALS IN THE HAW RIVER, NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
C. L. Haynie.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 668, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, 1974. 74 p, 5 fig, 17 tab, ref. OWRT A-070-NC(1), 14-31-0001-5033.

Descriptors: Water pollution sources, Chromium, Cobalt, Iron, *Trace elements, *Heavy metals, Industrial wastes, Municipal wastes, Water sampling, Neutron Activation Analysis, *North Carolina, *Path of pollutants, *Pollutant identification, *Haw River(NC), Antimony, Transport mechanism, *Trace metals.

Concentrations of chromium (Cr), antimony (Sb), cobalt (Co) and iron (Fe) were measured in water, suspended sediments and bottom sediments of the Haw River, North Carolina using instrumental neutron activation analysis. Data indicate significant sources of antimony and chromium upstream of stations 4A and 35. Cobalt is considered to have no significant man-made source in the Haw River system. Physical and chemical separations from five stations on Troublesome and Little Troublesome Creeks were performed to delineate five modes of transport for the trace metals. Mechanisms of transport for the metals vary depending upon flow and source of the metal. Metals from geochemical weathering are transported primarily (about 60%) by the crystalline minerals. Metals from contamination are transported mainly (about 59%) by hydrous oxide coatings of iron and manganese. Adsorption, which is the major mode of transport for chromium under high flow conditions, is decreased at low flow when transport by hydrous oxides predominates. (Stewart-NC State)
W78-06356

THE IMPACT OF URBAN STORMWATER ON THE WATER QUALITY STANDARDS OF A REGULATED RESERVOIR,
Tennessee Univ., Knoxville Water Resources Research Center.
F. C. Larson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 334, Price codes: A09 in paper copy, A01 in microfiche. Research Report No. 62, March 8, 1978. 166 p, 47 fig, 32 tab, 21 ref, 4 append. OWRT A-043-TENN(4), 14-34-0001-8045.

Descriptors: *Urban runoff, *Storm water, Water quality, Flow, *Tennessee, *Water quality standards, *Reservoirs, *Storm runoff, Model studies, Sampling, Dissolved oxygen, Hydrogen ion concentration, Biochemical oxygen demand, Conductivity, *Ft. Loudoun Reservoir(Tenn), Temperature, Fecal coliforms.

Urban stormwater runoff may or may not have a significant effect on the water quality of a receiving stream. Changes in the water quality of Fort Loudoun Reservoir (near Knoxville, Tennessee) as a result of stormwater runoff were observed. A transient flow model was used to trace a slug of water for examination of water quality during runoff events. A sampling methodology was developed which, when used in conjunction with the flow model, allowed graphical predictions of water quality changes in the slug of water as it moved past the city. A grab sampling technique (used before, during and after runoff events) was also developed to increase the water quality data. Water quality parameters obtained were dissolved oxygen, pH, biochemical oxygen demand, conductivity, temperature, total solids and fecal coliforms. Over 30 test runs were included in the study. No significant water quality changes were observed between control values and those obtained after the addition of stormwater runoff in the reservoir. No general trends could be determined for any parameters which seemed to fluctuate according to conditions specific to each rainfall-runoff event. Total solids violated stream standards on two occasions, dissolved oxygen was in violation 19 times and standards for fecal coliform numbers were frequently violated.
W78-06362

THE EFFECT OF SEEPAGE ON THE DESIGN OF STORM WATER PONDS IN FLORIDA,
Florida Univ., Gainesville. Dept. of Civil Engineering.
J. P. Glass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 205, Price codes: A05 in paper copy, A01 in microfiche. Master of Engineering, Thesis, 1976. 85 p, 18 fig, 1 tab, 38 ref, 1 append. OWRT A-028-FLA(1).

Descriptors: *Storm water, *Storm runoff, *Surface runoff, *Florida, Ponds, *Design, *Seepage, Groundwater movement, Waste water disposal, Water treatment, Aquifer management, Orange County(FL), Marion County(FL), Seepage basins

Seepage and groundwater flow factors are discussed in relation to the design of storm water seepage basins; safer and more economical ponds, resulting from a better understanding of transient flow, are emphasized. A literature review, on-site inspection of operational storm water seepage ponds, interviews with engineers and regulatory officials, and mathematical and numerical analysis of transient groundwater flow comprised the research effort. Experiments in seepage pond use for waste water disposal, water treatment, and artificial recharge aquifers are widespread, yielding pertinent information on water quality, economics, and clogging of pond bottoms applicable to Florida's conditions. Inspection of operational seepage ponds in Orange and Marion Counties indicated that successful pond design depends upon a knowledge of the sub-surface soil condition. Interviews with pond designers indicated no widely accepted design method; even though the unsteady seepage that makes these ponds work is a relatively complicated phenomenon, there is usually very little money in the design budget for analysis. Existing analytical solutions of the unsteady groundwater flow equations were reviewed. Solution of the Dupuit-Forcheimer approximation to the problem was used to prepare a dimensionless chart to aid in the design procedure. Subsequent numerical solutions of the corresponding nonlinear equations were also organized into a similar, more accurate diagram. An appendix contains a flowchart and computer program listing. (Wares-IPA)
W78-06369

BUOYANCY EFFECTS IN THERMALLY STRATIFIED OPEN-CHANNEL FLOW,
Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
For primary bibliographic entry see Field 8B.
W78-06371

INDUSTRIAL POINT SOURCES OF PETROLEUM: POLLUTION LOADS AND ECONOMIC PARAMETERS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
T. J. Tuffey, and P. Ginsberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 394, Price codes: A03 in paper copy, A01 in microfiche. Report NSF/RA-760381, Prepared for National Science Foundation, Washington, D.C., January 1976. 24 p, 8 tab. NSF AEN74-14810.

Descriptors: *Water pollution, *Industrial wastes, *Oil wastes, *Oil industry, Pollutants, Oil, Water pollution sources, Surveys, Industries, Effluents, Economics, Estuaries, *Delaware Estuary, Petroleum refining, Industrial effluents.

Pollution and economic parameters of refinery and non-refinery industrial effluents are discussed. The purpose was to publicize a significant data base. This resource can be of use to others as well as the project team in analyzing problem situations. Two authors from different disciplines worked independently on the informaton compiled. Different approaches caused some data overlaps that result in slightly different figures. Included were sections that provide: (1) refinery petroleum load as determined by permit search and verification; (2) other refinery parameters calculated from EPA guidelines; (3) non-refinery petroleum load as determined by permit search; and (4) an economic parameter of refinery residuals. (Sims-ISWS)
W78-06376

HYDROCARBONS IN CORES OF NORTHWESTERN ATLANTIC COASTAL AND CONTINENTAL MARGIN SEDIMENTS,
Woods Hole Oceanographic Institution, MA. Dept. of Chemistry.
J. W. Farrington, N. M. Frew, P. M. Gschwend, and B. W. Tripp.
Estuarine and Coastal Marine Science, Vol. 5, No. 6, p 793-808, November 1977. 4 fig, 3 tab, 55 ref. EPA R 802724, NSF GX352 12, ONR N00014-66-C0262; NR083-004.

Descriptors: *Organic compounds, *Cores, *Sampling, *Sediments, *Massachusetts, *Atlantic Ocean, Coasts, Continental margin, Lead radioisotopes, Depth, Gas chromatography, Urbanization, Atmospheric fallout, *Buzzards Bay(Mass), Alkanes, Cycloalkanes, Phenanthrenes.

The concentrations and composition of hydrocarbons in sections from a Pb210 dated core from Buzzards Bay, Massachusetts, were reported. Terrigenous n-alkane concentrations remain constant throughout the 62 cm and 195 years sampled. Gas chromatographic analysis on SCOT columns revealed an unresolved complex mixture of alkanes and cycloalkanes which decreases in concentration with increasing depth. Phenanthrene and C sub 1 and C sub 2 substituted phenanthrene concentrations also decreased with increasing depth, and the relative abundance of C sub 1 and C sub 2 homologs compared to phenanthrene suggest a pyrolytic origin for these aromatic hydrocarbons. The various sources of hydrocarbons in surface sediments and the processes which could govern their distribution were discussed. The most likely source of the phenanthrenes and the unresolved complex mixture of alkanes and cycloalkanes in the upper core sections circa 1900 to the present seems to be urban air fallout. A depth distribution of alkanes and cycloalkanes similar to the Buzzards Bay core was found for a second area of Buzzards Bay and for cores from sediments of the Gulf of Maine and Hudson Canyon. Two C sub 25 cycloalkenes were identified as major hydrocarbons in the sediments. Their concentratuions decrease with increasing depth in the cores. Mass spectra of these compounds and their hydrogenation products were reported. (Visocky-ISWS)
W78-06384

THE DYNAMICS OF STRATIFICATION AND OF STRATIFIED FLOW IN LARGE LAKES.
International Joint Commission-United States and Canada, Windsor (Ontario). Standing Committee on the Scientific Basis for Water Quality Criteria.
For primary bibliographic entry see Field 2H.
W78-06388

SIMULATION OF THE VERTICAL THERMAL STRUCTURES OF LAKES UNDER TRANSIENT METEOROLOGICAL CONDITIONS,
Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 2H.
W78-06393

NEARSHORE PLUME AND CURRENT STUDIES IN EASTERN LAKE MICHIGAN,
Environmental Technical Assessments, Inc., Oak Brook, IL.
M. B. Hoglund.
In: The Dynamics of Stratification and of Stratified Flow in Large Lakes, Chapter 10; Proceedings of Workshop, Windsor, Ontario, February 26, 1976. Great Lakes Research Advisory Board, International Joint Commission, Windsor, Ontario, p 125-142, 1976. 9 fig, 2 tab.

Descriptors: *Heated water, *Lake Michigan, *On-site tests, *Water temperature, Discharge(Water), Nuclear powerplants, On-site investigations, Surveys, Measurement, Lakes, Temperature, Distribution patterns, Spatial distribution, Current(Water), *Thermal pollution, *Path of pollutants, Thermal plumes.

This study was directed toward measurement of the physical parameters associated with the thermal discharge from the Donald C. Cook Nuclear Plant, located on the southeastern shore of Lake Michigan near Bridgman, Michigan. The data, therefore, represent very localized conditions in the nearshore regions of Lake Michigan and as such, are not particularly pertinent to the large-scale dynamics of stratification and stratified flow in Lake Michigan. Furthermore, the objective of this study was to satisfy regulatory requirements of the Nuclear temperatures that exceed the ambient water temperature by 3 F or more, and to identify the areas of the lake, lake bottom and shorelines affected by the plume. It was often found that the lake water temperatures on the up-current side of the discharge are higher by approximately 1 F than the lake temperatures on the down-current side of the discharge. This pattern seems to persist at all depths. Analysis of the short-term current meter data showed that there is often little correlation in either current direction of current speed as recorded by the 4 current meters. (See also W78-06388) (Humphreys-ISWS)
W78-06396

ESTIMATES OF NONPOINT SOURCE POLLUTION BY MATHEMATICAL MODELING,
Maryland Univ., College Park. Dept. of Civil Engineering.
R. H. McCuen, R. C. Sutherland, R. L. Powell, and G. E. Kamadulski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 553, Price codes: A02 in paper copy, A01 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No. 43, March 1978. 13 p. OWRT A-030-MD(1), 14-34-0001-7044.

Descriptors: *Water quality models, Street sweeping, *Sediment prediction, *Mathematical models, Water pollution sources, *Nonpoint pollution sources, Estimating, Environmental effects, Computer models, *Urbanization, Simulation analysis.

The environmental consequences of the rapid expansion of urban communities into areas that had previously been dominated by rural land use has been the cause of increasing concern over the past decade. Techniques for the rational analysis of the environmental quality of the affected region are needed to examine the environmental consequences of existing and future projects in the planning community. A computer simulation model was developed to estimate the accumulation of pollutants in urban subbasins. A model component is also used to estimate the removal of the pollutants for any rainfall event. The simulation model could be used by planners to estimate the pollution loading from an urban subbasin that enters streams for all or part of that region.
W78-06405

MEASUREMENT OF TRICKLING FILTER EFFECT ON POLLUTED RIVERS (MESSUNG DES BENTHALEFFEKTS IM VORFLUTER),
Technische Hochschule, Darmstadt (West Germany). Inst. fuer Wasserversorgung, Abwasserbeseitigung und Raumplanung.
W. Esser.
Wasserwirtschaft, Vol 68, No 3, p 83-85, 1978. 3 fig, 1 tab, 8 ref.

Descriptors: *Trickling filters, *Waste assimilative capacity, *Microorganisms, *Rivers, *Pollutant identification, Biological treatment, Decomposing organic matter, Slime, Bacteria, Waste water treatment, Waste water disposal.

The waste assimilative capacity of a river was found to be dependent upon both the attached organisms and suspended organisms residing in the water. On-site experiments were conducted to evaluate the contribution of attached organisms in the river self-purification process. The concept of the trickling filter was employed for the direct quantification of nutrient removal by attached organisms. The results of the study revealed that attached organism purification was responsible for 66-90% of the nutrient removal. The treatment ability of the attached organisms increased as the concentration and degradability decreased. The study verified the importance of bacterial slimes in the waste assimilative capacities of rivers. (Lisk-FIRL)
W78-06421

VIRUS ADSORPTION BY FIVE SOILS,
Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
W. D. Burge, and N. K. Enkiri.
Journal of Environmental Quality, Vol 7, No 1, p 73-76, 1978. 4 fig, 3 tab, 14 ref.

Descriptors: *Bacteriophage, *Soil types, *Clay loam, *Silts, *Adsorption, Sands, Loam, Sodium chloride, Cation exchange, Carbon, Organic compounds, Isotherms, Viruses, Kinetics, Waste water treatment, Land management.

The Freundlich isotherm was applied to the adsorption kinetics of phi X-174 bacteriophage in five soil types with varying physical and chemical properties. Adsorption rates of 6 ml of the bacteriophage were observed in 6 g samples of Aastad clay loam, Kranzburg silt loam, Palouse silt loam, Parshall silt loam, and Quincy loamy sand. The Freundlich isotherm and adsorption rate constants were calculated for adsorption of the virus by the soil were also determined. The Quincy soil with a pH of 7.2 showed no adsorption of the virus, due possibly to its high organic content. Bacteriophage adsorption was represented as a function of the square root of time. The cation exchange capacity, specific surface area, and organic carbon content of the soil correlated with the virus adsorption rates of the four remaining soils. The influence of pH was found to be significant in the adsorption of the virus by the soil. (Lisk-FIRL)
W78-06422

BIODEGRADATION OF SOME CATIONIC SURFACTANT AGENTS (BIODEGRADATION DE QUELQUES AGENTS DE SURFACE CATIONIQUES),
Monpellier-2 Univ. (France). Lab. d'Hydrobiologie.
B. Baleux, and P. Caumette.
Water Research, Vol. 11, No. 9, p 833-841, 1977. 15 fig, 1 tab, 18 ref.

Descriptors: *Biodegradation, *Alkalis(Bases), *Chlorides, *Bromides, *Surfactants, Sulfonates, Spectroscopy, Colorimetry, Bacteria, Waste water treatment, Rivers, Analytical techniques.

The biodegradation of 10 cationic surfactants in sewage wastes and river water was studied. Bacterial growth of heterotrophic populations was not inhibited or destroyed by the cationic surfactants, although pathogenic bacteria were affected. A colorimetric technique using sodium alizarine sulfonate was employed to monitor the decrease of active material during surfactant biodegradation. Measurements of biodegradation were obtained with infrared spectroscopy. The ten cationic surfactants studied were: 15 ethoxymethyl distearyl ammonium chloride, hexadecyltrimethylammonium chloride and bromide, dodecylpyridinium iodide, hexadecylpyridinium bromide, laurylpyridinium chloride, diisobutylphenoxtyethoxyethyl benzyl dimethylammonium chloride, quaternary alkylimidazolium compound, ethoxylated tertiary alkyl primary amines, and dimethyldistearylammonium chloride. Five of the alkylammonium compounds were found degradable while the other five were not. Three of the non-degradable products were cyclical alkylammonium

compounds of benzene and pyridium, while the other two were petroleum derivatives. (Lisk-FIRL)
W78-06507

ORGANOCHLORINATED RESIDUES IN WASTEWATERS BEFORE AND AFTER TREATMENT,
Laval Univ., Quebec. Dept. des Vivres.
For primary bibliographic entry see Field 5D.
W78-06518

LIMITATIONS OF SINGLE WATER SAMPLES IN REPRESENTING MEAN WATER QUALITY, III. EFFECT OF VARIABILITY IN CONCENTRATION MEASUREMENTS ON ESTIMATES OF NUTRIENT LOADINGS IN THE SQUAMISH RIVER, B. C.,
Department of the Environment, Vancouver (British Columbia). Inland Waters Directorate (Pacific Region).
For primary bibliographic entry see Field 5A.
W78-06523

QUALITY CRITERIA FOR WATER, JULY 1976.
Environmental Protection Agency, Washington, D.C. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5G.
W78-06527

OIL SPILLS, AND SPILLS OF HAZARDOUS SUBSTANCES.
Environmental Protection Agency, Washington, D.C. Div. of Oil and Hazardous Materials.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 458, Price codes: A02 in paper copy, A01 in microfiche. 1972, 22 p.

Descriptors: *Estuaries, *Oil spills, *Hazards, *Water pollution sources, *Pollution abatement, Water pollution control, *Outer Continental Shelf, Hazardous materials, Ocean dumping, Pollutant transport.

Approximately 80% of the reported spills involve oil, including crude and petroleum products ranging from grease to gasoline and waste lubricating oil. It is estimated that over 30 million gallons of oil were discharged in 1972. The remaining 20% involve hazardous polluting substances other than oils, which include poisons, corrosive materials, oxidizing agents, radioactive materials, and other compounds and mixtures where severely affect the aquatic environment. For both oil and hazardous materials the source of the discharges is linked to transport, transfer, storage, manufacturing and production operations. Oil terminals--tank storage farms and other facilities for storing oil--accidentally release oil to the environment. Spills also come from offshore platforms, tankers and other vessels, and from pipelines. The goals of EPA are to eliminate the spills, reduce discharges resulting from operational practices and minimize the impact of spills on the environment. To accomplish these goals, a three-phase program has been developed by EPA and the Department of Transportation for implementation by EPA, the U.S. Coast Guard and the Office of Pipeline Safety. The program includes response, prevention and enforcement. (Sinha-OEIS)
W78-06529

MODELING OF OIL EVAPORATION IN AN AQUEOUS ENVIRONMENT (RESEARCH ON THE EFFECTS OF CRUDE OIL TRANSFER AND UPSTREAM REFINERIES ON DELAWARE BAY),
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5G.
W78-06533

BIOLOGICAL OIL SLICKS. PART I - LITERATURE EXAMINATION,
Naval Research Lab., Washington, D.C.
J. M. Leonard.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-039 553, Price codes: A03 in paper copy, A01 in microfiche. NRL Memorandum Report 955, July 1959. 30 p, 4 tab, 31 ref.

Descriptors: *Water pollution sources, *Oil pollution, *Films, *Plankton, Zooplankton, Baseline studies, Bibliographies, *Outer Continental Shelf, Biogenic oils, Literature reviews, Oil films.

It has been suggested that some of the films on the sea surface may be oils of marine biological origin. This report summarizes a survey of scientific literature relating to the distributions of oil-bearing marine plankton and the quantities of oil which may be available to form surface films. Analytical data on the composition of plankton oils indicate ample amounts of surface active substances. No definite mechanism by which the oil is liberated and comes to the surface is adduced; it is suggested that the fecal pellets of certain zooplankton provide a route by which sufficient quantities of oil could be dispersed in the sea. (Sinha-OEIS)
W78-06536

POLAROGRAPHIC DETECTION OF CD(II) AND CU(II) IONS IN BILGE WATER,
Naval Academy, Annapolis, MD. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W78-06537

OIL SPILL AND OIL POLLUTION REPORTS NOVEMBER 1976 - JANUARY 1977,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06539

OIL SPILL AND OIL POLLUTION REPORTS AUGUST 1976 - OCTOBER 1976,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06540

OIL SPILL AND OIL POLLUTION REPORTS MAY 1976 - JULY 1976,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06541

OIL SPILL AND OIL POLLUTION REPORTS MAY 1975 - JULY 1975,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06545

PREDICTABILITY OF LNG VAPOR DISPERSION FROM CATASTROPHIC SPILLS ONTO WATER: AN ASSESSMENT,
Arkansas Univ., Fayetteville. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5G.
W78-06546

PROCESSES, PROCEDURES AND METHODS FOR CONTROL OF POLLUTION FROM SALT WATER INTRUSION.
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5G.
W78-06547

WAVE CLIMATE AT SELECTED LOCATIONS ALONG U.S. COASTS,
Coastal Engineering Research Center, Fort Belvoir, VA
For primary bibliographic entry see Field 2L.
W78-06548

POLLUTANT TRANSFER TO THE MARINE ENVIRONMENT.
Rhode Island Univ., Kingston; and Texas Univ at Austin. Port Aransas. Marine Science Inst
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 713, Price codes: A04 in paper copy, A01 in microfiche. Deliberations and Recommendations of the N S F, International Decade of Ocean Exploration Pollutant Transfer Workshop held in Port Aransas, Tex, Jan 11-12, 1974. 63 p, 9 fig, 9 tab, 4 app. R. A Duce, P. L. Parker (Eds).

Descriptors: *Water pollution sources, *Heavy metals, *Oil pollution, Environmental effects, Baseline studies, *Outer Continental Shelf, *Transfer processes, *Pollutant transport, Pollutant dispersion, Ocean dumping, Petroleum hydrocarbons, Chlorinated hydrocarbons, Biological effects.

Scientists in the two-year-old Pollutant Transfer Program of the National Science Foundation, International Decade of Ocean Exploration met in a workshop at Port Aransas, Texas, on January 11-12, 1974. This report summaries their presentations as well as their discussions of and recommendations for future research. The discussion of scientific accomplishments within the Pollutant Transfer Program has been separarted into two chapters: trace metals, and chlorinated and petroleum hydrocarbons. Within these chapters are descriptions of intercalibration and standardization programs presently underway and planned. Also included are discussions of research on transfer processes to the marine environment (e.g., physical and chemical transfer in the water column and sediments, and biological transfer) of trace metals, and chlorinated and petroleum hydrocarbons. (Sinha - OEIS)
W78-06549

STEADY-STATE DISSOLVED OXYGEN MODEL FOR THE RIDEAU RIVER,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
K. Adamowski, and A. C. Middleton.
Canadian Journal of Civil Engineering, Vol 4, No 4, p 471-481, December 1977. 5 fig, 6 tab, 14 ref.

Descriptors: *Water pollution control, *Dissolved oxygen, *Simulation analysis, *Mathematical models, *Rideau River(Canada), Parameter estimation, Data collections, Management, Water policy, Equations, Systems analysis, Effects, *Canada.

A steady-state, one dimensional dissolved oxygen (DO) model was developed for summer conditions for the Rideau River near Ottawa, Ontario. Model parameters were estimated for July 1975 conditions, and model acceptance was based on June 1975 conditions. Results of the model indicated that the tributaries in this section had only a marginal effect on DO concentrations. The major factor affecting DO concentrations was the distributed source-sink processes, which include photosynthesis, respiration, and sediment oxygen demand. River channel reaeration and aeration at dams had a minimal effect on DO. (Bell-Cornell)
W78-06574

AN EVALUATION OF THE POTENTIAL FOR USING DRAINAGE CONTROL TO REDUCE NITRATE LOSS FROM AGRICULTURAL FIELDS TO SURFACE WATERS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.

W78-06578

URBAN RUNOFF POLLUTANT ADSORPTION AND FILTERING BY SELECTED NORTHERN GUAM SOILS AND LIMESTONE,
Guam Univ., Agana. Water Resources Research Center.
W. J. Zolan, R. N. Clayshulte, and S. J. Winter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 692, Price codes: A03 in paper copy, A01 in microfiche. Publication No. 6, March 1978. 39 p, 20 fig, 7 tab, 12 ref, 2 append. OWRT A-005-GUAM(2), 14-34-0001-6054, 7023, 7024.

Descriptors: *Percolating water, *Water pollution sources, *Limestone, *Clays, Urbanization, Groundwater, *Urban runoff, Soils, *Adsorption(Soils), Percolation, *Filtration(Soils), Fecal coliforms, Bacteria, Phosphorus, Methylene Blue Active substances, Oil, Grease, Biochemical oxygen demand, *Guam.

The concentrations of most pollutants in urban runoff percolating through lysimeter columns containing Guam soil and limestone were substantially reduced. This reduction by adsorption and/or filtration occurred after percolation through 3/4 meter of substrata. Pollutants showing a 70 percent or greater reduction in concentration included total and fecal coliform bacteria, orthophosphorus, and total phosphorus. Compared to limestone, soils generally showed greater removal of MBAS and oil and grease. The mean removal rate of MBAS for soils averaged 68 percent. Mariana limestone was particularly permeable to MBAS, generally removing less than 30 percent.
W78-06581

QUALITY OF PERCOLATE BELOW THE ROOT ZONE OF SELECTED VEGETABLES GROWN IN NORTHERN GUAM,
Guam Univ., Agana. Water Resources Research Center.
J. L. Demeterio.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 666, Price codes: A03 in paper copy, A01 in microfiche. Completion Report April 1978. 28 p, 14 tab, 15 ref. OWRT A-004-GUAM(1), 14-31-0001-5054.

Descriptors: *Percolating water, *Water pollution, *Clays, *Fertilizers, Pesticides, Vegetables, Root zone, Sevin, Diazinon, Malathion, Dibron, Farm wastes, Ammonium sulfate, Nitrogen, Phosphorus, Percolation, Potassium nitrate, *Guam, Tomatoes, Cabbage, Peppers, Eggplant, Water quality.

Northern Guam farms were surveyed in 1976 and 1977 for pesticid and fertilizer usage. The major pesticides used in 1976 and 1977 were sevin, diazinon, malathion, and dibron. Kethane was widely used in 1976 but not in 1977. Animal manure, 15-15-15 and 16-16-16 were the most widely used fertilizers in 1976 and 1977. A notable increase in the use of ammonium sulfate occurred in 1977. The chance of groundwater contamination from agricultural chemicals is minimal since a very small percentage of the land area is currently being utilized for full-time farming. Bench scale lysimeter studies were conducted to determine the concentrations of nitrogen and phosphorus in percolate water after passing the root zone of selected fertilized vegetables. Tomatoes, Chinese cabbage, head cabbage, eggplant, and bell pepper were grown using ammonium sulfate, chicken manure, potassium nitrate, and 15-15-15 as fertilizers. Potassium nitrate is the best nitrogen source but is cost prohibitive and 15-15-15 percolates excessive amounts of nitrate and ammonia nitrogen. Actively growing vegetables used the nitrogen in the ammonium sulfate and chicken manure at comparable rates.
W78-06582

GROUND-WATER QUALITY NEAR THE WATER TABLE IN SUFFOLK COUNTY, LONG ISLAND, NEW YORK,
Geological Survey, Mineola, NY. Water Resources Div.
J. Soren.
Long Island Water Resources Bulletin LIWR-8, Suffolk County Dept of Environmental Control, 1977. 33 p, 3 fig, 3 maps, 5 tab, 17 ref.

Descriptors: *Water quality, *Groundwater, *Water pollution sources, *Water wells, *New York, Sampling, Shallow wells, Water analysis, Chemical analysis, Path of pollutants, Metals, Nutrients, Fertilizers, Pesticides, Sewage, Water supply, Evaluation, *Suffolk County(NY).

From 1972-75, observation wells, screened mostly from 10 to 20 feet below the water table, were installed at 171 sites throughout Suffolk County, N.Y., to (1) obtain baseline data on chemical quality of shallow ground water; (2) delineate areas currently affected by contaminants; and (3) enable future monitoring of ground-water quality. Analyses of water from the observation wells showed that in the more populated, western part of the county, significant contamination of the ground water by nitrate nitrogen had occurred mainly as a result of sewage disposal to the ground, and, in the rural eastern part, mainly from fertilizer leachates. Contamination by synthetic detergents was significant only in a small part of southwestern Suffolk County. Virtually no ground-water contamination from pesticides was found in the county. Radioactivity of the shallow ground water showed iron and manganese to occur in significant but not injurious concentrations; other metals were found to be within safety limits that have been recommended by agencies of the United States. (Woodard-USGS)
W78-06586

TIME-OF-TRAVEL AND DYE-DISPERSION STUDIES OF SELECTED STREAMS AND LAKES IN THE OSWEGO RIVER BASIN, NEW YORK, 1967-75,
Geological Survey, Albany, NY. Water Resources Div.
H. L. Shindel, L. A. Wagner, and P. H. Hamecher.
New York State Department of Environmental Conservation, Albany Report of Investigation RI-17, 1977. 153 p, 122 fig, 1 tab, 10 ref.

Descriptors: *Dye releases, *New York, *Rivers, *Lakes, *Water quality, Forecasting, Path of pollutants, Tracking techniques, Dye dispersion, Rhodamine, Streamflow, Flow rates, *Oswego River Basin(NY), *Time-of-travel studies.

In the State of New York, time of travel was determined for reaches of 21 streams in the Oswego River basin, and dispersion of dye was traced in Cross Lake and Onondaga Lake. Two dyes, rhodamine B and rhodamine WT, were used as tracers. Relations of discharge to time of travel of leading edge, peak, centroid, and trailing edge (at 10 percent of peak of dye cloud) through the subreaches are shown in graphs for streams on which more than one time-of-travel run was made. Velocities of peak dye concentration ranged from 0.05 to 2.36 feet per second. Water-surface profiles and graphs showing cumulative time of travel of peak dye concentration are presented for all reaches studied, and time-of-travel data for each subreach are given in tabular form. Curves showing the relation between time and dye concentration, derived from instantaneous dye injections, were determined for many sites within the reaches studied. (Woodard-USGS)
W78-06589

IMPACT OF POTENTIAL PHOSPHATE MINING ON THE HYDROLOGY OF OSCEOLA NATIONAL FOREST, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
J. A. Miller, G. H. Hughes, R. W. Hull, J. Vecchioli, and P. R. Seaber.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 853, Price codes: A08 in paper copy, A01 in microfiche. Water-Resources Investigations 78-6, February 1978. 159 p, 43 fig, 23 tab, 78 ref.

Descriptors: *Baseline studies, *Water quality, *Water pollution sources, *Strip mine wastes, *Phosphates, Groundwater, Aquifers, *Florida, Aquifer testing, Effluents, Streams, Evaluation, Aquifer management, Hydrologic budget, Leakage, Sinks, Water levels, *Pre-phosphate mining study, *Osceola National Forest(Fla).

Potentially exploitable phosphate deposits underlie part of Osceola National Forest, Fla. Hydrologic conditions in the forest are comparable with those in nearby Hamilton County, where phosphate mining and processing have been ongoing since 1965. Given similarity of operations, hydroloigc effects of mining in the forest are predicted. Flow of stream receiving phosphate industry effluent would increase somewhat during mining, but stream quality would not be greatly affected. Local changes in the configuration of the water table and the quality of water in the surficial aquifer will occur. Lowering of the potentiometric surface of the Floridan aquifer because of proposed pumpage would be less than five feet at nearby communities. Flordian aquifer water quality would be appreciably changed only if industrial effluent were discharged into streams which recharge the Flordian through sinkholes. The most significant hydrologic effects would occur at the time of active mining: long-term effects would be less significant. (Woodard-USGS)
W78-06590

ELUTRIATION STUDY OF WILLAMETTE RIVER BOTTOM MATERIAL AND WILLAMETTE-COLUMBIA RIVER WATER,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 5C.
W78-06592

DISTRIBUTION OF DIPHYLLOBOTHRIASIS IN THE AREA OF THE GORKI WATER RESERVOIR, (IN RUSSIAN),
Gorkovskii Meditsinskii Inst. (USSR).
T. S. Yurasova.
Med Parazitol Parazit Bolezni 46(2), p 222-223, 1977.

Descriptors: Distribution, Reservoirs, *Diphyllobothiasis, *Path of pollutants, Human diseases, Public health, Water pollution effects, Human population, *USSR(Gorky Reservoir).

The prevalence of diphyllobothriasis among the human population of the coastal areas of the Gorky water reservoir (USSR) during its development and after it was in use is reported. A number of therapeutic and prophylactic measures are suggested for reduction of the incidence of diphyllobothriasis.--Copyright 1978, Biological Abstracts, Inc.
W78-06665

TRANSFORMATION OF ORGANOTIN COMPOUNDS IN WATER, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Inst. (I) (USSR). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5D.
W78-06671

TRANSLOCATION OF LABELLED FERTILIZER NITROGEN IN SOIL COLUMNS, (IN GERMAN),
Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf. Inst. fuer Landwirtschaft; and Oesterreichische Studien-

gesellschaft fuer Atomenergie G.m.b.H., Seibersdorf. Forschungzentrum.
For primary bibliographic entry see Field 2G.
W78-06674

NUTRIENT LOSS RESEARCH,
Agricultural Research Service, Columbia, MO.
For primary bibliographic entry see Field 4D.
W78-06689

SEASONAL DISTRIBUTION OF VITAMIN B12 IN LAKE KINNERET,
Kinneret Limnology Lab., Tiberias (Israel).
For primary bibliographic entry see Field 5C.
W78-06690

DISTRIBUTION OF MYXOBACTERS IN AQUATIC HABITATS OF AN ALKALINE BOG,
Central Michigan Univ., Mt. Pleasant. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-06691

5C. Effects Of Pollution

EFFECTS OF BURROWING TUBIFICID WORMS ON THE EXCHANGE OF PHOSPHORUS BETWEEN LAKE SEDIMENTS AND OVERLYING WATER,
Maine Univ. at Orono. Dept. of Botany and Quaternary Studies.
R. B. Davis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 857, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, September 1974. 31 p, 8 fig, 5 tab, 17 ref. OWRT A-022-ME(1).

Descriptors: *Lake sediments, *Phosphorus, *Tubificids, *Benthos, *Worms, *Maine, *China Lake(Me), Radioisotopes, Radioactivity, Phosphoric acid, Oxygen, Diffusion, Lakes.

Experiments were conducted with cores of undisturbed, non-calcareous sediment from China Lake, Maine. Radioactive phosphoric acid introduced into water overlying the sediment was taken up rapidly by the sediment where most of the 32P became aluminum and iron bound. Tubificids accelerated the decrease of 32P in the water and the depth of penetration of the sediment, but much of the mobility of 32P was due to diffusion. Release of 32P from the sediment to overlying water with or without oxygen occured but was impeded near the interface especially when oxygen was present. The worms did not affect the release of 32P to the water. The worms reduced the proportion of PO4-P in the interstitial water of the uppermost sediment, probably due to their effect of increasing Eh there. However, most of the mobile 32P was in some form other than PO4 which was probably redox-insensitive. The moderate effects in these experiments probably reflect the moderate populations of worms used. (See also W78-00921)
W78-06202

CHIRONOMIDS (DIPTERA) FROM SEDIMENTS OF LAKE MARTIGNANO (LAZIO), (IN ITALIAN),
Rome Univ. (Italy). Ist. di Zoologia.
For primary bibliographic entry see Field 5B.
W78-06203

CONCENTRATIONS OF NUTRIENTS AND CHLOROPHYLL ON A CROSS-CHANNEL TRANSECT IN JUAN DE FUCA STRAIT, BRITISH COLUMBIA,
British Columbia Univ., Vancouver. Inst. of Oceanography.
For primary bibliographic entry see Field 5B.
W78-06216

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX A--MAIN SHIP CHANNEL (SAN FRANCISCO BAR).
Army Engineer District, San Francisco, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-038 309, Price codes: A10 in paper copy, A01 in microfiche. June 1974. 218 p.

Descriptors: *Waste disposal, *Estuarine environment, *Dredging, *Water pollution effects, *Deposition, Baseline studies, Path of pollutants, Sediments, *California, *Dredge disposal, *San Francisco Bay(CA).

A study was conducted to determine the effects of dredge material disposal on the marine environment of San Francisco Bay and Estuary. This report on the Main Ship Channel across the San Francisco Bar presents the results of studies conducted on the San Francisco Bar during the period December 1970 through April 1972. The study program included sampling, testing and analyzing the physical, biological and chemical properties of the Main Ship Channel and disposal sites on the Bar and the determination of the material dispersion and deposition pattern during the release operations. (Sinha-OEIS)
W78-06253

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX D--BIOLOGICAL COMMUNITY,
Stanford Research Inst., Menlo Park, CA.
D. Liu, and C. Norwood.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-037 728, Price codes: A20 in paper copy, A01 in microfiche. Army Corps of Engineers, San Francisco, California, Engineer District, August 1975. 468 p, 15 fig, 64 tab, 193 ref, append. DACW-7-73-C-0059.

Descriptors: *Benthic fauna, *Sediments, *Dredging, *Environmental effects, Waste disposal, Heavy metals, Water pollution effects, *California, Estuarine environment, Dredge disposal, Environmental impact, *San Francisco Bay(CA).

The benthic community study to determine the environmental impact of dredging and disposal operations in San Francisco Bay describes the collection of 'baseline' information on sediment-swelling animals in three ship channels maintained by the Corps of Engineers, as well as in four federally authorized disposal areas for dredged material in San Francisco Bay and Estuary. This information provides a basis for evaluating future changes in the distribution and abundance of benthic animals and in certain physical and chemical properties of the water and sediment in these areas. In addition data from previous benthic-animal studies conducted in San Francisco Bay and data on the effects of heavy metals on benthic species found in the Bay were reviewed and summarized. A literature review of previous benthic community studies and of the effects of heavy metals on benthic animals reportedly found in the Bay is also incorporated in this report. (Sinha-OEIS)
W78-06255

PHENOL DEGRADATION IN ARTIFICIAL BODIES OF WATER (1970 EXPERIMENTS) (ROUGH DRAFT),
N. A. Lapteva, T. F. Mikryakova, L. A. Baronkina, B. F. Zhukov, and N. V. Goryacheva.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-tr-2930, Price codes: A02 in paper copy, A01 in microfiche. Report ORNL-tr-2930, (1975). Translation from Institut Biologii Vnutrennikh Vod. Trudy, Vol 24, p 159-166, 1973. 10 p, 5 fig, 5 tab, 7 ref.

Descriptors: *Phenols, *Aquatic bacteria, *Water pollution effects, Nitrates, *Phosphates, *Absorption, *Oxidation, Toxicity, Toxins, Oxygen, Temperature, Ammonia, Water pollution, *Phenol accumulation, *Saprophytic anaerobes, *Saprophytes, Flagellates insuforia, Phenol bacteria.

Phenol concentration was varied in 7 plantings of Elodea, Lemna, and Spirogyra to determine the effect on biotic populations. Nitrogen and phosphorus salts were added to one planting and their effects were monitored. Microbe populations were surveyed for number of saprophytic anaerobes, total bacterial content, and number of phenol bacteria (saprophytes that destroy phenol). Weekly measurements of nitrate nitrogen, phosphate phosphorus, ammonia, and phenol concentrations were taken; daily measurement of the number of colorless flagellates and infusoria, oxygen content, and water temperatures were made. Results indicate that the presence of biogenic elements (nitrates and phosphates) prevents phenol accumulation by accelerating its destruction. After addition of large doses of phenol, the number of phenol bacteria increased. Colorless flagellates appeared earlier in plantings containing biogens and was higher in plantings to which large doses of phenol were added. In high phenol-content plantings, fungus content was higher than in those with no or little phenol. The role of temperature, oxygen, and nitrogen and phosphorus salts in the destruction of phenol was demonstrated. The most reliable index of the degree of phenol contamination of water is the number of phenol-destroying bacteria and not the total amount and content of this group of saprophytic bacteria which is found. The number of phenol-oxidizing bacteria does not indicate the rate of phenol destruction. Saprophytic anaerobes are present when there is a rapid destruction of phenol. The amount of phenol and saprophytic bacteria in the bottom silt and bottom water layer is greater than in the water mass. (Seip-IPA)
W78-06273

AN ENVIRONMENTAL SURVEY OF EFFECTS OF DREDGING AND SPOIL DISPOSAL, NEW LONDON, CONNECTICUT: 4TH QUARTERLY REPORT.
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A015 647, Price codes: A06 in paper copy, A01 in microfiche. Prepared for Naval Facilities Engineering Command, Philadelphia, Penn., Informal Report No 75, August, 1975. 118 p, 33 fig, 32 tab, 8 ref, 4 append.

Descriptors: *Dredging, *Spoil banks, Ecology, *Environmental effects, *Fish populations, *Water pollution effects, Mercury, Connecticut, Flow characteristics, Flow system, Flow measurement, *Thames River(CT), New London Dumping Ground, *Dredging material disposal, *Spoil disposal.

Results of the fourth 3-month period (March-May 1975) of studies monitoring the effects of dredging in the Thames River and spoil disposal at the New London Dumping Ground are reported. Completed surveys of dredging impact on suspended materials in the river confirm that effects are limited to within 150 m of the dredge. Predredging circulation in the lower river is estimated: a model of the river's flow characteristics has been selected and is being tested. Hg was lower in Feb. and Apr. 1975 than during earlier periods, perhaps due to removal by dredging of contaminated sediments. Spoil pile observations found materials cohesive and spoil related turbidity low. Overall finfish abundance was much lower in Feb. 1975 than in earlier surveys, though populations in and near the spoiling area were within the same range as those collected at 'control' stations located some distance from the designated

spoiling area. Large decreases in benthic macrofaunal densities attributable to natural seasonability were observed throughout the study area between predisposal and April 1975 collections. Declines in numbers of species and species diversities were smaller except in the immediate spoiling area. The major detrimental effect of spoiling to date has been through actual burial of existing communities over a relatively small area (within 0.5 mile of the disposal buoy). Predisposal water and sediment samples from 44 stations were analyzed for fecal coliform and other bacteria; highest counts were found in the river and were higher at disposal area stations on an ebb tide than on a flood tide. River outflow may have an effect on water quality within the designated disposal area. (Seip-IPA)
W78-06274

BIOLOGICAL AND ECOLOGICAL STUDIES ON THE INTERACTION OF BDELLOVIBRIO AND ENTEROBACTERIACAE,
Auburn Univ., AL.
J. M. Westergaard.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-16,790. PhD Thesis, 1977, 284 p.

Descriptors: *E. coli, *Sewage bacteria, *Viruses, *Parasitism, *Enteric bacteria, Analytical techniques, Microorganisms, Path of pollutants, Coliforms, Water analysis, Waste water treatment, Municipal wastes, Bdellovibrio.

The occurrence of Bdellovibrio and its possible hosts (Enterobacteriaceae, Pseudomonadaceae, Vibrionaceae, Neisseriaceae, Chromobacterium, Streptococcus, Rhodotorula, Escherichia coli, Klebsiella pneumoniae, and Salmonella pullorum) was investigated with water samples collected from wells, ponds, streams, waste water oxidation lagoon systems, and municipal waste water treatment plants. Although Bdellovibrio was most easily isolated from municipal waste water, studies indicated that Bdellovibrio was not incorporated into the intestinal microflora population of animals. The simulataneous 3-log reduction in Bdellovibrio and the host E. coli when a waste water innoculated mixture was incubated for 72 hr suggested that biologica purification of waste water by Bdellobivrio was minor. (Schulz-FIRL)
W78-06289

SYMPOSIUM PROCEEDINGS: ENVIRONMENTAL ASPECTS OF FUEL CONVERSION TECHNOLOGY, II (DECEMBER 1975, HOLLYWOOD, FLORIDA).
Research Triangle Inst., Research Triangle Park, NC.
For primary bibliographic entry see Field 5D.
W78-06302

CLIMATIC EFFECTS ON WASTEWATER TREATMENT,
North Dakota State Univ., Fargo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-06305

A KINETIC MODEL OF STEADY STATE PHOSPHORUS FIXATION IN A BATCH REACTOR I. EFFECT OF SOIL/SOLUTION RATIO,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-06317

A KINETIC MODEL OF STEADY STATE PHOSPHORUS FIXATION IN A BATCH REACTOR II. EFFECT OF PH,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-06318

A KINETIC MODEL OF STEADY STATE PHOSPHORUS FIXATION IN A BATCH REACTOR - III. EFFECT OF SOLUTION REACTION,
Florida Univ., Gainesville. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-06319

EFFECTS OF UNRECORDED POLLUTION FROM URBAN STORMWATER RUNOFF ON BENTHIC MACROINVERTEBRATES OF THE GREEN RIVER, MASSACHUSETTS,
Massachusetts Univ., Amherst.
J. M. Pratt.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-30582. PhD Thesis, 1977, 202 p.

Descriptors: *Urban runoff, *Bioindicators, Diversification, *Diptera, *Benthic fauna, Mayflies, Oligochaetes, Gastropods, Microorganisms, Urban drainage, Waste water disposal, On-site investigations, Municipal wastes, *Massachusetts, *Green River(Mass).

The impact of pollutant-bearing runoff on benthic microinvertebrates was evaluated in a year-long investigation of the urban and non-urban areas of the Green River in Massachusetts. General water sample analyses showed that wet weather runoff levels were not usually biologically limiting. One sampling station was located above the primary urban area and five stations were established downstream from it. Using the Brillouin species diversity index, the urban mean diversity of collections declined from 4.4 to 3.0 in a downstream direction, while the upstream collection averaged 4.7. Collections in the spring were the most diverse. Diptera, Ephemeroptera, and Trichoptera were the dominant species in the upstream samples. The downstream urban samples showed high diversities of Diptera, Oligochaeta, and Gastropoda, with lower densities of Ephemeroptera and Trichoptera. Pollution-sensitive taxa were replaced by forms more tolerant of urban runoff; species dissimilarity was observed in samples obtained farther downstream. Pollution-sensitive species indicated that urban runoff disrupted the biota, particularly during summer periods of low flow. Urban runoff disruption appeared to be localized in the riverbed. (Lisk-FIRL)
W78-06321

BODY COMPOSITION, GROWTH RATE AND GROSS GROWTH EFFICIENCY OF YOUNG CARPS (CYPRINUS CARPIO L.) KEPT UNDER INTENSIVE CULTURE CONDITIONS. (IN GERMAN),
Freiburg Univ. (West Germany). Limnologisches Inst.
H. Kausch, and F. Ballioncusmano.
Arch Hydrobiol Supplement B 48(2), p 141-180, 1976.

Descriptors: *Juvenile growth stage, Thermal pollution, Heated water, Waste water treatment, Activated sludge, *Carp, Denitrification, *Growth rates, Model studies.

A description of a warm water recirculating system for carp culture is given. Waste water is treated with activated sludge under oxidative and anoxidative conditions. Due to denitrification no accumulation of NO3 takes place. Body composition, caloric content, growth rate and gross growth efficiency of 16-100 g wet wt carp (C. carpio L.) fed on trout pellets (42% protein) at different feeding levels are shown. An empirical model of the relation between ration and growth (both in grams of dry weight) indicates that the level of growth is determined by body size and ration size.—Copyright 1977, Biological Abstracts, Inc.
W78-06323

NITROGEN FIXATION IN LAKES OF THE LAKE WASHINGTON DRAINAGE BASIN,
Washington Univ., Seattle. Dept. of Microbiology.
D. L. Tison, F. E. Palmer, and J. T. Staley.
Water Research, Vol. 11, No. 9, p 843-847, 1977. 2 fig, 2 tab, 18 ref.

Descriptors: *Lakes, *Trophic level, *Nitrogen fixation, *Lake Washington Basin(WA), *Acetylene reduction, Lake Washington(WA), Lake Sammamish(WA), Lake Findley(WA), Lake Chester Morse(WA), Washington, Oligotrophy, Mesotrophy, Algae, Epilimnion, Eutrophication.

Measurements of biological nitrogen fixation rates using the acetylene reduction technique in epilimnetic waters of four lakes near Seattle, Washington support the hypothesis that rates are directly related to a lake's trophic status. Lower rates were measured in Lakes Findley and Chester Morse, considered oligotrophic, than in Lakes Washington and Sammamish, which are mesotrophic. It should be noted that algal blooms in eutrophic lakes may be dominated by species which do not fix nitrogen, and in nutrient-poor lakes cyanophytes may fix nitrogen at rates which are low but significant in proportion to the nitrogen cycling of the community. On an annual basis, epilemnetic biological nitrogen fixation is not a major source of fixed nitrogen for any of the four lakes investigated, though it may be important in summer when inorganic forms of nitrogen have been depleted from the epilimnion. The contribution of fixed nitrogen in these lakes, all of which are in the Lake Washington basin, is estimated at less than 1% of the total annual nitrogen input from other sources. Nitrogen fixation was detected regularly during the summer in the two mesotrophic lakes, but only occasionally in the oligotrophic lakes. Comparisons are made with the Great Lakes, and with lakes in California, Alaska, and Wisconsin. Measurements used in this study were made between June 1973 and October 1974. (Lynch-Wisconsin)
W78-06326

PRODUCTION OF PIKE, ROACH AND CHUB IN A SELECTED FRAGMENT OF PILICA RIVER (BARBEL REGION),
Lodz Univ. (Poland). Dept. of Comparative Anatomy and Animal Ecology.
T. Penczak, Z. Maciej, and M. Marek.
Pol Arch Hydrobiol 23(1), p 139-153, 1976.

Descriptors: *Biomass, *Chub, Esox-lucius, Leuciscus-cephalus, *Pike, *Pilica River(Poland), Rivers, *Roach, Rutilus-rutilus, Water pollution effects, *Fish reproduction.

In a morphologically uniform fragment of the Pilica River (barbel region) (Poland), characterized by a high and closely determined degree of water pollution, the production and biomass of 3 predominant ichthyofauna species were investigated. Presumably, water pollution is the main factor limiting the chub (leuciscus cephalus) population. The pike (Esox lucius) population is greatly reduced by catches discordant with the protective size (catching of yound, < 40 cm long individuals). The young year classes of the roach (Rutilus rutilus) population remain under a strong pressure of the pike.—Copyright 1977, Biological Abstracts, Inc.
W78-06329

MONTHLY VARIATION IN THE CHEMICAL COMPOSITION OF MANGROVE OYSTERS IN THE LAS MARITAS LAGOON (VENEZUELA), (IN SPANISH),
Universidad de Oriente, Cumana (Venezula). Inst. of Oceanography.
J. Bonilla Ruiz.
Bol Inst Oceanogr Univ Oriente Cumana 14(1), p 117-128, 1975.

Descriptors: *Phosphates, *Nitrogen, *Carbohydrates, Chemicals, Crassostrea-Rhizophorae, *Lagoons, Las-Maritas Island, Mangroves, Monthly, *Oysters, *Venezuela, Seasonal.

Montly variation in the chemical compositon of 2 sizes, 4-6 and 6-8 cm, of mangrove oysters (Crassostrea rhizophorae) from the Maritas Lagoon Island, Venezuela, was studied from July 1967-Dec. 1969. The seasonal fluctuation in height, moisture and chemical compounds of the fresh and dried meat of the oyster seemed to be similar in both size groups studied and no cyclic sequences in the variation were observed. The carbohydrate concentration showed a maximum in Aug. 1967, and Jan., Nov. and Dec. 1969. By comparison of the carbohydrate content of the oysters and the phosphate and organic and inorgganic-N content of the water from the eastern and western zones of the laguna Las Maritas a possible correlation was studied among these parameters; an inverse tendency was observed in the relationships among phosphate, inorganic-N and carbohydrate content. To know the yield of oysters C. rhizophorae from the laguna Las Maritas, a comparison of the fattening of this oyster with the fattening of the oyster C. rhizophorae from Bahia de Mochima and Laguna Grande (Venezuela) and the oyster C. virginica from the Guariquen zone (Venezuela) was made. They showed a great difference in fattening.--Copyright 1977 Biological Abstracts, Inc.
W78-06330

ON THE CONTAMINATION OF SEA WATER WITH SALMONELLA AND FECAL INDICATOR ORGANISMS: I. OCCURRENCE AND DISTRIBUTION OF SALMONELLA AND FECAL INDICATOR ORGANISMS IN COASTAL SEA WATER OF FUKUYAMA, (IN JAPANESE),
Hiroshima Univ. (Japan). Dept. of Food Chem. Tech.
For primary bibliographic entry see Field 5B.
W78-06331

THE IMPACT OF URBAN STORMWATER ON THE WATER QUALITY STANDARDS OF A REGULATED RESERVOIR,
Tennessee Univ., Knoxville Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W78-06362

IMPACT OF FEDERAL AND STATE WATER QUALITY LAWS ON ALASKA NATIVE REGIONAL CORPORATIONS.
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5G.
W78-06366

ESTIMATES OF NONPOINT SOURCE POLLUTION BY MATHEMATICAL MODELING,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-06405

FERTILIZING POND WATER: CRITICAL REVIEW (IN SERBO-CROATIAN),
Poliopr. Fak., Zavod Poliopr. Zool., Zagreb, Yugosl.
B. Rzanicanin, and I. Balzer.
Poljopr Znan Smotra 37(47), p 11-18, 1976.

Descriptors: *Fertilizing pond water, Fish, Minerals, *Nitrogen, Phosphates, Ponds, Reviews, Water pollution, Organic fertilizers, *Fertilizers, Cultures, Mineral fertilizers.

The use of mineral and organic fertilizers in pond water in relation to fish culture is discussed. The use of N fertilizers and phosphates is necessary. Organic fertilizers, added to mineral fertilizers, cover more requirements, and are therefore superior.--Copyright Biological Abstracts, Inc.
W78-06406

THE TOXICITY TO GOLDFISH OF MIXTURES OF CHLORAMINES, LAS AND COPPER, (TOXIC CONSTITUENTS AND GROSS TOXICITY OF WASTE TREATMENT EFFLUENT TO FISHES),
Maryland Univ., College Park. Inland Environmental Lab.
C. Tsai, and J. A. McKee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 554, Price codes: A03 in paper copy, A01 in microfiche. Maryland Water Resources Research Center, College Park, Technical Report No. 44, April 1978. 31 p, 7 fig, 4 tab, 47 ref. OWRT A-029-MD(1), 14-34-0001-7044.

Descriptors: *Toxicity, *Goldfish, *Chloramines, *Copper, *Bioassay, *Sewage effluents, Water pollution effects, Chemical wastes, Chlorination, *Linear alkylate sulfonates, Detergents.

The toxicity to goldfish to mixtures of chloramines linear alkylate sulfonate (LAS) and copper was studied by a continuously flowing bioassay during an exposure period of 96 hours. The results indicate that interactions of individual toxicities of these three chemicals were either additive of synergestic, depending on the rates of toxic action of the individual chemicals, toxicity ratios of the chemicals in the mixtures, and the concentrations of the mixtures.
W78-06408

THE IMPACT OF STREAM RECONSTRUCTION AND A GABION INSTALLATION ON THE BIOLOGY AND CHEMISTRY OF A TROUT STREAM,
Lehigh Univ., Bethlehem, PA. Dept. of Biology.
P. T. Bradt, and G. E. Wieland, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 543, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, January 1978. 61 p, 9 fig, 19 tab, 46 ref, append. OWRT C-7145(6225)(1).

Descriptors: *Gabions, *Rechanneling, *Benthic macroinvertebrates, Biomass, *Diversity index, Water chemistry, Flow velocity, Brown trout, *Stream reconstruction, Limestone springs, *Stream improvement, *Channel improvement, Water pollution effects, Dissolved oxygen, Oxygen saturation, Alkalinity, *Bushkill Creek(Penn), *Pennsylvania.

The purpose was to evaluate the effect of a gabion installation and stream reconstruction in a 2km section of rechanneled stream. The Bushkill Creek, supporting a naturally reproducing brown trout population in Northampton County, PA, was sampled bi-weekly biologically, chemically and physically for sixteen months. Prior to the sampling, stream reconstruction efforts included both a gabion (rock current deflectors) installation to narrow and deepen the stream bed and tree and shrub planting to cover bare banks and provide eventual shade. The stream bed was open to sunlight and primary productivity, as evidenced by larger algae populations, increased in the rechanneled area. The following benthic macroinvertebrate parameters significantly increased also through the rechanneled area: diversity index, biomass, total numbers, and number of taxa. The following chemical parameters increased significantly through the rechanneled area: conductivity, dissolved oxygen, percent oxygen saturation and alkalinity. Orthophosphate decreased significantly and flow velocity increased significantly. Limestone springs contributed to the increase in conductivity and alkalinity. Increased photosynthesis and turbulence contributed to the increase in dissolved oxygen and oxygen saturation. The gabions deepened and narrowed the stream channel resulting in a cooler stream in summer.
W78-06410

AUTOMATIC MONITORING TECHNIQUES OF EUTROPHICATION SUBSTANCES IN COASTAL SEA WATER (FY 1976-1978), (SANGYO HAISUI NO FUEIYOKASEIBUN NO SHORI NI KANSURU KENKYU-KENSHUTAUKI HAIHATSU NI KANSURU KENKYU),
Government Industrial Research Inst., Osaka (Japan).
For primary bibliographic entry see Field 5A.
W78-06469

RESEARCH ON HYGIENIC CONDITIONS OF THE OLIVERI-TINDARI LAKE COMPLEX (MESSINA),
Messina Univ. (Italy). Inst. of Hygiene.
For primary bibliographic entry see Field 5A.
W78-06499

BIODEGRADATION OF SOME CATIONIC SURFACTANT AGENTS (BIODEGRADATION DE QUELQUES AGENTS DE SURFACE CATIONIQUES),
Monpellier-2 Univ. (France). Lab. d'Hydrobiologie.
For primary bibliographic entry see Field 5B.
W78-06507

QUALITY CRITERIA FOR WATER, JULY 1976.
Environmental Protection Agency, Washington, D.C. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5G.
W78-06527

LECTURES ON ESTUARINE CIRCULATIONS AND MASS DISTRIBUTIONS,
Johns Hopkins Univ., Baltimore, MD. Dept. of Earth and Planetary Sciences; and Johns Hopkins Univ., Baltimore, MD. Dept. of Mechanics and Materials Sciences.
For primary bibliographic entry see Field 2L.
W78-06538

ELUTRIATION STUDY OF WILLAMETTE RIVER BOTTOM MATERIAL AND WILLAMETTE-COLUMBIA RIVER WATER,
Geological Survey, Portland, OR. Water Resources Div.
J. F. Rinella, and S. W. McKenzie.
Open-file report 78-28, 1977. 8 p, 3 tab, 9 ref.

Descriptors: *Environmental effects, *Dredging, *Harbors, *Bottom sampling, *Oregon, Sediments, Columbia River, Mixing, Chemical analysis, Nutrients, Metals, Pesticides, Aquatic life, Evaluation, Bottom sediments, *Portland Harbor(Ore), *Willamette River(Ore), *Elutriate.

Bottom material from the Willamette River was collected and mixed with Willamette and Columbia River waters on May 17, 1977. The elutriate, as well as each sample, was analyzed for selected nutrients, metals, and pesticides. Results show that the average dissolved ammonia, manganese, and zinc concentrations would require dilution by receiving water to achieve aquatic-life criteria levels. (Woodard-USGS)
W78-06592

AQUATIC TOXICOLOGY AND HAZARD EVALUATION: PROCEEDINGS OF FIRST ANNUAL SYMPOSIUM ON AQUATIC TOXICOLOGY SPONSORED BY ASTM COMMITTEE E-35 ON PESTICIDES, 25-26 OCTOBER 1976, MEMPHIS, TENNESSEE.
American Society for Testing and Materials, Philadelphia, PA. Committee E-35 on Pesticides.

ASTM (Philadelphia, Pennsylvania) Special Technical Publication No. 634, 307 p, 1977. Mayer, F. L., and Hamelink, J. L., eds.

Descriptors: *Conferences, *Toxicity, *Water pollution, Pesticides, Hazards, Chemicals, Testing procedures, Bioassay, Model studies, Pollutants, Aquatic life, Environment, Safety, Water pollution effects, Benthos, Invertebrates, Fish, Polychlorinated biphenyls, Water quality, Dredging, Solid wastes, Waste disposal, Diets, Pulp wastes, Sulfite liquors, Oysters, Pulp and paper industry, Effluents, Lentic environments.

The 22 presentations by different authors deal with the philosophy and rationale of environmental safety and hazard evaluation of chemicals, especially new products; toxicity testing methods and approaches to bioassays; residue dynamics and modeling techniques; and biological effects of pollutants and interpretation of test results. A subject index and symposium are appended. (See W78-06609) (Brown-IPC)
W78-06608

EVALUATION OF THE EFFICACY OF SULFITE PULP MILL POLLUTION ABATEMENT USING OYSTER LARVAE,
Washington State Dept. of Fisheries, Brinnon.
R. D. Cardwell, C. E. Woelke, M. I. Carr, and E. W. Sanborn.
In: American Society for Testing and Materials, Special Technical Publication No. 634, p 281-295, 1977. 7 fig, 17 ref, 1 tab.

Descriptors: *Water pollution effects, *Oysters, *Sulfite liquors, *Pulp wastes, Water pollution sources, Wastes, Industrial wastes, Washington, Pulp and paper industry, Effluents, Water quality, Toxicity, Incineration, Waste water treatment, Larvae, Biological treatment, Aquatic life, Aquatic animals, Sulfite pulp mills, Puget Sound(Washington), Spent sulfite liquor.

Improvements in marine water quality attributable to treatment of effluents from two sulfite pulp mills (Scott Paper Co. and Weyerhaeuser Co.) were assessed in two regions of Puget Sound, Washington, from 1972 to 1975. The primary criterion for assessing water quality was its acute toxicity to larvae of Pacific oysters, Crassostrea gigas. Incineration of spent sulfite liquor drastically reduced the extent and range of receiving-water toxicity to these larvae. Thus, more than 30 sq km of receiving water near Everett, Washington, was highly toxic to the larvae in 1972 before spent sulfite liquor combustion, but only 1 sq km was similarly toxic in 1975 after installation of incineration equipment. These results suggest that secondary (biological) treatment may not be necessary to eliminate effluent toxicity, but further studies are needed regarding the effluent's effects on life cycles of sensitive indigenous aquatic species. (See also W78-06608) (Brown-IPC)
W78-06609

TOXICITY OF EFFLUENTS OF NOVEL LEACHING PROCESSES,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
J. Wong, M. Le Bourhis, R. A. Wostradowski, and S. Prahacs.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 248-1, Progress Report to March 31, 1974, 67 p, 16 fig, 29 ref, 2 tab, 6 append.

Descriptors: *Bleaching wastes, *Toxicity, *Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Biochemical oxygen demand, Color, Chemical oxygen demand, Water pollution effects, Fish, Aquatic animals, Pulp and paper industry, Effluents, Hardwood, Softwood, Kraft pulp, Resin acids, Wood extractives.

The fish toxicity, BOD, and color of bleach plant effluents using 9 novel (mostly 3-stage) sequences were evaluated and compared with effluents from conventional bleaching sequences. The stages included chlorination, caustic extraction, chlorine monoxide, chlorine dioxide, oxygen, ozone, hypochlorite, and peroxide in various combinations, as well as Cl/Cl dioxide mixtures and high-consistency gas-phase treatments. Few generally valid conclusions could be drawn from the results, but some interesting findings were obtained: Toxicity of chlorination effluents was greatly affected by the residual Cl content as measured immediately after Cl bleaching at 3% consistency. Except for the D/CE effluent, the toxicity was not significantly affected by the type of pulp (hard- vs. soft-wood kraft), nor was the C(D) stage effluent less toxic than a normal chlorination effluent. Alkaline-extraction effluents from 2 representative eastern hardwoods and 2 typical eastern softwoods showed nearly identical toxicities. Color, BOD, or COD were not useful parameters for toxicity prediction. As expected, color was much higher in softwood than in hardwood effluents. No simple correlation was evident between BOD or COD and the type of pulp or the bleaching sequence used. Resin acid content did not correlate with effluent toxicity. (Brown-IPC)
W78-06612

REDUCTION OF TOXICITY OF CONDENSATES FROM SULFITE WASTE LIQUOR EVAPORATORS,
Eco-Research Ltd., Pointe Claire (Quebec).
For primary bibliographic entry see Field 5D.
W78-06613

ASSESSMENT OF THE SENSITIVITY OF MAJOR AQUATIC FOOD CHAIN ORGANISMS TO NEWSPRINT MILL EFFLUENTS,
Eco-Research Ltd., Pointe Claire (Quebec).
A. Dumouchel, T. Matula, J. Reed, and M. A. Wilson.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 328-1, Final Report to March 31, 1975. 78 p, 10 fig, 16 ref, 16 tab.

Descriptors: *Pulp wastes, *Toxicity, *Fish food organisms, *Water pollution effects, Wastes, Industrial wastes, Water pollution sources, Canada, Foreign countries, Biological treatment, Chlorophyta, Algae, Zooplankton, Benthos, Aquatic algae, Aquatic life, Rainbow trout, Daphnia, Pulp and paper industry, Effluents, Bioassay, Invertebrates, Newsprint mills, Groundwood pulp, Kraft pulp.

Two newsprint mill effluents from eastern Canada, from furnishes containing groundwood and kraft pulps, were evaluated for toxicity, before and after secondary biological treatment, to two species each of green algae, zooplankta, and benthic macro-invertebrates. The untreated effluents, which were toxic to rainbow trout, were also toxic to Daphnia magna, Gammarus fasciatus, Selenastrum capricornutum, and Scenedesmus quadraicauda, and caused an avoidance reaction in Bithynia tentaculata. Treated effluents, which were not toxic to trout, caused reduced growth rates in the two green algae, but had no effects on the other species. Algae were not sensitive to linoleic and dehydroabietic acids (used as control substances) in concentrations up to 10 ppm. Acute-toxicity bioassays using Daphnia magna are simpler than those using Salmo gairdneri while giving readily correlatable results. (Brown-IPC)
W78-06614

REDUCTION OF THE TOXICITY TO FISH OF EFFLUENTS FROM PAPER MILLS,
Eco-Research Ltd., Pointe Claire (Quebec).
M. A. Wilson, R. LeBlanc, I. Middelraad, and P. J. LeBlanc.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 329-1, Final Report to March 31, 1975. 35 p, 10 ref, 9 tab.

Descriptors: *Toxicity, *Fish, *Pulp wastes, Wastes, Industrial waste, Water pollution sources, Pulp and paper industry, Effluents, Chemicals, Pigments, Dyes, Water pollution effects, Aquatic animals.

Effluents from two nonintegrated fine-paper mills were studied for fish toxicity. One effluent was nontoxic, but this mill generally used more water per ton of paper made than did the other which generated mildly toxic effluent. The cause of the toxic effect could not be related to the chemicals used in papermaking during the sampling periods. Because additives (pigments, sizes, fillers, dyes, etc.) are specific to each mill's operations, further studies of such complex process variables are not likely to give generally valid insights. (Brown-IPC)
W78-06615

EVALUATION OF THE EFFECTS OF EFFLUENTS FROM THE PULP AND PAPER INDUSTRY ON THE PRODUCTIVITY OF MARINE ALGAE,
Nova Scotia Research Foundation, Dartmouth.
K. Hellenbrand.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 370-1, Progress Report to March 31, 1976. 42 p, 31 fig, 4 ref, 2 tab.

Descriptors: *Pulp and paper industry, *Effluents, *Water pollution effects, *Marine algae, Wastes, Industrial wastes, Water pollution sources, Pulp wastes, Photosynthesis, Respiration, Toxicity, Fish, Ammonia, Sulfite liquors, Marine plants, Aquatic plants, Inhibition, Kraft mills, Sulfite pulp mills.

The aim of this study was to develop a simple method for measuring sublethal effects of pulp mill effluents in low concentrations on marine macro-algae (seaweeds). everal seaweed species were collected and incubated for periods upm to 14 days in aerated seawater containing 2,5 or 10% of effluent at 10, 15, or 20C. Both draft and sulfite mill effluents were used. and their effects were assessed by measuring photosynthesis (oxygen generation) and respiration (oxygen consumption) rates at intervals, using an oxygen probe, at a constant light intensity or in the dark. Most observed effects were small, but some cases of significantly changed photosynthesis or respiration rates were recorded. The effluent most toxic to fish at high concentrations, rarely reduced but often enhanced photosynthesis, particularly of Ulva lactuca. Reductions of respiration rates did not seem correlated with fish toxicity. All effluents significantly reduced the respiration of at least 2 seaweed species. It is concluded that pulp mill effluents probably act by two mechanisms, on inhibitory action caused by toxic components, another stimulatory action due to nutrients or activators. The two mechanisms counteract each other, so that toxic effects may be delayed. (Brown-IPC)
W78-06617

THE EFFECT OF CHEMICAL TREATMENT ON THE TOXICITY OF PULP AND PAPER MILL EFFLUENTS,
Beak Consultants Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5D.
W78-06619

WATER MANAGEMENT EFFECT OF THE PLZEN SULFITE PULP MILL SHUTDOWN (VODOHOSPODARSKY EFEKT LIKVIDACE SULFITOVE CELULOZKY V PLZNI),
Zapadoceske Papirny, Pilsen (Czechoslovakia).
For primary bibliographic entry see Field 5G.
W78-06630

TLM TEST OF TANNERY WASTE WATERS BY USING FISH,
Showa Women's Univ., Tokyo (Japan).
For primary bibliographic entry see Field 5A.
W78-06653

DISTRIBUTION OF DIPHYLLOBOTHRIASIS IN THE AREA OF THE GORKI WATER RESERVOIR, (IN RUSSIAN),
Gorkovskii Meditsinskii Inst. (USSR).
For primary bibliographic entry see Field 5B.
W78-06665

PHYTOPLANKTONIC ASSOCIATIONS OF SWEDISH LAKES,
Lund Univ. (Sweden). Limnological Inst.
E. Teiling.
Proceedings of the Seventh International Botanical Congress, Stockholm, Sweden, 1950. p 828-829.

Descriptors: *Bioindicators, *Phytoplankton, *Trophic level, *Sweden, *Lakes, Eutrophication, Oligotrophy, Mesotrophy, Desmids, Cyanophyta, Desmidieta, Protococcaleta, Myxophyceta, Algae, History.

A brief summary of a lecture concerns the association of certain types of phytoplankton with lake trophic status observed in some 600 lakes in southern Sweden. A continuous series of phytoplankton associations was developed, in relationship to lakes ranging from oligotrophic to eutrophic status. Main groups of associations are Desmidieta, Protococcaleta, and Myxophyceta. Certain stenotrophic leading forms are used as boundary marks of the secondary association; the presence or abundance of these forms characterizes the type of association. Most of the phytoplanktonic forms are eurytrophic, occurring in lakes of diverse trophic level. Optimal degree of trophy is indicated by abundance, and minimal degree by stunted growth. Leading forms, form oligotrophic to eutrophic, are: Dactylococcus ellipsoideus, Tabellaria flocculosa var. pelagica, Kirchneriella lunaris, Fragilaria crotonensis, Attheya zachariasi, Melosira granulata, Microcystis aeruginosa, M. viridis, and, in southern Scania on Mesozoic bedrock, Lyngbya contorta and Pediastrum kawraiskyi. Field studies showed that water of rocky basins in achaean bedrock contained small amounts of nutrients and had a small planktonic vegetation rich in desmids; in basins surrounded by clay, cultivated soil, and settlement, which had increasing nutrients, desmids decreased and planktonic protococcoid and cyanophyte algae increased. (Lynch-Wisconsin)
W78-06683

SOME MESOTROPHIC PHYTOPLANKTON INDICATORS,
Lund Univ. (Sweden). Limnological Inst.
E. Teiling.
Proceedings of the International Association of Theoretical and Applied Limnology, Vol. 12, 1955, p 212-215. 1 fig.

Descriptors: *Phytoplankton, *Bioindicators, *Mesotrophy, *Trophic level, *Algae, Sweden, Lakes, Eutrophication, Oligotrophy, Ecology, Soils, Altitude, Littoral, Vegetation, Desmids, Urbanization, History.

A correlation between phytoplankton composition and lake trophic level is based on observations in some 700 Swedish lakes. Stenotrophic plankters, with a pronounced limit toward the oligotrophic side of the spectrum, were selected as indicators. Mictoplanktic pseudo-associations were excluded. A general section of Sweden is fugured, from the alpine region (oligotrophic) and Archaean bedrock partly covered by moraine, to the lowland area of southern Scania (eutrophic) on Mesozoic bedrock covered by clay. The limit of clay sedimentation corresponds to the upper level of ice lakes and glacial sea. Indicators of extreme oligotrophy are the desmids Tabellaria flocculosa var pelagica and Dactylococcopsis ellipsoideus, strictly confined to oligotrophic lakes with rocky shores, very poor littoral vegetation, and no settlement. Desmid association without these two indicator species occurs in clear lakes in moraine soil lacking settlement. With decreasing oligotrophy the majority of planktic chlorococcales begin to occur, especially Kirchneriella lunaris. Towards the eutrophic side three diatoms appear: Fragilaria crotonensis, Attheya zachariasii, and Melosira granulata. In more eutrophic lakes certain eurytrophic Myxophyceae occur in summer, forming blooms; these include Aphanizomenon, Anabaena flos-aquae, and A. circinalis; with increasing eutrophy Microcystis aeruginosa and M. viridis appear. (Lynch-Wisconsin)
W78-06684

SOME LITTLE KNOWN SWEDISH PHYTOPLANKTERS,
Lund Univ. (Sweden). Limnological Inst.
E. Teiling.
Svensk Botanisk Tidskrift, Vol. 51, No. 1, 1957. p 207-222, 29 fig, 1 tab, 35 ref.

Descriptors: *Phytoplankton, *Sweden, *Lakes, *Dulcellieria, *Floral lists, *Classification, *Speciation, Algae, Oligotrophy, Coelastrum chodati, Lake Dammstugutjarn(Sweden), Lake Hallangen(Sweden), Lake Hemsjon(Sweden), Lake Valen(Sweden), Lake Mortsjon(Sweden).

Several phytoplankters found in Swedish lakes are noted, with special attention to the description of a new genus, Ducellieria. In 1915 Ducellier described a new alga, Coelastrum chodati, which the present author concludes does not belong in Coelastrum, but rather should be assigned to a new genus which he names Ducellieria. Ducellier's algal does not possess the regular numbers of cells found in the Coelastrum coenobium, the structure of cell bridges is quite distinct, and important generic differences are found in the protoplast. Two species of Ducellieria are recognized, D. chodati (with D. chodati var armata) and D. tricuspidata. D. chodati is eurytrophical and seems to be a summer plankter. Remarks on other algae include Calothrix brevissima, Gloeocystis gigas var pallida (from oligotrophic Lake Dammstugugolen(, Eutetramorus, Cosmarium boreale, and Spondylosium panduriforme. A table is included listing the planktonic algae found in Lakes Dammstugutjarn, Hallangen, Hemsjon, Valen, and Mortsjon. (Lynch-Wisconsin)
W78-06685

ON THE VARIATION OF MICRASTERIAS MAHABULESHWARENSIS F. WALLICHII,
Lund Univ. (Sweden). Limnological Inst.
E. Teilig.
Botaniska Notiser, Vol. 109, No. 2, 1956, p 260-274, 33 fig, 7 tab, 24 ref.

Descriptors: *Micrasterias mahabuleshwarensis f. Wallichii, *Phytoplankton, *Algae, *Lake Trysjon(Sweden), *Classification, Sweden Desmids, Eutrophication, Zinc, Water pollution effects, Lakes.

Plankton collected in little Lake Trysjon, Sweden contained a very rare desmid, Micrasterias mahabuleshwarensis f. Wallichii. Its richness in deviating forms and abundance inspired a detailed investigation. Lake Trysjon is a mildly eutrophic lake about 500 m by 150 m by 4 m deep in Ainkgruvan, Narke. The pH, which was 6.9-7.1 until 1947, increased to 7.3 when a nearby laundry began operation. Waste stone from a zinc mine has been used to partly fill the lake, and zinc concentrations of 0.6 mg/l are found in the water. Plankton samples were collected in the summers of 1943-45 and 1947-48. A total of 1238 specimens of M. mahab. f. Wallichii were collected. This study confirms its classification as a forma rather than a separate species. Two types appear in the samples gracilis and robusta. The former has long conical processes, while the latter has shorter processes. The two types were connected by a complete series of intermediate forms. Most specimens were of the robusta type, but in 1944 the gracilis type strongly dominated. Dichotypical specimens consisting of one semicell of each type were not uncommon. It is possible that the difference is caused by varying light conditions. A striking diversity in certain details of M. mahab. leads to a general division into the europaea-type and the indica-type; distinguishing features are noted. (Lynch-Wisconsin)
W78-06686

STAURASTRUM PLACTONICUM ANS ST. PINGUE: A STUDY OF PLANKTONIC EVOLUTION,
Lund Univ. (Sweden). Limnological Inst.
E. Teiling.
Svensk Botanisk Tidskrift, Vol. 41, No. 2, 1947, p 218-234. 24 fig, 27 ref.

Descriptors: *Phytoplankton, *Staurastrum planctonicum, *Staurastrum pingue, *Bioindicators, *Classification, *Evolution, *Speciation, Sweden, Algae, Lakes, Staurastrum manfeldtii, Staurastrum sedbadi, Desmids, Oligotrophy, Eutrophication, Trophic level, Pelagic organisms.

The probable evolution of several plankters found in Swedish lakes is described, and some nomenclatory details are revised. Two evolutionary series are established: (1) Staurastrum manfeldtii to S. pingue with S. luetkemuelleri as an intermediate form, and (2) S. sebaldi var ornatum to S. planctonicum wiht S. sebaldi var ornatum forma planctonic as an intermediate form. S. manfeldtii var planctonicum is here transferred to S. sebaldi. S. luetkemuelleri is frequent in oligotrophic lakes; S. pingue has wider distribution, but is absent in most eutrophic and oligotrophic lakes; S. planctonicum has a more limited ecological range, and is found only in nearly eutrophic waters but not in the most eutrophic ones. The evolution of these pelagic forms appears to represent a tendency toward reduction of protuberances. As ornamentation signifies dead weight, pelagic conditions favor smoother forms, probably evolved through survival of the fittest. Both S. pingue and S. planctonicum are more pronounced plankters than S. manfeldtii and S. sebaldi var ornatum. Factors accounting for the advanced evolution of these plankters in Swedish lakes are discussed. (Lynch-Wisconsin)
W78-06687

PHYTOPLANKTON OF LAKE SHIWA NGANDU,
For primary bibliographic entry see Field 2H.
W78-06688

SEASONAL DISTRIBUTION OF VITAMIN B12 IN LAKE KINNERET,
Kinneret Limnology Lab., Tiberias (Israel).
B. Cavari, and N. Grossowicz.
Applied and Environmental Microbiology, Vol. 34, No. 2, p 120-124, August 1977. 3 fig, 24 ref.

Descriptors: *Vitamin B12, *Eutrophication, *Algae, *Lake Kinneret(Israel), *Phytoplankton, Israel, Bacteria, Lakes, Dinoflagellates, Peridinium, Bacillariophyta, Cyanophyta, Chlorophyta, Vitamins, Hypolimnion, Sediments, Limiting factors, Seasonal, Nutrients.

Examination of vitamin B12 content and its relationship to the distribution of algae and bacteria in the waters of Lake Kinneret, Israel, showed a positive correlation with Bacillariophyta and Chlorophyta and an inverse relationship with Cyanophyta. The onset of blooms of the dinoflagellate Peridonium coincided with increasing concentrations of B12, but persistence of

Peridonium after depletion of B12 suggests that the dinoflagellate is not dependent on the vitamin. This was corroborated by laboratory tests. The study was conducted February 1975 to March 1976. Vitamins have been suggested as major factors in controlling the appearance of algal blooms and the succession of algal populations, and dinoflagellates have been reported to be strongly dependent on B12. Bacteria are the main vitamin producers. The highest B12 concentration in the lake was about 100 ng/l recorded November-December 1975 at a depth of 40 m. The vitamin is formed in the hypolimnion and in sediment, and is liberated from the hypolimnion during turnover. The first increase of Peridonium occurred in February 1975 at high B 12 concentrations; Bacillariophyta and Chlorophyta also increased their biomass parallel to the B12 increase. During these months of isothermal conditions, however, concentrations of various nutrients (including B12) increase in the photic zone, and the increase in algal biomass could result either from nutrient or B12 increases or both. The B12 level may serve as a eutrophication indicator. (Lynch-Wisconsin)
W78-06690

DISTRIBUTION OF MYXOBACTERS IN AQUATIC HABITATS OF AN ALKALINE BOG,
Central Michigan Univ., Mt. Pleasant. Dept. of Biology.
L. A. Hook.
Applied and Environmental Microbiology, Vol. 34, No. 3, p 333-335, September 1977. 1 fig, 2 tab, 17 ref.

Descriptors: *Bacteria, *Myxobacteria, *Davis Lake(MI), *Alkaline water, *Bogs, Distribution patterns, Vestaburg Bog(MI), Lakes, Dissolved oxygen, Hydrogen ion concentration, Water temperature, Dominant organisms, *Michigan, Myxococcus fulvus, Species diversity, Sphagnum, Runoff.

Water and terrestrial samples taken in Davis Lake (Vestaburg Bog), an alkaline bog near Vestaburg in south-central Michigan, showed ten species of myxobacteria, including six species of the family Myxococcaceae. Myxococcus fulvus was dominant at all five aquatic sampling sites and comprised 54-90% of all observations. M. disciformis was relatively abundant in the fossa at the lake's margin, but few were found in other parts of the bog and none in soils surrounding the lake. Samples were obtained from five aquatic and three terrestrial sites September 1975-July 1976; pH, dissolved oxygen, and temperature were measured in-situ. Frequency of occurrence and diversity of aquatic myxobacter species was highest in aquatic sites associated with upland soils surrounding the bog, and lowest in the center and bottom of the lake. All species found in soil samples were also found in water samples, reflecting a high degree of runoff which washes nutrients and soil microorganisms into the bog. the 80 x 100 m lake occupies the bottom of a steeply-banked oblong basin. A quaking Sphagnum mat was 6.0-8.7, dissolved oxygen was nearly uniform (3.2-14.0 ppm) except in bottom sediments which were almost anaerobic (0.6-1.3 ppm), and temperature ranged from -2.0 to 15.0C. (Lynch-Wisconsin)
W78-06691

MERCURY IN THE LAKE POWELL ECOSYSTEM,
New Mexico Univ., Albuquerque. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W78-06694

PREIMPOUNDMENT STUDY: CEDAR CREEK DRAINAGE BASIN: EVANS COUNTY WATERSHED: EVANS, TATTNALL, AND CANDLER COUNTIES, GEORGIA,
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W78-06695

COPEPOD 2: A MARKOV-TYPE MODEL FOR COPEPOD POPULATION DYNAMICS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
L. A. Maguire, C. W. Gehrs, and W. Van Winkle.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL/TM-4976, Price codes: A06 in paper copy, A01 in microfiche. Publication No. 883, ORNL/TM-4976, July 1976. 97 p, 15 fig, 3 tab, 10 ref, 6 append.

Descriptors: *Copepods, *COPEPOD2, *Model studies, *Zooplankton, *Mathematical models, Animal populations, Population, Seasonal, *Oklahoma, Diaptomus clavipes, Egg mortality, Instars, Mortality, Ponds, Computer programs.

A model of copepod population dynamics, COPEPOD2, derived from the Leslie matrix and Markov theory, is described. Parameter values were estimated from data gathered during a one-year field study of Diaptomus clavipes in a small Oklahoma pond. The model consists of one compartment for each age class within an instar or instar group, and the number of compartments per instar corresponds to its duration in the life cycle. The number of copepods in each compartment is monitored through a one, one-half, or one-quarter day time step. Events in the annual life cycle are modelled as explicit seasonal functions, not as responses to environmental factors such as water temperature or food. In a preliminary version, population parameters (instar durations, mortality rates, clutch size) are assumed constant. The model output gives a plausible representation of annual changes in D. clavipes numbers following the temporal pattern and average magnitude of the field data, but does not reflect fluctuations around the mean. The model is most responsive to changes in egg mortality and clutch size. A modification permits use of submodels for calculating population parameters as functions of environmental factors. A disadvantage of COPEPOD2 is its lack of adult age structure, limiting adult mortality patterns to those that are independent of age. (Lynch-Wisconsin)
W78-06696

5D. Waste Treatment Processes

MANAGEMENT OF URBAN RUNOFF AND WASTEWATER IN THE OSLOFJORD AREA,
Norsk Inst. for Vannforskning, Blindern.
For primary bibliographic entry see Field 5G.
W78-06214

OPTIMIZATION OF A REGIONAL WATER RESOURCE QUALITY MANAGEMENT SYSTEM,
California Univ., Berkeley.
For primary bibliographic entry see Field 5G.
W78-06234

A METHOD FOR REMOVING SOLUBLE SELENIUM FROM ACIDIC WASTE WATER,
Department of the Interior, Washington, DC.
W. N. Marchant.
Available from Patent Office. Patent Serial No 596,117, July 15, 1975. 6 p, 2 tab.

Descriptors: *Zinc, *Mine wastes, *Mining, *Reduction(Chemical), *Waste water treatment, Water pollution, *Patents, *Selenium, Smelting operations, *Smelter effluent treatment, Scrub solutions, Reducing agents, Concentrating techniques.

Procedures for the removal of selenium from acidic scrub solutions (used in the treatment of zinc smelter effluent) are described. The waste water is treated with powdered zinc, an effective metallic reducing agent. The process may also be employed for removal of selenium from other aqueous wastes (such as those from copper refining processes, scrubber solutions from coal burning operations, etc.). Other metallic reducing agents such as iron or aluminum may be used. Two examples are provided for the concentration of soluble selenium from waste water. The performances of other reducing agents are compared in a third example. The government-owned invention described is available for licensing. (Seip-IPA)
W78-06260

INVESTIGATING WASTE OIL DISPOSAL BY DIRECT INCINERATION,
Army Mobility Equipment Research and Development Center, Fort Belvoir, VA. Petroleum and Materials Dept.
For primary bibliographic entry see Field 5E.
W78-06261

ASSESSMENT OF WASTEWATER MANAGEMENT, TREATMENT TECHNOLOGY, AND ASSOCIATED COSTS FOR ABATEMENT OF PCBS CONCENTRATIONS IN INDUSTRIAL EFFLUENTS. TASK II,
Versar, Inc., Springfield, VA.
G. Contos, R. L. Durfee, E. E. Hackman, III, and K. Price.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 433, Price codes: A13 in paper copy, A01 in microfiche. Final Report No EPA-560/6-76-006, February, 1976. 263 p, 43 fig, 58 tab, 10 ref, 5 append. 68-01-3259.

Descriptors: *Polychlorinated biphenyls, *Carbon, *Adsorption, *Waste water treatment, *Industrial wastes, *Capacitors, Recycling, Incineration, Landfills, Water pollution treatment, Air pollution, Solid wastes, Cost analysis, *PCB manufacturing process - Monsanto, *Ultraviolet ozonation, Transformers, Pretreatment.

A study was conducted of wastewater management and treatment technology available to determine toxic pollutant effluent concentrations and daily load achievable in 3 industrial categories: polychlorinated biphenyls (PCBs) and capacitor and transformer manufacturing. Under normal operating conditions, plants in these categories have PCB discharges to either waterways or sewage treatment plants and, under heavy rainfall conditions, to storm sewers or directly to waterways. Carbon adsorption technology is currently the best means of successful PCB removal. Although still in the research stage, ultraviolet-ozonation treatment offers potential of complete destruction of PCBs all the way to CO2, H2O and HCl. AMBERLITE polymeric adsorbents, also under development, have demonstrated a PCB removal efficiency roughly equivalent to carbon during laboratory testing. High temperature, controlled incineration is the best destruction means for scrap oils and burnable solid wastes generated at these plants; scientific landfilling is the best disposal method for nonburnable contaminated solids. Zero discharge objectives can best be achieved by eliminating discharge streams and developing recycle systems. Recommendations are: (1) all non-contact cooling water be segregated, cooled, and recycled, (2) all other wastewater streams be pretreated, and (3) the portion of the pretreated water which would be used in the plant be treated with carbon and the excess water be incinerated in a specially designed system which would allow for energy recovery. Supporting data, rationale for the selection of recommended treatment technologies, associated costs are included. (Seip-IPA)
W78-06262

GAS AND LEACHATE FROM LANDFILLS: FORMATION, COLLECTION, AND TREATMENT,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W78-06263

STATEMENT FOR COMPREHENSIVE WATER POLLUTION CONTROL PROGRAMS,
Public Health Service, Washington, D.C. Div. of Water Supply and Pollution Control.
For primary bibliographic entry see Field 5G.
W78-06264

INVERTED SIPHONS FOR OIL TRAPPING,
Calspan Corporation, Buffalo, NY.
R. C. Ziegler, R. E. Baier, and D. J. Schuring.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-249 360, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-600/2/76-028, February, 1976. 63 p, 24 fig, 6 tab, 4 ref. 11020 DJG. WPRD 263-01-68.

Descriptors: *Oil pollution, *Siphons, *Sewers, *Model studies, Pollutant identification, Water pollution sources, Fluoride number, Gas chromatography, Telemetry, Fuels, *Inverted siphon sanitary system, Buffalo River Project(NY), Oil trapping, Oil detectors, Surface oils, Petroleum pollution, Infrared spectra emulsified oil, Fuel oils.

Investigations of the oil trapping characteristics and efficiency of an inverted siphon sewer system were conducted as part of a demonstration program for preventing and eliminating oil pollution in the Buffalo River. Analysis of samples taken from a full-scale system and tests conducted on 1/24 and 1/12 scale models reveal that the inverted siphon sanitary sewer design is nearly 100% effective for trapping surface oils including those that are constantly discharged into the sewer, e.g., cooking oils and greases and petroleum oils that enter as a result of accidental or deliberate discharges from gas stations, railroad refueling operations, and other industrial sources. The inverted siphon sewer configuration has nearly zero efficiency for trapping emulsified oils carried in the bulk waters of the sewer. Characterization studies revealed that most (70%) of the trapped oils were of petroleum origin. The petroleum-based fuels were diagnosed (on the basis of infrared spectra and gas chromatograms) as being essentially identical to No. 2 fuel oil, which was routinely used in railroad refueling nearby and was entering the Buffalo sewer line from an oil sump overflow in the railroad terminal. Oil detectors were developed and their use for both automatic and manual measurement of accumulated sewer oil depths are described; a telemetering system permitted oil data to be transmitted to a remote monitoring station several miles from the siphon via radio frequency link. (Seip-IPA)
W78-06268

AEROSOL PRODUCTION BY WASTE WATER SPRAY NOZZLES,
Brookhaven National Lab., Upton, NY.
For primary bibliographic entry see Field 5A.
W78-06270

LIQUIDATION OF THERMAL ELECTRIC POWER STATION WASTE WATERS - ACTUAL TECHNICAL PROBLEMS (ROUGH DRAFT),
V. P. Shvetsova, and S. D. Shcherbinina.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-tr-2982, Price codes: A02 in paper copy, A01 in microfiche. Report ORNL-tr-2983, (1974). Translation from Energetik, No 8, p 28, 1974. 7 p.

Descriptors: *Thermal powerplants, *Thermal pollution, *Water pollution treatment, Water purification, *Pollution abatement, *Water pollution control, Waste water treatment, Oil pollution, Thermal electric power.

Recommendations for the treatment, reduction, and prevention of thermal electric power station (TES) wastes are presented; they may be stated as follows: All thermoelectric stations should be constructed without external drainage. Water contaminated with petroleum products should be partially purified in petroleum traps and in mechanical filters; this partially purified water can be economically recycled and used in chemical rectification for irrigation of wet scrubbers, ash washout, and condenser cooling in the TES without damage to equipment. Systems for washing regenerative air pre-heater and boiler assemblies should be closed, i.e., waste-free. As neutralizing agent, ammonia formed in the sludge can be used to remove water from the filter cakes and would yield for metallurgical operations a solution free from iron, nickel, vanadium, and other metals. A thermal method should be applied in the preparation of diluent water for boiler supply. A heat and electric power plant should utilize a steam regenerator; the water supply to all pieces of equipment should be lime or soda-lime water. Feed water purification processes should use desalinated water which is free of iron. Blow-through water of the evaporator and steam regenerator should be well concentrated and the salt obtained sent to a processing point, buried or discharged to oceans. Water from hydrosol removal should be recirculated and blow-through water should be used for make up water to supply the evaporator and steam regenerator. Water, after chemical cleaning of the thermal power system or after its conservation, should be discharged into the hydrosol removal system and used as an additive in the cooling system. (Seip-IPA)
W78-06271

SANITARY AND ONCOLOGICAL ASSESSMENT OF AGRICULTURAL USE OF SEWAGE CONTAINING CARCINOGENIC HYDROCARBONS (ROUGH DRAFT),
Institut Eksperimentalnoi i Klinicheskoi Onkologii, Moscow (USSR).
For primary bibliographic entry see Field 5B.
W78-06275

MICROBIAL DEGRADATION OF PHENOLS IN THE PURIFICATION OF PHENOLIC WASTE WATERS WITH ACTIVATED SLUDGE,
Nauchno-Issledovatelskii Inst. Vodosnabdyavane Kanaliz. (Bulgaria).
V. Semov, and L. Andreeva.
Report ORNL-tr-2983, (1975). Translation from Sanit, Tekh. Vol. 8, No. 1, p 183-190, 1972. 7 p, 2 tab, 9 ref.

Descriptors: *Microbial degradation, *Biological treatment, *Activated sludge, *Phenols, *Biodegradation, *Microorganisms, *Oxidation, Chemical wastes, Domestic wastes, Waste water treatment, Water purification, Waste treatment, *Coke-chemical production wastes, *Biological oxidation, Resorcin, Pyrocatechol, O-cresol.

The ability of microorganisms (present in the activated sludge produced from the purification of domestic waste water) to decompose mono-and divalent phenols in coke-chemical plant waste waters was investigated. The biological oxidation of 4 phenolic compounds - phenol, o-cresol, pyrocatechol, and resorcin - was studied. In simultaneous purification of industrial phenolic waste water and domestic waste water in which the ratio of phenolic water to domestic water was gradually increased from 1:20 to 1:5 over an 8-month period. It was found that the number of strains of microflora which oxidize phenolic compounds increased. The microorganisms 'adapted' to increased portions of phenolated water through radical biochemical metabolic changes. With increased concentration of phenol, there was a marked increase in the ability of microflora to decompose phenolic compounds and in the number of species which do so. Phenol and pyrocatechol were most readily decomposed biologically O-cresol and resorcin were oxidized less readily; hydroquinone was assimilated by only 2 of the 309 microbe strains isolated. (Seip-IPA)
W78-06276

WATER VAPOR DIFFUSION MEMBRANE DEVELOPMENT,
Ionics, Inc., Watertown, MA.
M. K. Tan.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-17827, Price codes: A04 in paper copy, A01 in microfiche. Final Report, NASA-CR-137804, January 1976. 68 p, 28 fig, 4 tab. NAS 2-7651.

Descriptors: *Water reuse, *Recycling, *Sewage treatment, *Membrane processes, Waste water treatment, *Vapor diffusion water reclamation unit(VDR), *Astronauts, *Space, *Water reclamation.

Polyvinyl chloride and cellophane membranes, used as phase separators in vapor diffusion water reclamation units (VDR) which recycle wastewater produced by astronauts in space are investigated. Eighteen different membranes were procured, characterized and tested in a modified bench-scale VDR unit. Four membranes were selected for further study of flux decline resulting from membrane fouling. The system was also investigated for low temperature application on wash water where the permeated water is not recovered but vented into space vacuum. Pretreatment does not significantly increase flux, product quality, or membrane fouling and should be omitted in future VDR designs; however, it is required to prevent wetting when using microporous hydrophobic membranes in the presence of a wetting agent such as soap. Permeate removal by vacuum is superior to removal by sweep gas. The VDR is effective for lower temperature of wash water in which the product water is vented to space vacuum; microporous hydrophobic membranes are not suitable for this application. The level of water removal from the urine charge should not exceed 80% (total solids should not exceed 15%) for best results. Turbulence promotion is required, especially when the charge concentration is relatively high. In the flat sheet configuration, 2-channel flow path with ridges is the preferred design for maximizing mixing and decreasing the boundary layer; the optimum pumping rate has not been determined. Ionics has developed a full-scale VDR unit for the treatment of various food products; this stack arrangement is briefly discussed. (Seip-IPA)
W78-06277

USE OF XANTHATES FOR THE REMOVAL OF METALS FROM WASTE STREAMS,
Goodyear Atomic Corp., Piketon, OH. Process Technology Dept.
M. E. Holland.
Available from the National Technical Information Service, Springfield, VA 22161 as GAT-826, Price codes: A02 in paper copy, A01 in microfiche. Report No GAT-826 October, 1975. 17 p, 2 fig, 5 tab, 17 ref.

Descriptors: *Chelation, *Metals, *Cellulose, *Waste water treatment, *Chemical precipitation, Sawdust, *Xanthates, *Cellulose derivatives, Straw, Corn starch.

The technical feasibility of producing large quantities of xanthate derivatives of corn starch, straw, sawdust, and cellulose filter cartridges, for use as metal chelating agents (to complex and precipitate metals from waste water solutions), was investigated. Xanthation of these materials was increasingly easier in the order of sawdust, straw,

starches, and pure cellulose; the capacity of the xanthates of these materials to remove dissolved metals from aqueous solutions was found to vary considerably as a result of their degree of xanthate formation. The cellulose filter cartridges and corn starch xanthates were the most efficient (removing 98-100% of the dissolved metals); the straw and sawdust xanthates removed 42-80% (an average of 80%) of the dissolved metals. Disadvantages of using xanthates for metal ions complexation and removal include: discoloration of the effluent, high effluent pH, objectionable odor caused by xanthate decomposition, limited capacity, the need for large amounts of wash water, the impracticality of large-scale synthesis, and the availability of better methods. (Seip-IPA)
W78-06278

DECONTAMINATION OF WATER CONTAMINATED WITH POLYCYCLIC AROMATIC HYDROCARBONS ((PAH) II. ACTION OF CHLORINE AND OZONE ON PAH DISSOLVED IN DRINKING AND RIVER WATER (ROUGH DRAFT),
Perugia Univ. (Italy). Inst. of Hygiene.
G. S. Sforzolini, A. Savino, and S. Monarca.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-tr-2961, Price codes: A01 in paper copy, A01 in microfiche. Report ORNL-tr-2961, (1974). Translation from Igiene Moderna, Vol 66, No 6, p 595-619, 1974. 5 fig, 13 tab, 27 ref.

Descriptors: *Oxidation, *Chlorine, *Ozone, Water pollution treatment, *Aromatic compounds, Organic compounds, Potable water, Polynuclear aromatic hydrocarbons, Pyrene, 3,4-benzopyrene, 3,4-benzofluoroanthene, 11,12-benzofluoranthene, 1,2-benzoanthracene, Doubly distilled water, Distilled water, River water, Deionized water.

The oxidizing action of chlorine and ozone on 5 polycyclic aromatic hydrocarbons (PAH)-pyrene, 3,4-benzopyrene, 3,4-benzofluoroanthene, 11,12-benzofluoroanthene, and 1,2-benzoathracene - was investigated when dissolved in drinking, deionized, river and doubly distilled water. Ozone at a concentration of 0.40 plus or minus 0.05 mg/l) oxidizes the PAH dissolved in all 4 types of water to a greater extent than does chlorine (at a concentration of 2 plus or minus 0.25 mg/l) for a 30-minute contact time. Most sensitive to treatment with chlorine and ozone in all types of water is 3,4-benzopyrene; the least sensitive is 3,4-benzofluoroanthene, which is particularly insensitive to chlorine. High variability in results expressed as the standard deviation, the confidence interval, and the coefficient of variation) was encountered for ozonation and chlorination of river water and de-ionized water; low or zero variability was encountered in doubly distilled and drinking water. This is attributable to the variable nature and quality of river and de-ionized water and the nearly constant composition of doubly distilled and drinking water. Chlorine and ozone react with other constituents of river water, thus reducing their availability for reaction with the hydrocarbons under investigation. In chlorine treatment of pyrene and 3,4-benzopyrene dissolved in doubly distilled and de-ionized water, there are observable new spectrophotometric peaks in the ultraviolet and low visible ranges; this is probably due to the presence of chloride derivatives of these hydrocarbons. (See also W77-03369) (Seip-IPA)
W78-06279

COSTS OF RADIUM REMOVAL FROM POTABLE WATER SUPPLIES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
C. E. Singley, B. A. Beaudet, W. E. Bolch, and J. Palmer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 950, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA - 600/2-77-073, April, 1977. 139 p, 54 fig, 13 tab, 20 ref, 6 append. EPA R 803864-01.

Descriptors: *Radium radioisotopes, *Potable water, *Cost analysis, *Efficiencies, *Treatment facilities, *Ion exchange, *Reverse osmosis, *Lime, Capital costs, Operating costs, Maintenance costs, Annual costs, Radioactivity, Waste water treatment, Planning, *Radium removal methods, *Lime-soda softening.

In a guide for planners and water utility personnel in areas where radium exceeds EPA Drinking water Regulations limits, existing data on radium removal from potable water by lime-soda softening, ion exchange, and reverse osmosis treatment methods are analyzed; efficiency models to estimate capital, annual operating, and maintenance costs are proposed. No statistically significant correlation was found between raw water and radium activity levels and other quality parameters investigated, although a trend toward significance was noted between radium and iron, barium, and boron. Efficiencies of the 6 lime-soda softening plants studied varied from 59-96% radium removal and averaged 80%; radium removal varied nonlinearly with total hardness. The majority of radium activity removed appears in the dry waste sludge at levels approaching 100,000 pCi/kg; safe disposal of contaminated sludge is critical. Lime-soda softening is a cost-effective removal method, particularly at plant capacities above 10 MGD. Investigations at 8 ion exchange and 2 reverse osmosis plants demonstrated a potential 95% or greater efficiency from a well-operated plant (either type). In ion exchange plants, the majority of removed radium appears in the regenerated brine effluent (levels approaching 1000 pCi/l); about 9% of the radium activity remains in the exchange medium and is not regenerated. Reverse osmosis costs were higher than for other treatment processes; application should be limited to treatment of very brackish or very high radium-content raw water. Disposal methods for spent brine resulting from both ion exchange and reverse osmosis plants may be limited by salinity rather than radium activity levels. (Seip-IPA)
W78-06280

ELECTRO-REGENERATED ION-EXCHANGE DEIONIZATION OF DRINKING WATER,
Southern Research Inst., Birmingham, AL.
For primary bibliographic entry see Field 5F.
W78-06281

DEVELOPMENT OF A MOBILE TREATMENT SYSTEM FOR HANDLING SPILLED HAZARDOUS MATERIALS,
Envirex Inc., Milwaukee, WI. Environmental Sciences Div.
M. K. Gupta.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 707, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/2-76-109, July, 1976. 75 p, 22 fig, 16 tab, 20 ref, 2 append. 68-01-0099.

Descriptors: *Water pollution treatment, *Reverse osmosis, *Chlorination, *Carbon, Adsorption, *Flocculation, Sedimentation, *Filtration, Ammonia, Chlorinated hydrocarbon pesticides, Chlorine, Phenols, Organic compounds, Copper sulfate, *Waste spill treatment, On-site treatment, *Activated carbon adsorption, *Granular media filtration, Aluminum sulfate, Benzene, Acetone cyanohydrin, Acrylonitrile, Chlorinated hydrocarbons, Methanol, Tetraethyllead, Tetramethyllead, Water soluble organic wastes, Water soluble inorganic wastes, Chlorosulfonic acid, Formaldehyde, Mercuric chloride, Phosphorous penta-sulfide, Styrene.

Laboratory and engineering studies conducted to determine the design of a Mobile Hazardous Material Spills Treatment Trailer are documented. The Trailer and its main components (pumps, portable reaction and storage tanks, mixed media filters, activated carbon columns, etc.) are described; a summary of spill response capabilities are presented. The trailer is a mobile self-contained, modular filtration/carbon adsorption unit designed for on-site treatment of spilled hazardous water-soluble organics. Nine materials, selected on the basis of the priority ranking system developed by EPA, were evaluated: acetone cyanohydrin, acrylonitrile, ammonia, chlorinated hydrocarbons, chlorine, methanol, phenol, tetraethyllead (TEL), and tetramethyllead (TML). Several others were evaluated for treatment feasibility by reverse osmosis. The unit treatment processes of chemical reaction, flocculation, sedimentation, granular media filtration, and activated carbon adsorption formed the most suitable and versatile system for on-site removal and treatment of hazardous materials. A 12.6 l/sec (200 gpm) mobile system was constructed based on the design data outlined. Reverse osmosis can be utilized on a selective basis for the treatment of water soluble inorganics but is unsuitable for many materials because of their low water solubility and effect on membranes. Optimum processes (including activated carbon adsorption, chlorination, coagulation, filtration, and physical-chemical methods) are outlined for treatment of acetone cyanohydrin, acrylonitrile, chlorine, phenol, ammonia, pesticides, herbicides, methanol, TEL, and TML. (Seip-IPA)
W78-06283

COMBINATION OF AN ELECTROLYTIC PRETREATMENT UNIT WITH SECONDARY WATER RECLAMATION PROCESSES.
McDonnell-Douglas Astronautics Co., Santa Monica, CA. Biotechnology and Space Sciences Dept.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-17828, Price codes: A10 in paper copy, A01 in microfiche. Report No. NASA-CR-147448, 1976. 195 p, 39 fig, 21 tab, 9 ref, 3 append. NASA-JSC-NASI-11781.

Descriptors: *Waste water treatment, Pre-treatment(Water), Potable water, *Polyelectrolytes, *Urine, Evaporation, Carbon, *Electrolysis, Water reuse.

An electrolytic pretreatment unit with secondary water reclamation processes was designed, fabricated, and verified for operation in conjunction with an air evaporation unit for the recovery of potable water from human urine. The electrolytic-evaporation system is an automated, six-man, flight-concept prototype, designated Electrovap. The electrolytic pretreatment unit removes partial organics from urine. The air evaporation unit then distills and evaporates the urine for emoval of remaining organics and inorganic salts. The system is self-sterilizing and was developed for space missions of medium to long-term duration. Fail-safe control features ensure safe unattended operation. The integrated system was operated for testing for a five day period, during which 108.5 lb or urine and 27.1 lb of flush water were processed. Only minor malfunctions were noted, verifying the feasibility of the concept. Pretreatment reduced average total organic carbon concentration to 778 ppm; evaporation produced water with an average total organic carbon concentration of 10,42 ppm, low conductivity, and average total dissolved solids content of less than 1 ppm. Product water met all standards for potable water with the exception of pH. The Electrovap system was concluded to be suitable for recovery of potable water human urine with minor adjustments recommended. The appendices contain information on subtasks (failure modes, evaluation, specifications). (Wares-IPA)
W78-06285

MERCURY RECOVERY FROM CONTAMINATED WASTE WATER AND SLUDGES,
Georgia-Pacific Corp., Bellingham, WA. Bellingham Div.
R. Perry.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-238 600, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-660/2-74-086, December, 1974. 119 p, 29 fig, 28 tab, 61 ref, 4 append. 12040, HDU, 1BB037.

Descriptors: *Water pollution, *Metals, *Sludge disposal, *Waste water treatment, *Mercury, Sulfides, Chemical precipitation, Hydrogen sulfide, Filtration, Electrolysis, Activated carbon, Ion exchange, Reduction(Chemical), Particle size, Oxidation, Chlorination, Reclamation, Separation techniques, *Chlor-alkali cells, Resource recovery, Clarification, Thickening, Roasting, Vacuum filtration.

A plant was designed, built, and installed to remove Hg from waste water and sludge produced by a mercury cell chlor-alkali plant. Hg content of the waste water ranged from 300 to 18,000 ppb mercury, while content of the brine sludge ranged from 150 to 1,500 ppm. Other sludges (Hg content 10 to 25 ppm) processed were from the waterway near the plant outfall. Sulfide precipitation system achieves effluent Hg levels ranging from 10 to 125 ppb for an 87 to 99% removal, handling up to 280 liters/minute adequately with a 48-hour cycle between backwashings. Capitol cost is $143,900 and operating costs are $.50/3,785 liters. The sludge system comprising collection system, a thickener, a vacuum filter, multiple hearth furnace, and condensers processes 140 to 320 kg/hour dry sludge. From feed mercury cntent ranging from 290 to 440 ppm, clinker mercury content after treatment contains from 0.5 to 7.2 ppm (removal rate of 98.3 to 99.890). Waterway sediments are also treated in the sludge system at 87 to 92% efficiency of mercury removal. Capital cost of the sludge system is $365,500; operating costs are $32/metric ton of dry sludge treated. Advantages include: process steps, pH range compatibility with total plant effluent, concentrated mercury products, inexpensive chemicals, and minimal environmental stress. Application of the treatments to wastes from other chlor-alkali plants is recommended, with refinements for cost efficiency improvement. Appendices descibe oxidation process, determination of Hg, experimental data, and an operating manual for the system. (Wares-IPA)
W78-06286

SEWAGE FACILITIES CONSTRUCTION REPORT, 1971.
Environmental Protection Agency, Washington, DC. Water Quality Analysis Branch.
For primary bibliographic entry see Field 5G.
W78-06287

SEWAGE FACILITIES CONSTRUCTION REPORT 1972, 1973, 1974.
Environmental Protection Agency, Washington, DC. Point Source Analysis Branch.
For primary bibliographic entry see Field 5G.
W78-06288

MUNICIPAL SLUDGE MANAGEMENT: EPA CONSTRUCTION GRANTS PROGRAM. AN OVERVIEW OF THE SLUDGE MANAGEMENT SITUATION,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W78-06290

COST ESTIMATES FOR CONSTRUCTION OF PUBLICLY-OWNED WASTEWATER TREATMENT FACILITIES. 1976 NEEDS SURVEY, (REPORT TO CONGRESS).
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W78-06291

FLUORIDE EMISSIONS FROM PHOSPHORIC ACID PLANT GYPSUM PONDS,
North Carolina State Univ. at Raleigh.
For primary bibliographic entry see Field 5A.
W78-06292

STATISTICAL SUMMARY, 1968 INVENTORY, MUNICIPAL WASTE FACILITIES IN THE UNITED STATES,
Federal Water Quality Administration, Washington, DC. Div. of Technical Support.
For primary bibliographic entry see Field 5G.
W78-06293

DEVICES FOR ONBOARD TREATMENT OF WASTES FROM VESSELS,
Thiokol Corp., Brigham City, UT. Wasatch Div.
T. J. O'Grady, and P. E. Lakomski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 993, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-670/2-74-091, December 1974. 117 p, 39 fig, 15 tab, 2 ref, 2 append. ROAP 21APK, 68-01-0115.

Descriptors: *Sewage treatment, *Sludge disposal, Ships, *Filtration, *Incineration, *Chlorination, *Cost analysis, Physicochemical properties, Waste water treatment, *Zero discharge waste treatment.

A program involving the demonstration of a pleasure craft zero discharge, physical/chemical waste treatment system, which employs a unique filter-incinerator device, was conducted. Test data from laboratory and shipboard demonstration tests are presented, as well as data on manufacture and installation costs. The system utilizes processes for filtration of influent waste to remove coarse and suspended solids, incineration of collected coarse and suspended solid material, and chemical treatment of the collected filtrate to reduce biochemical oxygen demand prior to discharge. During the development period, a no-discharge standard was adopted by EPA, and the development program was redirected to develop a system which would totally prevent discharge of waste. After installation and use of the developed system to handle wastes of over 300 persons on a houseboat during the summer boating season of 1973, analysis of the recycled liquid showed a zero coliform bacteria count (making the treated water acceptable for reuse as flush water. The economics of the system were also demonstrated. The program demonstrated that a device combining two unit operations (filtration and incineration) can effectively and safely remove and destroy sewage sludge, and can be adapted with minor modifications to installation on commercial vessels. (Wares-IPA)
W78-06294

EXPLOSIVES REMOVAL FROM MUNITIONS WASTEWATERS,
Rohm and Haas Co., Philadelphia, PA.
B. W. Stevens, R. P. McDonnell, R. K. Andren, and J. M. Nystrom.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A015 602, Price codes: A03 in paper copy, A01 in microfiche. Report No. 290131, 1975. 25 p, 12 fig, 1 tab, 6 ref. Presented at the 30th Annual Purdue Industrial Waste Conference, Lafayette, Indiana, May 6-8, 1975.

Descriptors: *Industrial wastes, *Adsorption, *Waste water treatment, Pilot plants, Iowa, Chemical wastes, Hazards, Polymers, Burlington(IA), Munitions, Ordinance.

Pilot plants studies conducted at the Iowa Ammunition Plant, Burlington, Iowa, have demonstrated a safe, practical, and economical polymeric adsorption process for removing trinitrotoluene (TNT) and other hazardous explosive materials, such as DNT and nitrocresols, from waste streams. The absorbents consist of hard, insoluble, porous resin beads formed from copolymers of styrene and divinylbenzene or acrylic esters. Having a high surface area to weight ratio, the beads employ Van der Waals forces to absorb many water soluble organics. The process is also reversible, so that absorbed organics can be desorbed from the surface of the resin by polar organic solvents. The absorbent also can be effectively regenerated to restore its original capacity, and the solvent regenerant can be reclaimed for reuse, leaving only a concentrated aqueous sludge of explosive contaminants for ultimate disposal. As a result of the success of the pilot-scale study, full-scale demonstration installations of the process are being planned for several ordinance plants in the United States. The same process is equally applicable to industrial waste streams containing aromatic nitrobodies. (Wares-IPA)
W78-06295

STUDIES ON MUST FIELD HOSPITAL WASTEWATER TREATMENT,
Army Mobility Equipment, Research and Development Center, Fort Belvoir, VA. Sanitary Sciences Div.
J. G. Vlahakis.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A008 963, Price codes: A04 in paper copy, A01 in microfiche. Report No. 2121, December, 1974. 54 p, 15 fig, 16 tab, 11 ref, 2 append. 1G762708AH67, Intra-Army Order 4720.

Descriptors: *Waste water treatment, *Polyelectrolytes, Carbon filters, Reverse osmosis, Hospitals, Coagulation, *Treatment facilities, Powdered carbon, Medical Unit Self-Contained Transportable(MUST).

An investigation was carried out on applicability of using polyelectrolyte-aided-carbon coagulation as a pretreatment in combination with a high-recovery reverse osmosis (RO) system to treat a synthetically prepared Medical Unit, Self-Contained, Transportable (MUST) hospital wastewater possessing variable characteristics. The five-source hospital waste consisted of X-ray, operating room, laboratory, shower, and kitchen waters. Two powdered carbons and four different cationic and anionic polymers were tested. Turbidity reductions of the treated waters reached as high as 97%, and total organic carbon removals averaged about 50%. Based on these results, a 10,000 gpd pilot plant was tested on a 200 hour basis (100 consecutive hours per run) to evaluate its performance by these parameters: total organic carbon removal, turbidity, pH, chemical oxygen demand, linear alkyl sulfonates, total hardness, total alkalinity, suspended solids, conductivity, silver, chromium, zinc, and RO flux and salt rejection. The principles of the completed system involved polyelectrolyte-aided carbon coagulation, upflow clarification, diatomaceous earth filtration, and demineralization by spiral-wound RO. The MUST wastewater was adequately treated by this process; dosages of 1000 mg/l Nuchar A and 100 mg/l Cat-Floc were successful in the field. The appendices contain the MUST wastewater formula and results of MUST water jar tests. (Wares-IPA)
W78-06296

PROCEEDINGS OF THE BIOCONVERSION ENERGY RESEARCH CONFERENCE HELD AT MASSACHUSETTS UNIVERSITY, AMHERST ON 25-26 JUNE 1973.
National Science Foundation, Washington, DC. Research Applied to National Needs.
For primary bibliographic entry see Field 5E.
W78-06298

A MODEL FOR MULTI-PERIOD REGIONAL WASTEWATER PLANNING,
North Carolina Univ. at Chapel Hill.
For primary bibliographic entry see Field 5G.
W78-06299

GUIDANCE REGARDING THE SETTING UP OF ENCAMPMENT HYGIENE AT A PERMANENT ENCAMPMENT AREA (OHJE LEIRIHYGIENIAN JARJESTELYSTA YSYVILLA LEIRIALUEILLA),
Research Center of the Defence Forces, Helsinki (Finland).
I. Waris, and J. Rasi.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 382, Price codes: A02 in paper copy, A01 in microfiche. Report No. USAMIIA-K-6744, July, 1976. 13 p, 2 fig. Translated from Finnish.

Descriptors: *Sanitary engineering, *Sewage treatment, Waste disposal, Human population, Community development, Facilities, Encampment hygiene.

Directives and recommendations are presented for use in determined proper placement of lodging and servicing areas on terrains for which the daily load exceeds 200 men. The placement guidance deals with resolving problems related to housekeeping centers and/or lodging areas of companies; field latrines, solid wastes, and wastewater are treated. Provisions are made for hygienic standards in water supply, nutritional provisions (preparation, transport, storage, and housekeeping), garbage handling (solid refuse, wastewater, and latrines), saunas and swimming beaches, vehicle maintenance stations, and environmental protection. (Wares-IPA)
W78-06300

SYMPOSIUM PROCEEDINGS: ENVIRONMENTAL ASPECTS OF FUEL CONVERSION TECHNOLOGY, II (DECEMBER 1975, HOLLYWOOD, FLORIDA).
Research Triangle Inst., Research Triangle Park, NC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 182, Price codes: A17 in paper copy, A01 in microfiche. Report No. EPA-600-2-76-149, June, 1976. 403 p, 77 fig, 88 tab, 286 ref, append. EHB529, 68-02-2125.

Descriptors: *Environmental effects, *Fuels, Technology, Control, Measurement, Conferences, Fuel conversion, Processes.

Proceedings of the symposium on environmental aspects of fuel conversion technology held December, 1975, in Hollywood, Florida, are presented. The objective of the symposium was to review and discuss environmentally related information in the field of fuel conversion technology. Specific topics addressed were environmental problem definition, process technology, control technology, and process measurements. (See W78-06303 thru W78-006307) (Wares-IPA)
W78-06302

COAL CONVERSION PROCESS WASTEWATER CONTROL,
McKee (Arthur G) and Co., Cleveland, OH.
T. A. Parsons, and R. A. Ashworth.
In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology, II (December 1975, Hollywood, Florida), p 225-231. 2 fig, 1 tab, 5 ref.

Descriptors: *Coals, *Effluents, Pollutants, Pollutant identification, Pollution abatement, Recycling, Wastewater disposal, Control, Environmental effects, *Fuel conversion, Recovery, Residuals.

Principal wastewater generating processes are identified from various unit operations incorporated in the process sequence of coal conversion plants. The magnitude and characteristics of the effluents expected from various coal conversion processes are described; these discharges are potentially highly pollutional unless wastewater control is engineered into the production facility. Process-oriented effluent control alternatives, which exploit the prospects for process revision, recovery, recycle, and serial reuse, are presented. Treatment-oriented effluent control concepts are analyzed for applicability to wastewater disposal situation. Technical problems associated with the implementation of wastewater control are discussed, and the expected performance of the wastewater control concepts are evaluated in terms of contributions of pollutants and residuals (See also W78-06302) (Wares-IPA)
W78-06303

A TAPERED FLUIDIZED-BED BIOREACTOR FOR TREATMENT OF AQUEOUS EFFLUENTS FROM COAL CONVERSION PROCESSES,
Oak Ridge National Lab., TN.
C. D. Scott, C. W. Hancher, D. W. Holladay, and G. B. Dinsmore.
In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology, II (December 1975, Hollywood, Florida), p 233-240. 3 fig, 2 tab, 9 ref.

Descriptors: *Environmental effects, *Biological treatment, Fluid mechanics, Microbiology, Degradation(Decomposition), Microorganisms, Biomass, Aerobic bacteria, *Fuel conversion, *Processes, Residuals, Bioreactors, Fluidized bed.

A bioreactor system based on a tapered fluidized bed is under development for the microbiological degradation of hazardous organic compounds expected in aqueous effluent waste streams from coal conversion processes. Such a system will be used with fluidized reaction medium alleviates operational problems associated with biomass buildup and allows easy removal or addition of the active materials. The tapered reactor tends to stabilize the fluidized bed while allowing a much wider range of operating conditions. Preliminary experimental results from a study made with a three inch diameter tapered fluidized bed reactor that contained adhering Pseudomonas bacteria and operated aerobically indicate that the phenol content of a feed stream can be reduced to less than 25 ppb. This concept is compatible with multistage operation, and scale-up is considered practical. (See also W78-06302) (Wares-IPA)
W78-06304

CLIMATIC EFFECTS ON WASTEWATER TREATMENT,
North Dakota State Univ., Fargo. Dept. of Civil Engineering.
S. L. Klemetson.
In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology, II (December 1975, Hollywood, Florida), p 241-251. 10 fig, 8 tab, 3 ref. ENG7510251.

Descriptors: *Climates, *Waste water treatment, Fuels, Water pollution, Biology, Pollutants, Facilities, Design, Path of pollutants, Coal gasification, Synthetic fuels.

Principal factors of the climate (temperature, solar radiation, heating days, wind roses, precipitation, and snowfall) are discussed in their relationship to wastewater treatment processes. Since the development of coal gasification processes to produce synthetic natural gas is expected to create potential pollution problems, the sources of pollutants at the site and basic constituents of the waste streams are described. The wastewaters are generally treated in several typical physical, chemical, and biological treatment processes. The effects of temperature variations on biological reaction rates, biological oxygen demand, removals, and detention times are estimated. It is recommended that more concern be placed on the effect of climatic conditions on wastewater treatment design, so that the potential for added pollution of water can be averted. It is considered that the physical and electrical design aspects require special attention to prevent malfunctions of their operations. The climate of a given area is concluded to affect the selection of the treatment sequence, which is chosen in terms of desired effluent limitations. (See also W78-06302) (Wares-IPA)
W78-06305

WASTE MANAGEMENT OF FUELS PROCESSING EFFLUENTS,
Exxon Research and Engineering Co., Florham Park, NJ.
G. W. Grove.
In: Symposium Proceedings: Environmental Aspects of Fuel Conversion Technology, II (December 1975, Hollywood, Florida), p 253-258. 6 fig.

Descriptors: *Fuels, *Waste water treatment, *Industrial wastes, Industrial water, Waste disposal, Technology, Energy, Economics, Sludge, Separation techniques, *Refineries.

Technology developed in the past several years for refinery wastewater treatment sludge concentration is described. It is speculated that refining of hydrocarbon fuels results in wastewater streams containing hydrocarbons, solids, and water. These contaminants must be removed from the water prior to discharge or reuse. Whether resulting from synthetic or conventional fuels refineries, the techniques for concentration and disposal of waste hydrocarbons and solids should be much the same. These techniques involve a series of concentration steps resulting in a reduced volume of sludge that can be treated in the lowest cost environmentally acceptable manner. The advantages of the new technology developed for such treatment sludge concentration include: less energy consumption, lower investment and operation cost, higher sludge concentration that reduces final sludge treatment or disposal cost, and improved separation of waste and water. (See also W78-06302) (Wares-IPA)
W78-06306

WATER REQUIREMENTS FOR AN INTEGRATED SNG PLANT AND MINE OPERATION,
Water Purification Associates, Cambridge, MA.
For primary bibliographic entry see Field 3E.
W78-06307

INTERACTION OF URBAN STORMWATER RUNOFF, CONTROL MEASURES AND RECEIVING WATER RESPONSE,
Florida Univ., Gainesville.
For primary bibliographic entry see Field 5B.
W78-06309

PROCESS MODIFICATIONS OF AEROBIC DIGESTION FOR PRODUCT STABILITY AND NITROGEN CONTROL,
Colorado Univ., Boulder.
R. B. Hartman.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-24,227. PhD Thesis, 1977, 223 p.

Descriptors: *Waste water treatment, *Biological treatment, *Aerobic treatment, *Sludge digestion, *Stability, Municipal wastes, Treatment facilities, Sludge, Nitrates, Nitrogen.

Aerobic digestion was evaluated for reducing odor and nitrate contamination problems associated with land application of sludges from waste water

treatment. Laboratory-scale studies indicated that biological oxidation of nitrogenous material in the sludge provided greated flexibility in sludge nitrogen control. The maximum digestion rate occurred near 30C. Product stability increased with detention time. The degree of stability depended strongly on a small biodegradable fraction that was oxidized shortly before the end of the digestion process. Additional alkalinity, which could be introduced by including a reactor for biological dentrification in the aerobic digestion sequence, was needed to maintain conditions favorable for completion of the nitrification reactions. Aerobic digestion of waste water sludges was considered viable, yielding a product which was highly stable and suitable for land application. (Snyder-FIRL)
W78-06316

EFFLUENT QUALITY VARIATION AT DIFFERENT ORGANIC LOADINGS WITH MULTICOMPONENT SUBSTRATE IN THE ACTIVATED SLUDGE PROCESS,
Vanderbilt Univ., Nashville, TN.
S. Siber.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-30373. PhD Thesis, 1977, 173 p.

Descriptors: *Activated sludge, *Organic loading, *Phenols, *Carbon, *Sulfur compounds, Model studies, Organic matter, Organic compounds, Waste treatment, Sludge treatment, Municipal wastes, Analytical techniques.

Parameters of substrate removal by activated sludge were examined in laboratory tests with a synthetic, organic multicomponent substrate used to simulate waste water. The substrate, a mixture of glucose, phenol, and sulfanilic acid, was treated with activated sludge in a continuous flow, completely-mixed laboratory-scale reactor. Parameters observed during the treatment process were the removal of substrate as measured by total organic carbon, removal at four food-to-microorganism ratios, influent and effluent quality, and the effect of sludge age on substrate removal. Combinations of the phenol, glucose, and sulfanilic acid were varied to more accurately approximate the removal, biodegradability, and influent concentration of each substrate. Overall removal rates were found to be the sum of the single substrate removal rates when analysed in terms of total organic carbon. A kinetics model was used to show the relationship of the parameters to effluent quality. (Lisk-FIRL)
W78-06322

DETERMINING THE ECONOMICS OF FILTER CAPPING,
J. H. Larson, and R. D. Letterman.
Water and Sewage Works, Vol. 124, No. 11, p 94-96, November 1977. 1 fig, 3 tab, 2 ref.

Descriptors: *Filter capping, Economics, *Optimization, *Waste water treatment, *Filtering, *Alternative costs, Effluents, Water pollution control, Equations, Filters, Sand filters, Anthracite, Coals, Electric power costs, Costs, Backwashing, Treatment facilities.

Unless chemical or electrical costs are inordinately high, capping of sand filters in wastewater treatment is an economical alternative only for plants using more than 5% of total plant pumpage for backwashing. Filtering mediums of granular bed filters should ideally store a large quantity of filtered solids with minimum head loss development, be readily cleaned by backwashing, and produce an effluent of acceptable quality. Compromises must be made in filter design since these requirements are not consistent. Current use is mainly of dual-media filters, consisting of a coarse anthracite layer on top of a layer of sand. Many conventional single-medium sand filters are being converted into dual-media filters through capping, in which, for example, a six-inch layer of sand is replaced by six inches of anthracite coal. Studies at filtration plants on Lake Michigan indicated that the capped filters permitted run lengths two to four times as long as sand-only filters, and effluent turbidity was about equal. Processed water is used to backwash a sand filter, and the increase in filter run length resulting from capping a sand filter is directly proportional to the savings in backwash water, provided the same quantity of water is required per backwash (which appears to be the case). Total plant pumpage is equal to consumer demand plus backwash water requirements. (Lynch-Wisconsin)
W78-06325

TECHNOLOGICAL ECONOMICS APPLIED TO WASTE RECOVERY AND TREATMENT PROCESSES,
Aston Univ., Birmingham (England). Dept. of Chemical Engineering.
A. V. Bridgwater.
Effluent and Water Treatment Journal, Vol. 17, No. 9, p 467-473, September 1977. 5 tab, 6 ref.

Descriptors: *Economics, *Waste treatment, *Capital costs, *Recycling, *Waste disposal, Costs, Technology, Taxes, Investment, Incentives, Marketing, Depreciation, Financing, Operating costs, Energy, Pollution abatement, Labor, Raw materials, Equipment, Planning, Treatment facilities.

As part of a series on economics of waste recovery and treatment processes, information is given for making rough estimates of capital costs. A table gives models for estimating costs of processes and operations (in British pounds), as of January 1977. Where economy of scale is limited, only a single cost is quoted, but usually at a stated capacity. Mixed process costs may be determined by adding together component costs. Cost models include liquid effluent treatment, solid waste treatment, gaseous emissions, deep well injection, chimney stacks, and lagoons or reservoirs. Additional tables provide equivalent data for equipment based on delivered costs and overall disposal and treatment costs, including both capital and operating costs. Economies of scale are not included in the latter. Constituent elements of operating costs are conventionally estimated as functions of raw materials, labor energy, fixed investment-related costs, and selling price; each of these factors is discussed in the text. Other aspects discussed are: depreciation, investment incentives, taxation, and markets for recovered materials. For the domestic refuse materials recovery industry, the potentially most valuable materials to recover are metal fractions; but as these tend to be relatively impure, not only will the price be low, but the scrap may not be recyclable by usual methods. (Lynch-Wisconsin)
W78-06327

ANNUAL REPORT, 1973, INSTITUTE FOR WASTE REMOVAL (SVA), THE NETHERLANDS.
Institute for Waste Removal (SVA), Amersfoort (Netherlands).
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 075, Price codes: A05 in paper copy, A01 in microfiche. Report EPA TR76-434, 1974. 92 p, 16 fig, 4 tab, 31 ref, 2 append. Trans by EPA, Research Triangle Park, N.C.

Descriptors: *Waste water disposal, *Waste water treatment, *Waste disposal, *Waste dumps, *Waste treatment, Sewage treatment, Sewage effluents, Research and development, Heat, Pollutant indentification, Cost analysis, *Combustion, Netherlands.

Institute activities for 1973 are reported. Topics include: (1) waste processing, removal, and dumping recommendations for municipalities and facilities; (2) testing procedures and results; (3) reports of working groups and commissions; (4) collection of data on quantities and nature of waste materials; (5) coordination of and participation in research activities; (6) visits to plants; (7) conferences and symposia; (8) lectures given; (9) recommendations and advice; (10) representations and attendance; (11) ancillary organizations; and (12) publications in journals. Three complete reports are included: (1) Energy from Wastes - a discussion of the use and cost benefit of refuse combustion-generated heat as an electricity and heating source, (2) Removal of hexavalent chromium poisons using activated charcoal columns, and (3) The combined processing of purification mud (mud which results from purification of household and similar types of non-toxic industrial wastewater) and solid wastes. (Seip - IPA)
W78-06343

CLEANING COAL WITH COAL: COAL HUMIC ACIDS FOR REMOVAL OF ACIDS, ALKALI, SALINITY, AND HEAVY METAL POLLUTANTS ASSOCIATED WITH THE USE OF COAL AS A FUEL,
Missouri Univ.-Columbia. Dept. of Chemistry.
S. E. Manahan, J. B. Green, J. Godwin, and B. Ting.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 580, Price codes: A09 in paper copy, A01 in microfiche. Missouri Water Resources Research Institute, Rolla, Completion Report, February 15, 1978. 178 p, 17 fig, 32 tab, 141 ref, 3 append. OWRT B-115-MO(2), 14-31-0001-4170.

Descriptors: *Humic acids, *Fly ash, *Coals, *Water pollution treatment, *Air pollution, *Coal combustion effluents, *Gas scrubbers, Sulphur dioxide, Combustion.

The use of humic acid (HA) (a constituent of low rank coal) and fly ash (FA) as potential scrubber chemicals for the treatment of water pollution arising from coal combustion effluents is investigated. HA is characterized and purification processes are described. Cation binding by HA is believed to occur via 3 main mechanisms: (1) ortho-phenolic-carboxylic chelation, (2) intra- and intermolecular exchange of acidi groups having appreciable acidity, and (3) exchange following hydrolysis of groups on HA. The mechanism of absorption of SO2 (a primary constituent of coal combustion effluents) by sodium humates is detailed. Absorption occurs mainly via simple neutralization, but SO2 is also complexed by HA under acidic conditions. Optimum SO2 sorption by HA-FA mixtures of various ratios is investigated. FA chemical makeup and properties are elucidated through selective dissolution in mineral acids. This behavior of FA in acids indicates that it contains several fractions of differing solubilities: an alkaline fraction, an Fe203-A1203 fraction, a magnetic Fe304 fraction and an Si02 fraction. FA is largely made up of spherical glass particles of varying sizes with mior amounts of crystalline matter. The chelating agents salicylic acid and HA dissolve FA at high pH. Conclusions are: an HA-FA system is feasible; HA is effective in dissolving FA; and HA-FA solutions absorb S02 well. Further research into HA-FA absorption of NOx species, the kinetics of FA dissolution in HA, the effect of HA and FA concentration on FA dissolution, the potential of HA-FA mixtures in other applications, the treatment and/or regeneration of HA in spent scrubbing solutions, and the treatment of sulfur buildup in scrubbing solutions is recommended. (Seip-IPA)
W78-06347

CHARACTERIZATION OF THE NON-VOLATILE ORGANIC MATERIAL DURING PHYSICAL-CHEMICAL TREATMENT OF THE DISTRICT OF COLUMBIA RAW WASTE-WATER,
Washington Technical Inst., Washington, DC. Water Resources Research Center.
M. H. Aldridge, T. A. Pressley, C. Chapin, and A. Welebir.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 267, Price codes: A03 in paper copy, A01 in microfiche. WRRC Report No. 9, Final Report, August, 1976. 28 p, 2 fig, 9 tab, 8 ref. OWRT B-007-DC(1), 14-34-0001-6066.

Descriptors: *Waste water treatment, *District of Columbia, *Chlorination, *Adsorption, *Filtration, *Organic wastes, *Nitrogen compounds, Analytical techniques, Volatility, Ethers, Organic compounds, *Physico-chemical waste water treatment, *Breakpoint chlorination, Carbon adsorption, *Dual-media filtration, Non-volatile organic wastes, Nitrogenous wastes, Amphoteric wastes.

A physical-chemical treatment process used in a D.C. pilot waste-water treatment plant was examined; it consists of low-lime clarification system which feeds effluent into two parallel systems: (1) breakpoint chlorination, carbon adsorption, and dual-media filtration, and (2) neutralization, carbon adsorption, and dual-media filtration. The systems were operated and tested for a 1-month period in September 1974. Systems, sampling and sample preparation procedures, separation scheme, analytical techniques, and reagents are described. The major portion of the organic materials in treated and untreated waste water exists as nonvolatile materials, of which 90% were classified as ether-insoluble, amphoteric materials. Organic bases represent the least amount of ether-soluble organic material; 95% or more of the ether-soluble materials existed as acidic and neutral materials. Following breakpoint chlorination and carbon adsorption, an increase in strong acids was observed; this may have been accompanied by a comparable increase in the volatile chloroform. Fifty % or more of the nitrogenous organic material in both untreated and treated waste water may be classified as volatile. The nonvolatile nitrogenous organic material existed as ether-insoluble, amphoteric materials. Proteins and amino acids, carbohydrates and hydroxylated aromatic compounds represented about 30% of the organic materials in the treated and untreated waters. Further study recommendations are included. (Seip-IPA)
W78-06353

OPTIMAL ARTIFICIAL AERATION DESIGN IN POLLUTED STREAMS RECEIVING THERMAL DISCHARGE,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
For primary bibliographic entry see Field 5G.
W78-06357

EFFICIENT AND EQUITABLE PRICING FOR WASTEWATER SYSTEMS: THE MADISON METROPOLITAN SEWERAGE DISTRICT,
Wisconsin Univ.- Madison. Dept. of Agricultural Economics.
J. H. Peterson, and D. W. Bromley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 170, Price codes: A08 in paper copy, A01 in microfiche. Wisconsin Water Resources Center, Madison, Technical Report, WIS WRC 77-09, 1977. 157 p, 10 figs, 44 tables, 116 refs. OWRT B-087-WIS(3), 14-0001-4139.

Descriptors: *Cost sharing, *Sewage treatment, Waste water treatment, Management, *Pricing policy, Cost-benefit analysis, Wisconsin, Utility rates, Water rates, Sewerage, Pricing models, Madison Metropolitan Sewerage District(Wis), Decision making.

Pricing policies for local public wastewater systems were investigated. The objectives of a pricing policy are the attainment of efficiency and equity. The existing pricing rules for both water and sewerage services are the result of traditional utility rate practices. The primary emphasis on rate design has been to structure rates which will recover all the costs of service. The concepts of economic efficiency and social equity have not been well defined; consequently, the ideas of efficiency and equity have become intertwined and confused. Cost allocation methods usually result in average cost pricing. Efficiency criteria require a method of marginal cost pricing. A price-making decision method is needed for wastewater management which will reveal the tradeoffs between the attainment of efficiency and equity, and will incorporate explicit value judgments as a part of the decision-making process. The pricing model developed in this study shows how wastewater managers can choose a pricing rule for sewerage services which can be considered to be both efficient and equitable. In most cases, a rule of average cost pricing may achieve both of these objectives, provided that a distinction is made among users as to the differences in spatially related costs.
W78-06358

CHLORIDES IN THE KRAFT RECOVERY SYSTEM,
Institutet for Vatten- Och Luftvardsforskning, Stockholm (Sweden).
H. Norrstrom.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 598, Price codes: A04 in paper copy, A01 in microfiche. Typescript, 26 p, 17 fig, November 1977.

Descriptors: *Chlorides, *Kraft pulping, *Pulp and paper industry, *Water pollution control, *Bleaching wastes, Effluents, Water pollution sources, Industrial wastes, Waste disposal, Corrosion control, Costs, Biochemical oxygen demand, Color, Recovery systems, Economics, Alternative costs.

Methods of reducing bleaching effluents in kraft paper pulp processing were investigated, especially the effects of elevated chloride levels on kraft mill processes and equipment, chloride bleedout systems, and chloride balances. Oxygen bleaching and prolonged cooking result in lower discharges at lower cost, while separate evaporation and ion exchange techniques result in increased cost. Marked reduction in bleach effluent can be achieved without recycle to the recovery. Bleaching effluents represent a large proportion of total discharges in the industry, and in a modern mill for conventionally-bleached softwood kraft pulp, over half of the seven-day BOD and almost 90% of the color originates in the bleaching process. Bleaching effluents may contain compounds that degrade slowly and could accumulate in living organisms. There are two principal ways of reducing bleaching effluents: (1) modified process technology, such as prolonged delignification in the cook; or (2) oxygen bleaching followed by final bleaching with minimal chlorination from the bleaching chemicals. Concentrating the organic part of the effluent can be achieved by system closure, membrane techniques, resin sorption, and the like. The concentrated stream can then be sent to a destruction system with no link to the mill system or to the recovery system. The drawback is the input of chlorine compounds to the recovery system and the build-up of chlorine. (Lynch-Wisconsin)
W78-06374

DECOMPOSITION OF SEWAGE SLUDGE COMPOST IN SOIL: II. PHOSPHORUS AND SULFUR TRANSFORMATIONS,
Agricultural Research Service, Beltsville, MD. Biological Waste Management Lab.; and Agricultural Research Service, Beltsville, MD. Soil Nitrogen Lab.
J. M. Taylor, L. J. Sikora, C. F. Tester, and J. Parr.
Journal of Environmental Quality, Vol. 7, No. 1, p 119-123, 1978. 2 fig, 2 tab, 32 ref.

Descriptors: *Clay loam, *Silts, *Sands, *Sludge, *Phosphorus, Sulfur, Loams, Sludge treatment, Sludge disposal, Incubation, Waste water treatment.

Varying amounts of sewage sludge compost were incubated for 54 days at 22C in Evesboro loamy sand, Christiana silty clay loam, and Fauquier silt loam to evaluate the production of extractable phosphorus and sulfur. The sludge compost was incubated with carbon dioxide and ammonia and in applications of 0, 2, 4, and 6% of the dry weight. The amounts of extractable phosphorus and sulfur were dependent upon immobilization by iron and aluminum and mineralization by microbial activity. The Fauquier soil-sludge medium yield the least amount of extractable phosphorus and sulfur, with initial immobilization followed by mineralization at 54 days. Phosphorus mineralization occurred initially in the Evesboro soil-sludge mixture, the medium with the highest extractable phosphorus, with immobilization at 54 days. Extractable sulfur increased in this mixture after 54 days. An initial increase in extractable phosphorus was observed in the Christiana soil-sludge mix, followed by a decrease of phosphorus during incubation. Extractable sulfur was immobilized in this mixture during the early incubation period; higher compost applications of 4 and 6% produced subsequent sulfur mineralization. Applications of sludge compost adequately supplied or altered phosphorus and sulfur concentrations for plant growth. (See also W78-04581) (Lisk-FIRL)
W78-06414

MATHEMATICAL MODELING AND ECONOMIC OPTIMIZATION OF WASTE-WATER TREATMENT PLANTS,
Louvain Univ. (Belgium). Dept. of Engineering.
D. Tyteca, Y. Smeers, and E. J. Nyns.
Critical Reviews in Environmental Control, Vol. 8, No. 1, p 1-89, 1977. 10 fig, 11 tab, 231 ref.

Descriptors: *Mathematical models, Analytical techniques, *Treatment facilities, *Bibliographies, *Activated sludge, *Waste water treatment, Aeration, Biological treatment, *Reviews, Anaerobic treatment, Sludge digestion, Cost-benefit analysis, *Optimization, Dynamic programming, Waste water treatment, Mathematical studies, Municipal wastes.

Mathematical modeling procedures in waste water treatment plant processes were evaluated in an effort to achieve economic optimization of treatment facilities. A framework of treatment plant methods was developed for unit processes employing primary settlers, activated sludge aeration, secondary settlers, sludge thickening, sludge digestion, and press filtration. A review of mathematical models describing the kinetics of bacterial growth and substrate elimination was presented for single and multicomponent substrates, and microbial decay and growth stages. Model applications to biological treatment of waste water were evaluated with respect to kinetic parameters, including: oxygen demand, oxygen transfer efficiency, temperature effects, sedimentation, clarification, flocculation, and filtration. Mathematical models were developed for each of the treatment processes in the framework with respect to the interrelationships of the kinetics parameters. A study of dynamic models, trickling filters, thickening processes, anaerobic digestion kinetics, press filtration, and energy requirements of aeration devices was also conducted. Models of global treatment processes encompassing total plant operations and costs associated with each process unit were considered. The development of economic optimization models based on global models was attempted to maximize efficiency and minimize costs. The optimization study was directed toward activated sludge and anaerobic digestion processes, whole treatment plant cost minimization, and network optimization. (Lisk-FIRL)
W78-06415

SLUDGE COMPOSTING: A DISCUSSION OF ENGINEERING PRINCIPLES, PART I,
Los Angeles-Orange County Metropolitan Area Project. Regional Wastewater Solids Management Program.
R. T. Haug, and L. A. Haug.
Compost Science, Vol. 18, No. 6, p 6-11, November-December, 1977. 7 fig, 1 tab.

Descriptors: *Sludge treatment, *Biodegradation, *Volatility, *Aeration, *Sludge digestion, Degradation(Decomposition), Dewatering, Analytical techniques, Mathematical models, Sludge disposal, Waste water treatment, Municipal wastes.

Mathematical models were developed to represent the thermodynamic behavior of sludge composted by several techniques with and without amendments. The methods included: the windrow system, in which piles of waste are periodically rotated; the aerated pile system in which waste piles are maintained under aerobic conditions without turning; and the mechanical method, in which sludge is constantly rotated and aerated. A sludge composting mass balance equation, applicable to the aerated pile, the windrow, and the mechanical composting methods, was presented for calculating the quality of the compost material, recycle ratios for both dry and wet weights, the compost recycle solids, and the final desired solids contents. Techniques were developed for controlling volatile solids production during composting, based on the relationship to moisture content and mass balance. Volatility of the compost was found to decrease as the amount of cake solids decreased and recycled compost increased. Measures suggested for maintaining or increasing mixture volatility were: to increase the dewatered cake solids by drying the sludge before composting; to compost raw sludge rather than digested sludge solids; or to add a dry, degradable organic amendment. The volatilities examined exhibited a linear relationship to the total weight of the amendment required. (Lisk-FIRL)
W78-06416

SIMULATION STUDIES ON OPTIMIZATION OF THE ACTIVATED SLUDGE PROCESS,
Toledo Univ., OH. Dept. pf Civil Engineering.
D. I. Angelbeck, and A. B. Shah-Alam.
Journal Water Pollution Control Federation, Vol. 50, p 31-39, January, 1978. 4 fig, 1 tab, 30 ref.

Descriptors: *Activated sludge, *Mathematical models, *Aeration, *Microorganisms, *Analytical techniques, Optimization, Nutrients, Dynamic programming, Waste water treatment.

Optimization of the activated sludge treatment process of waste water was investigated in simulation studies with dynamic modelling. Two system differential equations were derived for the analysis of sludge and substrate mass balance. Microorganism mass balance in a completely mixed aerator was calculated as a function of influent sludge concentration and flow rate, microbial growth rate and endogenous decay rate coefficients, and dilution rates. Sinusoidal curves for system dynamics were used to evaluate the variations of influent microbial concentrations and substrate levels. System control was maintained by aerator detention time and sludge wastage rate. Optimal operational control of the system with a variational calculus technique minimized the desturbances in the effluent quality. Aerator detention time and sludge wastage rate were found to control the magnitude of the effect of system perturbations on the effluent quality. (Lisk-FIRL)
W78-06417

MEASURING AND PREDICTING FLOTATION PERFORMANCE,
Toronto Univ., (Ontario). Dept. of Civil Engineering.
R. Gehr and J. G. Henry
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 203-215, February, 1978. 11 fig, 3 tab, 14 ref.

Descriptors: *Flotation, *Dissolved oxygen, *Forecasting, *Laboratory tests, *Continuous flow, Model studies, Saturation, Analytical techniques, Treatment facilities, Separation techniques, Waste water treatment, Municipal wastes.

Techniques for the measuring and predicting dissolved oxygen flotation performance in waste water treatment were developed in laboratory batch tests and full-scale continuous flow flotation experiments. The dissolved air flotation process, involving air introduction, pressurization, polymer addition, blending, and flotation, was evaluated with respect to a series of parameters measured in the effluent samples. An air saturation level of 90% was recorded after batch flotation; a saturation of 41-52% was measured in the continuous flow full scale operation. The correlation between float solids concentration and the air-solids concentration was not significant. A thickening parameter was used in the batch tests to assess sludge amenability to flotation and to evaluate the effect of polymer dosage on flotation. When the thickening parameter was held constant during continuous flotation, changes in float solids concentration, recycle volume, influent volume, and available air mass could be predicted. Saturation levels in both batch and continuous flotation processes were 90% when the pressurizer in the continuous flow flotation operation was not allowed to clog. Flotation performance was directly dependent upon polymer dosage. Continuous flow flotation systems provided greater thickening and a clearer subnatant than the batch units. (Lisk-FIRL)
W78-06418

FACTORS INFLUENCING OXYGEN INPUT IN AERATORS WITH VERTICAL SHAFT (AZ OXIGENBEVITELT BEFOLYOASOLO TENYEZOK A FUEGGOLEGES-TENGELYU FELUELETI LEVEGOZTETOKNEL),
For primary bibliographic entry see Field 8C.
W78-06419

HYDRAULIC INVESTIGATION OF THE OPERATION OF DIFFERENT DESIGNS OF SECONDARY SETTLERS (IDRAVLICHESKOE ISSLEDOVANIE RABOT'L VTORICHNJIKH OTSTOINIKOV RAZLICH'IKH KONSTRUKCII),
For primary bibliographic entry see Field 8C.
W78-06420

MEASUREMENT OF TRICKLING FILTER EFFECT ON POLLUTED RIVERS (MESSUNG DES BENTHALEFFEKTS IM VORFLUTER),
Technische Hochschule, Darmstadt (West Germany). Inst. fuer Wasserversorgung, Abwasserbeseitigung und Raumplanung.
For primary bibliographic entry see Field 5B.
W78-06421

1978 SEWERAGE PROJECT FORECAST.
For primary bibliographic entry see Field 5G.
W78-06423

THE BARCELONA CONVENTION AND ITS PROTOCOLS,
Ministry of Foreign Affairs, Rome (Italy).
For primary bibliographic entry see Field 5G.
W78-06424

ENVIRONMENTAL POLLUTION CONTROL IN METROPOLITAN ATHENS,
Environmental Pollution Control Project, Athens (Greece).
For primary bibliographic entry see Field 5G.
W78-06425

COMPUTERIZATION AND AUTOMATION OF WASTEWATER SYSTEMS,
For primary bibliographic entry see Field 5G
W78-06427

CALCULATION OF FLOW RESTRICTION LENGTHS FOR RAIN OVERFLOW AND BASINS (BERECHNUNG DER DROSSELSTRECKE VON REGENUEBERLAEUFEN UND REGENBECKEN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
For primary bibliographic entry see Field 8B.
W78-06428

CITY STORM SEWERS DUG IN CLOSE QUARTERS.
For primary bibliographic entry see Field 8C.
W78-06429

NEW SHALLOW SEWER BEATS HIGH COST OF DEEP GRAVITY SYSTEM,
For primary bibliographic entry see Field 8G.
W78-06430

SEWER STRATEGIES FOR THE DALES AND THE FENS.
Surveyor, Vol 151, No 4465, p 14, January, 1978.

Descriptors: *Sewerage, *Storm water, *Treatment facilities, *Floods, *Infiltration, Sewers, Storm runoff, Storm drains, Pumping plants, Waste water treatment, Municipal wastes.

Sewage system overloads in West Yorkshire and Spalding, England, have been eliminated through the construction of new sewage treatment facilities. Sewage overflows in the Denby Dale area of Yorkshire had caused flooding of a gummed paper manufacturing plant several times a year. The Clayton West treatment works, with a design capacity of 1022 cu m/day and an actual flow of 2200 cu m/day, will be enlarged to a capacity of 5500 cu m/day. Sewers will be relaid to prevent infiltration and flooding. The overloaded treatment works at Spalding will be replaced by a new sewage treatment facility. Flooding was primarily caused by the unreliable storm water pumping system of the old works. The new treatment facility will provide partial sewage treatment before effluent is discharged into the River Welland. The new pumping system will include individual rising mains in each pumping station; all uncontrolled storm flows are now being handled by two storm drains. (Lisk-FIRL)
W78-06431

UPDATING AND COMPLETING SEWER RECORDS COULD COST LESS THAN YOU THINK.
For primary bibliographic entry see Field 8G.
W78-06432

MEASURING PRESSURE SURGES IN PIPELINES.
For primary bibliographic entry see Field 8G.
W78-06433

PIPELINE FLOATED ACROSS RIVER.
For primary bibliographic entry see Field 8F.
W78-06434

DIRTY 'OLE MAN RIVER' GETTING CLEANED UP.
For primary bibliographic entry see Field 8F.
W78-06435

NEW PORTOBELLO OUTFALL.
Water and Waste Treatment, Vol 20, No 12, p 28-31, December, 1977. 3 fig.

Descriptors: *Outlets, *Outfall sewers, *Pumping stations, *Conveyance structures, *Sewerage, Diffusion, Penstocks, Tunnel construction, Pipes, Protective coatings, Waste water treatment, Municipal wastes.

A new outfall constructed at the Portobello cliffs in England has a dry weather flow capacity of 5,800 liters/sec, a discharge rate 10 times that of the 1928 outfall it replaces. The outfall tunnel has a diameter of 3.4 m and a length of 1,830 m and will discharge treated effluent through a diffuser at a low tide ocean depth of 14.4 m. The shaft from the pumping station to the outfall tunnel was laid in water-bearing chalk which required manual excavation and peripheral ring grouting around the outside of the shaft for support. A nine shaft diffuser system with four port diffuser heads mounted on each shaft was installed on the last 347 m of the outfall. Waste water is treated at the pumping station which combines mesh cup screens, grit dredging, and solids dewatering and pressing. Preparation of the pumping station site in the chalk cliff was required before construction of the foundation. The final cost of the project was estimated at 3.7 million pounds sterling. (Lisk-FIRL)
W78-06436

IPEFREEZING A SEWER.
For primary bibliographic entry see Field 8C.
W78-06437

. TOUGH CONTENDER FOR PIPEWORK. IMPLE AS ABS,
or primary bibliographic entry see Field 8G.
W78-06438

TANDBY POWER.
or primary bibliographic entry see Field 8C.
W78-06440

EWATERING SLUDGE CONTAINING SOLID IATTER AND BOUND AND UNBOUND VATER.
ustralian Patent 488,609. Issued December 8, 977. The Australian Official Journal of Patents, rademarks, and Designs, Vol 47, No 46, p 4168, ecember, 1977.

escriptors: *Dewatering, *Sludge treatment, Alkalis(Bases), *Hydrogen, *Patents, Carbon, odium compounds, Calcium hydroxide, Potassin compounds, Design data, Waste water treatent, Municipal wastes.

process using an amine to dewater sludge consting of solid materials and water has been tented. The technique involves mixing an amine ntaining an alkyl or hydrogen, an alkyl radical th one to six or two to six carbon atoms, and a tal number of carbon atoms from three to seven, th the sewage sludge. The temperature is mainined below the inverse critical solution temperare of the amine. The reduced temperature causes e formation of a solid and a liquid which conns the amine and the water. After separation of e liquid and solid phases, the temperature of uid phase is raised to above the critical solution nperature, thereby separating into an amine and iquid. The amine is removed from the water and xed with an alkaline solution containing lithium droxide, sodium, or potassium salt of a weak id solution. The addition of a hydroxide solution duces the residual amine in the solid. (Lisk-RL)
78-06441

WASTE TREATMENT PLANT.
Australian Patent 488,148. Issued November 17, 1977. The Australian Official Journal of Patents, Trade Marks, and Designs, Vol 47, No 43, p 3920, November, 1977.

Descriptors: *Aeration, *Settling basins, *Patents, *Scum, *Aerobic treatment, Water purification, Reaeration, Waste water treatment, Design data, Equipment, Municipal wastes.

A waste water treatment tank that utilizes an aeration process and a settling basin has been patented. The tank is divided into two parts by an interior, centrally-located baffle. One side of the tank contains an aeration unit which aerates the waste water and maintains a continuous state of turbulence. The waste water passes into the aeration chamber of the tank through an inlet. After aeration, it is transferred by the interior baffle into the adjacent settling chamber containing an outlet. The waste water undergoes settling in this chamber; scum is recovered from the waste and recirculated to the aeration chamber via a recirculation device. (Lisk-FIRL)
W78-06442

WASTEWATER TREATMENT.
Australian Patent 488,263. Issued November 24, 1977. The Australian Official Journal of Patents, Trade marks, and Designs, Vol 47, No 44, p 3990, November, 1977.

Descriptors: *Biochemical oxygen demand, *Nitrates, *Biodegradation, *Patents, *Aeration, Denitrification, Design data, Aerobic bacteria, Aerobic treatment, Waste water treatment, Municipal wastes.

A raw waste water treatment process which reduces BOD levels through partial recycling of the denitrified effluent has been patented. The BOD content of the sewage effluent is reduced by aeration in an aeration chamber. Nitrogen compounds are oxidized to nitrates by biodegradation with aerobic microorganisms. The nitrates are conveyed to a denitrification zone where the nitrate-bearing waste water is denitrified. A part of the waste water containing nitrates which has been partially treated is returned and mixed with the raw influent in a facultative zone. This recycling of a portion of the waste water effects a BOD reduction in the raw effluent and a nitrate reduction in the recycled waste water. (Lisk-FIRL)
W78-06443

PROCESS AND APPARATUS FOR THE BIOLOGICAL PURIFICATION OF EFFLUENT.
Australian Patent 488,242. Issued November 24, 1977. The Australian Official Journal of Patents, Trademarks, and Designs, Vol 47, No 44, p 3985, November, 1977.

Descriptors: *Activated sludge, *Aeration, *Settling basins, *Patents, *Design data, Equipment, Oxygen, *Biological treatment, Waste water treatment, Municipal wastes.

A biological treatment system using two interchangeable basins to aerate and settle waste water has been patented. The two connected basins have air-tight sealed inlets. Sewage effluent is introduced into the first basin, where it is injected with pure oxygen or oxygen-enriched air. Activated sludge is administered and the mixture is retained in the basin for a predetermined period. The aerated effluent is then passed into the second basin, where sedimentation of solids occurs. Clarified water is removed from the tank until the activated sludge level in the first basin decreases to a predetermined level. At this point, the process is reversed and the second basin is transformed into an aeration tank while the first basin operates as a sedimentation basin. (Lisk-FIRL)
W78-06444

RESIDUES DEWATERING DURING WATER AND SEWAGE TREATMENT--BY FREEZING WITH COOLING AGENT LAYERWISE AND MELTING TO DEPOSIT RESIDUES.
Soviet Patent SU-546-566. Issued March 3, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 1, p 1, February, 1978.

Descriptors: *Dewatering, *Freezing, *Specific gravity, *Patents, *Melting, Separation techniques, Sludge, Solid wastes, Filtration, Design data, Waste water treatment, Municipal wastes.

A patent has been issued for a dewatering process in which residues from waste water treatment plants are frozen in a column with a cooling agent, such as n-butane; liquids are melted and decanted in the same column. The residues are introduced into the top of a column in which the cooling agent flows upwards. The n-butane has a density of 0.5-0.85 g/cu cm and a specific gravity of 0.605 g/cu cm at -5C. Depending upon column height, the temperature varies from -10 to 4C over 0.1-3 min in the cooling zone and from 0-4C over 0.1-6 min in the melting zone. For residues containing hydroxides, aluminum salts, organics and mineral materials, 250 liters of the cooling agent is added to the column for 14 liters of de-aerated liquid. The liquid effluent sinks to the bottom of the column where the temperature is 1.5C; vapor forms in the top layer where the temperature is -9C. Ice particles formed in the upper layer drop through the liquid levels, carrying residue particles to the bottom layer where they melt. Vacuum filtration removes the residue particles; the liquids are separated according to their specific gravities. The cooling agent is condensed and reused. Dewatering is increased by performing freezing, melting, and decanting in the same column. (Lisk-FIRL)
W78-06445

PACKAGED PLANT FOR PHYSICOCHEMICAL PURIFICATION OF WASTE WATER--WITH GRAVITY EVACUATION OF SLUDGE FROM FLOCCULATING AND DECANTING ZONES.
Belgian Patent BE-858-720. Issued January 2, 1978. Derwent Belgian Abstracts, Vol. A, No. 3, p 4 February, 1978.

Descriptors: *Flocculation, *Separation techniques, *Patents, *Gravity, *Sludge disposal, Coagulation, Neutralization, Construction materials, Plastics, Steel, Baffles, Waste water treatment, Municipal wastes.

A physicochemical waste water treatment plant that separates liquids and solids and discharges settled sludge by gravity flow has been patented. The packaged treatment plant is contained in a three compartment steel tank. An upper rectangular compartment coagulates and neutralizes the incoming waste water. The liquid is passed beneath partitions into a flocculation and separation chamber having walls inclined toward the third compartment. Baffles mounted on the inclined walls of both the second and third chambers reduce the velocity of the inflowing waste water. Solids separated in the flocculation compartment are evacuated by gravity flow to the third decantation and sludge disposal chamber. The plastic baffles mounted in the lower chambers are inclined at an angle of 55-60 degrees to the walls. The treatment plant has a flow capacity of 1-50 cu m/hr and provides economical installation and operation. (Lisk-FIRL)
W78-06446

SEWAGE SLUDGE TREATMENT BY STEAM--USING COMPRESSED AIR TO PREVENT BUBBLE ESCAPE.
French Patent FR-2343-703. Issued November 10, 1977. Derwent French Patent Abstracts, Vol. A, No. 1, p 3, February, 1978.

Descriptors: *Sludge treatment, *Steam, *Bubbles, *Heat treatment, *Patents, Heating, Aerobic treatment, Sludge disposal, Water purification, Separation techniques, Design data, Waste water treatment.

A patent has been issued for a heat treatment process for sewage sludge clarification. Steam and compressed air are introduced simultaneously into a sludge reactor. The escape of air bubbles from the reactor is prevented by the flow of compressed air distributed evenly over the surface of the sludge. After heat treatment, clarified water is separated from the sludge and decanted from the reactor for treatment in an activated sludge tank. Noxious gases produced during heat treatment of the sewage sludge are deodorized. The unit is self-contained and does not require high temperatures. (Lisk-FIRL)
W78-06447

WHITHER AUTOMATIC CONTROL IN THE SEWAGE TREATMENT FIELD,
Kent Instruments Ltd., Luton (England).
L. Thurley.
Water Services, Vol. 81, No. 981, p 693-696, November, 1977. 2 fig.

Descriptors: *Automatic control, *Analog models, *Digital computers, *Analog computers, *Activated sludge, Settling basins, Storm water, Screens, Sludge disposal, Treatment facilities, Waste water treatment, Municipal wastes.

The expansion and automation of waste water treatment facilities with analog discrete units or digital processes to meet effluent standards are discussed. Analog units include a flow control loop that operates a statutory recorder with a penstock to restrict the flow of storm runoff. A monitor for the coarse and fine screens can activate a rake mechanism or additional screening. Isolation penstocks with relay circuitry control the velocity in the grit separator with additional flumes, detritors, or macerators. Analog principles or inflow channel flumes are used to equalize the flow of waste into the primary sedimentation tanks. An ultrasonic sludge level detector regulates the hydrostatic removal of sludge on a time or suspended solids basis. The activated sludge controls involve a magnetic flow controller and detector head or a flow summation monitor of individual activated sludge channels. Mackereth probes are used for dissolved oxygen level monitoring. Preset digital processors automatically control the storm water inflow, primary sedimentation, and final sedimentation. Screens and detritors are automatically activated in sequential order according to flow rate. The handling, treatment, and disposal of sludge is more efficiently handled with the aid of visual and printed data from the digital processors. (Lisk-FIRL)
W78-06448

HORSHAM'S NEW STW HANDLES INCREASING POPULATION.
Water Services, Vol. 81, No. 981, p 705-706, 708-709, November, 1977. 1 fig.

Descriptors: *Sewerage, *Treatment facilities, *Biological treatment, *Dewatering, *Outlets, Humus, Intakes, Pumping plants, Waste water treatment, Municipal wastes.

The new municipal waste water treatment plant in Horsham, Sussex, England, with a daily effluent load of 335,000 liters and a BOD load of 414 kg, was constructed to alleviate the 342% overload on the existing facilities. The inlet works and pumping station, with three screw pumps, have a capacity of 2,680 liters/sec; an additional pump with a 1,320 liter/sec capacity is planned. Two storm water tanks were constructed with space provisions for two additional storm water holding tanks. Sewage effluent is mechanically screened and then hydrostatically desludged in two sedimentation tanks. Four biological filters are operated with alternate double filtration. Effluent is further treated by two interchangeable primary and two secondary humus tanks which return effluent to the secondary biological filters. Two sludge holding tanks dewater sludge that is conditioned with a polyelectrolyte and pressed by horizontal filter belts. Flowmeters monitor effluent and activate diesel generators for alternate power sources in the event of a power failure. Treated effluent is discharged into the River Arun through three outfalls. (Lisk-FIRL)
W78-06449

TREATMENT PLANT AND PIPELINE FLOW CONTROLLED BY MINICOMPUTER SYSTEM.
Water Services, Vol. 81, No. 981, p 700-701, November, 1977. 2 fig.

Descriptors: Computers, *Treatment facilities, *Biological treatment, *Data transmissions, *Control systems, Flow control, Pipelines, Sewerage, Transportation, Aeration, Screens, Sludge disposal, Outlets, Waste water treatment, Municipal wastes.

The largest municipal waste treatment facility in the Netherlands, located in Eindhoven, is controlled by a Philips P800-series minicomputer with telemetry links. The Eindhoven facility, with a population capacity of 750,000, also receives sewage from several southern villages via a 46 km long pipeline. The treatment processes, including bar screening, grit removal, primary and secondary sedimentation, aeration, and sludge pumping, are monitored and controlled by a computer system which furnishes visual and printed information on levels, flows, motor currents, and operating times. Six pumps, controlled by the computer's monitoring of the waste levels in the supply channels, have been installed to optimize pumping operations between the bar screens and the grit chamber. Dissolved oxygen levels in the three aeration basins are maintained by 24 loops controlled by the computer. Excess sludge pumping and routing to another treatment facility, as well as measurement of effluent quality parameters at the discharge point, are controlled by the computer. A Philips RL 200 time division multiplex telemetry system relays pipeline information to the central control room at the treatment facility. Based upon the pipeline data, the computer provides optimal use of the buffer in the pipeline and prevents or reroutes overflows. (Lisk-FIRL)
W78-06450

AGENCY SOUGHT FOR CANADIAN DOMESTIC UNIT.
Water and Waste Treatment, Vol. 21, No. 1, p 17, January, 1978.

Descriptors: *Aeration, *Settling basins, *Activated sludge, *Patents, *Domestic wastes, Microbial degradation, Water purification, Sands, Filters, Carbon dioxide, Waste water treatment, Waste water disposal, Sludge disposal, Municipal wastes.

A domestic sewage treatment unit that produces purified water and non-odorous sludge has been developed for distribution in England by Waltec Industries Limited of Penctanguishene, Ontario, Canada. The 'Aquarobic' unit, intended as a replacement for domestic septic tanks, consists of a 600-gal fiberglass aeration tank and a 90-gal settling basin. The system utilizes aeration and microbial degradation to purify waste water. Excess air is introduced into the raw waste by an elelctro-mechanical pump. Aerobic microorganisms consume the carbon-bearing pollutants in the sewage, producing carbon dioxide and inert chemical ash. The waste water is passed through a sand filter before discharge into the surrounding land. The sludge can be contained in the tank for a period of up to eight years before removal is required. The unit has a capacity of up to eight years before removal is required. The unit has a capacity of 400 gal/day and requires 0.39 kilowatts/hour electrical power for operation of the air supply pump. (Lisk-FIRL)
W78-06451

SAFETY INTERLOCKING AT SEWAGE WORKS.
Water and Waste Treatment, Vol. 21, No. 1, p 22, January, 1978.

Descriptors: *Treatment facilities, *Biological treatment, *Filters, *Safety factors, *Locks, Safety, Equipment, Design data, Structural design, Waste water treatment, Municipal wastes.

Castell Locks, a European safety interlocking manufacturer, has developed a safety lock system for waste water treatment plants. Full-scale testing of the system was conducted at a treatment plant in Wolverhampton, England. Six biological filter beds were equipped with power isolators and interlocks which prevent access to the beds when the electric current is connected. A Castell switch isolates the power supply to the beds, releasing a key when the switch is activated. The key releases the interlocks on the access doors and cannot be removed while the door is open. This safety precaution prevents the connection of the filter beds requires its own key, preventing access to one filter bed with the key from another. The system has been shown to be a cost-effective method of providing protection for plant personnel. (Lisk-FIRL)
W78-06452

NEW METHOD INJECTS SLUDGE INTO SOIL.
Water and Waste Treatment, Vol. 21, No. 1, p 17, January, 1978.

Descriptors: *Sludge digestion, *Sewage sludge, *Application methods, *Fertilizers, Equipment, Nitrogen, Soil treatment, Fertilizers, Farm wastes, Experimental farms, Waste water treatment, Waste water disposal, Municipal wastes.

A technique has been developed for injecting sewage sludge and agricultural slurries several inches below the soil surface. The method, which was developed to eliminate the visual and odor pollution resulting from land application of sewage effluent, utilizes a slave tanker equipped with sludge injection tubes. Two coulter discs and tines, mounted on the tanker, open a furrow into which sludge is injected through tubes attached to the backs of the tines. Two pairs of spring plates replace the gound over the sludge. This technique allows for the application of sludge on steeper gradients and reduces nitrogen loss from the sludge in the soil. On-site testing of the apparatus was conducted at the Anglian Water Authority's Great Billing works in England where 71% of the fertilizer used for agriculture is of sewage sludge origin. The process has been effective in the application of about 150 cu meters of digested sludge/sq acre of land at a rate of 1.8 cu m/min. (Lisk-FIRL)
W78-06453

DUTCH TREAT SEWAGE BY COMPUTER SYSTEM.
Processing, Vol. 24, No. 1, p 21, January, 1978. 2 fig.

Descriptors: Computers, *Treatment facilities, *Biological treatment, *Data transmissions, *Control systems, Flow control, Pipelines, Sewerage, Transportation, Aeration, Screens, Sludge disposal, Outlets, Waste water treatment, Municipal wastes.

A Philips P800-series minicomputer controls and monitors pipeline flows, water quality, and secondary treatment of sewage effluent at a municipal facility in Eindhoven, the Netherlands. The Eindhoven treatment facility, the largest waste water

treatment plant in the Netherlands, receives effluent from six pumping stations conveying wastes along a 46 km pipeline. The computer controls the plant's treatment processes, including coarse screening, grit removal, primary sedimentation, aeration, secondary sedimentation, and sludge pumping. The computer has been able to optimize the pump operation between the coarse screening and the grit removal chamber by automatically activating the pumps in sequential order to maintain a desirable level of waste in the channel. Pipeline flow data are fed into the computer via a time-division multiplex telemetry system. The computer is able to provide optimum buffer capacity in the pipes and prevent or reroute overflows. Monitoring equipment records the pH, redox potential, dissolved oxygen, temperature, conductivity and other parameters of effluent discharged into the Dommel River. Similar monitoring is conducted in the river above the point of discharge. The minicomputer furnishes a printout listing of water levels, flow rates, motor currents, operating hours, and other data. (Lisk-FIRL)
W78-06454

U.S.A. TRY RADIATION AGAIN.
Water and Waste Treatment, Vol 20, No 11, p 14, 16, November, 1977.

Descriptors: *Disinfection, *Radiation, *Gamma rays, *Cesium, *Pilot plants, Dewatering, Centrifugation, Sludge digestion, Sludge disposal, Fertilizers, Pathogenic bacteria, Waste water treatment, Municipal wastes.

Pilot plant investigations of the treatment of dried or composted sludge with ionizing gamma radiation to reduce pathogen levels are being conducted at the Sandia Laboratories in Albuquerque, New Mexico. The dried or composted sludge may be use for fertilizer or soil conditioner if pathogen levels are sufficiently reduced by irradiation. Small lots of the sludge are exposed to one megacurie of cesium-137, a waste product of nuclear reactors, activated by photons of 10 million electron volts. The sludge will be exposed to the gamma radiation in doses ranging from several thousand rads to several million rads. Doses of one million rads or less are expected to sufficiently reduce the pathogen levels in the sludge. Experiments will also be conducted on raw and digested sludge which has been dewatered by air drying, centrifugation, or filter pressing. The cost of the irradiation procedure is estimated at $60-70 per dry ton of sludge. (Lisk-FIRL)
W78-06455

FINE FILTRATION OF WASTE WATER USING ROTO-KLAER (FEINSIEBUNG VON ABWAESSERN DURCH DEN ROTO-KLAER),
Ingenieurberatung G. Morszeck, Hameln (West Germany).
V. W. Schoettler, and R. Schinke.
Fette-Seifen-Anstrichmittel, Vol 79, No 12, p 492-494, December, 1977. 1 fig.

Descriptors: *Filtration, *Separation techniques, *Filters, *Trickling filters, *Sands, Particle size, Seive analysis, Seives, Sewage treatment, Waste water treatment, Municipal wastes.

Applications of the ROTO-KLAER filter, manufactured by the Noggerath Co, for clarification of sewage at municipal treatment plants are presented. The ROTO-KLAER is capable of filtering fine material from sewage with a drum sieve unit. The filtration unit replaces the conventional sand traps a preclarification basins. The need for strainer racks is also eliminated by the ROTO-KLAER filter. The elimination of sand traps, preclarification basins, and strainer racks compensates for the higher cost of the ROTO-KLAER drum sieve. The overloading of trickling filter plants can be avoided and processes improved with the installation of the drum sieve filter. Installation information and additional application of the filter are also presented. (Lisk-FIRL)
W78-06456

OXYGEN INJECTION AT WORK'S INLET.
Water and Waste Treatment, Vol 21, No 1, p 16, January, 1978.

Descriptors: *Oxygenation, *Oxygen, *Odor, *Pilot plants, *Aerobic treatment, Waste water treatment, Sewage treatment, Treatment facilities, Sewage effluent, Municipal wastes.

An oxygen injection system, developed by BOC Ltd of England, has eliminated the odor problem at the Holdenhurst Sewage Treatment Works in England. Odors emanating from the treatment facility during holiday seasons were controlled by the pilot installation of the Vitrox system at the inlet to the waste treatment plant. About three-quarters of a ton of oxygen is injected daily into sewage waste as it arrives at the plant. The Vitrox system was found to afford an additional advantage to that of odor elimination. The additional oxygen enhances the biological treatment and quality of the sewage effluent, which receives a total oxygen load of more than 2 tons/day. Plans are being completed for the permanent installation of an oxygen injection plant at the Holdenhurst treatment facility. (Lisk-FIRL)
W78-06457

EXPERIMENT TO PRODUCE COMMERCIAL SOIL CONDITIONER FROM SEWAGE SLUDGE PROVES SUCCESSFUL.
For primary bibliographic entry see Field 5E.
W78-06458

HYGIENIZATION OF SEWAGE SLUDGE BY ELECTRON IN RADIATION,
Brown Boveri and Co., Ltd., Baden (Switzerland).
K. Tofaute.
Processing, Vol 24, No 1, p 22-23, January, 1978. 1 fig, 1 tab.

Descriptors: *Irradiation, *Electromagnetic waves, *Sludge treatment, *Screens, *Fertilizers, Disinfection sludge, Pathogenic bacteria, Salmonella, Viruses, Dewatering, Waste water treatment.

An electron irradiation process for the removal of pathogens from raw and digested sewage sludge has been developed by Brown Boveri and Company Ltd of Baden, Switzerland. The first stage of the irradiation process requires the screening of the sludge for the removal of foreign particles and homogenization of the remaining particles to about 1 mm. The pretreated sludge is applied in a thin layer to a rotating drum containing the irradiation apparatus. Irradiation is accomplished with a high-voltage rectifier attached to an electron through which the electrons are passed and deflected. The electron accelerator and scanner are operated in a vacuum. The irradiated, hygienized sludge is stored in a monitored, ventilated tank. Mortality rates of strains of Cole and Salmonella ranged from 10,000-100,000,000 with 300 krad irradiation; virus viability was reduced by 60-90%. The irradiated sludge was more easily settled and dewatered; coagulant requirements were reduced by as much as 50%. The irradiated sludge was more effective as fertilizer than steam-pasteurized sludge. A review of capital and operational costs is presented. (Lisk-FIRL)
W78-06459

HONG KONG'S LARGEST SEWAGE WORKS.
Water and Waste Treatment, Vol. 21, No. 1, p 6-7, January, 1978.

Descriptors: *Treatment facilities, *Biological treatment, *Aeration, *Sludge digestion, *Settling basins, Tertiary treatment, Waste water treatment, Red tide, Nitrogen, Municipal wastes.

A municipal sewage treatment plant currently under construction for Sha Tin near Hong Kong will have a daily capacity of 102,000 cu m of raw sewage when completed in 1980. The treatment facility, which will employ two physical treatment stages and one biological stage, will contain primary sedimentation tanks, aeration tanks, final settling tanks, sludge digestion and storage tanks, as well as a laboratory, an administration building, and a power generation building. The treatment facility will remove 92% of the pollutants in the sewage effluent before discharge into a landlocked harbor; provisions have been made for a tertiary treatment facility to protect the quality of the receiving harbor if necessary. The plant will receive a maximum flow of 3.6 cu m/second; biological treatment for nitrogen removal from the effluent will reduce the possibility of red tides in the harbor. The Sha Tin treatment facility, when fully developed, will be capable of treating sewage effluent from a population of 500,000. (Lisk-FIRL)
W78-06460

OZONE SHAKES CHLORINE'S HOLD ON DISINFECTION,
R. Remirez.
Chemical Engineering, Vol. 85, No. 4, p 59-61, February, 1978. 1 fig, 1 tab.

Descriptors: *Chlorination, *Ozone, *Disinfection, *Treatment facilities, *Oxygen, Equipment, Environmental sanitation, Organic compounds, Toxins, Waste water treatment, Water purification, Municipal wastes.

The transition from chlorine disinfection to ozone disinfection of sewage effluent by a number of waste water treatment facilities is discussed. Although the more expensive ozonation process requires constant gas dosages to prevent incomplete disinfection and toxin formation, chlorination can produce chlorinated organics which may be harmful to aquatic life. The relative expense of ozonation is reduced when the cost of dechlorination is required to eliminate harmful substances produced in the chlorine disinfection process. Sixteen municipal treatment facilities in the United States that employ ozone disinfection of waste water are cited. Union Carbide's UNOX/ozone system, which requires that oxygen be fed through the ozone generator only once, is evaluated for use in large treatment facilities. The alternative use of air rather than oxygen as a feedstock for ozone disinfection is discussed for large and small capacity treatment facilities. (Lisk-FIRL)
W78-06461

SHIELDHALL SEWAGE PURIFICATION WORKS--SPECIFICATION FOR AND SELECTION OF MECHANICAL EQUIPMENT AND PUMPS,
Strain and Robertson (Consulting Engineers, Glasgow (Scotland).
J. S. Buyers, and J. MacDonald.
Chartered Municipal Engineer, Vol 104, No 12, p 218-223, December, 1977. 4 fig.

Descriptors: *Sewage treatment, *Screens, *Scum, *Treatment facilities, *Sludge disposal, Storm water, Equipment, Design data, Construction materials, Carbon filters, Waste water treatment, Municipal wastes.

Equipment and operational specifications for the design of a primary treatment facility in Shieldhall, Scotland, are reviewed. The plant will have an initial flow capacity of 48 mgd with provisions for expansion to a capacity of 60 mgd and for a secondary treatment facility. The two control centers for the treatment plant will be located in the presedimentation building and in the sludge pumphouse. A computer control system may be installed at a later date. Four identical low level screw pumps, each with a 980 liter/second capacity, pump influent to the presedimentation building which con-

tains an oil boom, inclined bar screens, and grit dredging machines. Six main screw pumps with a 1580 liter/second capacity convey the flow to 12 primary treatment tanks, each equipped with a magnetic flowmeter, a gate valve, and an automatic scraper with a scum blade. Storm water is bypassed by two penstocks to storm tanks equipped with manually-operated scrapers. Sludge from the primary treatment is discharged to an inspection chamber before transport by automatic sludge from the primary treatment is discharged to an inspection chamber before transport by automatic sludge from the primary treatment is discharged to an inspection chamber before transport by automatic sludge pumps to holding tanks. Air emissions will be filtered through carbon for odor control. Sample contract checklists, safety factors, and construction materials are described. (Lisk-FIRL)
W78-06462

BELT PRESS BEATS SLUDGE DEWATERING PROBLEMS.
Processing, Vol. 23, No. 12, p 24-25, December, 1977. 2 fig, 1 tab.

Descriptors: *Sludge, *Dewatering, *Filters, *Flocculation, *Polyelectrolytes, Sewage sludge, Hydraulic structures, Sludge digestion, Pressure, Sludge disposal, Waste water treatment.

A belt filter press, developed by Alfa-Laval Co Ltd, provides increased and prolonged pressure during the sludge dewatering process. The ecobelt system processes the sewage sludge through a drainage stage, a low-pressure section, and a high-pressure stage. The sludge is first flocculated with polyelectrolytes and passed through a drainage filter band for gravitational dewatering. The sludge is further dewatered as it is pressed by ploughs and rollers while passing horizontally through the drainage section. The resulting sludge cake, which has been dewatered by 50%, is passed between polyester filter bands mounted on perforated rollers with diminishing diameters within the low pressure zone of the process. Pressure on the sludge cake increases as the roller diameters decrease until the cake is passed into the high pressure stage controlled by two hydraulic cylinders. Pressure on the sludge cake is increased by flat belts that squeeze the sludge-bearing filter bands against a large perforated roller. The high pressure dewatering stage produces a final filter cake with a solids content 10% greater than sludge treated without the high pressure stage. Filter belts are subject to less wear because they are not over-extended; the filtrate and water removed during the process can be recycled. Suspended solids recovery with this process has ranged from 99% for raw and digested sludge to 9% for aluminum hydroxide sludge. Solids recovery averaged 95%. (Lisk-FIRL)
W78-06463

SEALING A SEWAGE LAGOON FOR HALF THE COST,
For primary bibliographic entry see Field 5G.
W78-06464

ENVIRONMENT GETS TOP TREATMENT IN HAWAIIAN SEWAGE OUTFALL JOB.
Western Construction, Vol. 53, No. 2, p 30, February, 1978.

Descriptors: *Outfall sewers, *Offshore platforms, *Excavation, *Coral, *Outlets, Hydraulic structures, Explosives, Cranes, Construction equipment, Waste water disposal, *Hawaii, Municipal wastes.

A mobile ocean platform and explosive charges were employed in the construction of a sewage effluent outfall for Honolulu, Hawaii. The construction firm of Healy-Tibbitts utilized the Spider I offshore platform, which can transport equipment by walking along the ocean floor, to support excavation equipment. Shaped charges were required to break up the compacted coral on the sea floor in the outfall area. A 16-ft deep channel was blasted and 7,200 linear ft of material was excavated with a Lima 2400 crane and clamshell, a McKinnon-Tierney pile extractor, and a Cal-Weld hammer, all supported by the mobile platform. The outfall pipeline, ranging in diameter from 44 to 66 inches, contains a diffuser at the terminal of the outfall that discharges and disperses the sewage effluent at a depth of 100 ft. Divers were required to link the bell and spigot pipe sections and to set the explosive charges. The outfall will not be visible from the surface once the construction equipment is removed. (Lisk-FIRL)
W78-06465

CENTRALIZING SEWAGE TREATMENT IN DORSET.
Surveyor, Vol. 150, No. 4460, p 11-12, December, 1977.

Descriptors: *Treatment facilities, *Activated sludge, *Aeration, *Sewers, *Concrete pipes, Floods, Sumps, Conduits, Dissolved oxygen, Settling basins, Industrial wastes, Sludge treatment, Waste water treatment, Municipal wastes.

A waste water treatment facility, with a capacity greater than 3 million liters/day and serving an area of more than 11 km, has been completed in the Dorset area of England. Flooding problems encountered in the floodplain of the Stour River where the main trunk sewer was installed were alleviated with wellpoint dewatering and sump pumps. Twenty-one kilometers of sewers and rising mains were constructed of asbestos cement or spun iron ranging 150-600 mm in diameter. The treatment plant, with a capacity of 2,818,520 liters/day of domestic and 385,420 liters/day of industrial effluent, reduces suspended solids to 30 mg/liter and BOD to 20 mg/liter by biological treatment. Storm water flows that exceed three times the dry weather flow are directed by penstocks to eight storm water tanks, each with a 365 cu m capacity. After grit is removed activated sludge is introduced to the influent as it is passed to the aeration chamber. Complete aeration and mixing is accomplished by a Mammoth Rotor controlled by a dissolved oxygen meter. Effluent is treated in three settling basins before discharge into the Stour River. Activated sludge is hydrostatically removed and a portion is returned to the initial activated sludge operation. The remainder of the sludge is thickened in a 7.6-m tank with a picket-fence stirrer and removed to a holding tank for disposal. (Lisk-FIRL)
W78-06466

OVERALL OPTIMIZATION OF WATER PURIFICATION AND SLUDGE TREATMENT, (FY 1975-1977),
Japan Society of Civil Engineers, Tokyo. Sanitary Engineering Committee.
N. Tambo, A. Sato, H. Aya, S. Nambu, and S. Okamoto.
Environmental Research in Japan, 1976 Edition, 1977, p. 118-119.

Descriptors: *Sludge disposal, *Coagulation, *Filtration, *Dewatering, *Water purification, Pilot plants, Laboratory tests, Aluminum, Suspended solids, Waste water treatment, Municipal wastes.

Water purification and sludge treatment methods involving filtration and coagulation were evaluated in laboratory tests, pilot plants, and full scale treatment facilities. The ratio of aluminum to suspended solids significantly affected the removal capacities of both rapid filtration and direct filtration processes. The efficiencies of both filtration processes were similar and considered more effective than sedimentation for the removal of suspended solids. The optimum pH range for the effective coagulation of both organic and inorganic substances was established as pH 6.0-6.5. Coagulation with aluminum sulfate and polyacrylamide was efficient in solids removal and sludge generation but breakthrought occurred during initial direct filtration. Sludge quality was significantly affected by the ratio of aluminum coagulant to suspended solids. The volatile solids content of the sludge significantly affected the sludge dewaterability. Lime was the preferred sludge conditioner for landfill disposal. (Lisk-FIRL)
W78-06467

DEODORIZATION MEASURES FOR NIGHT SOIL TREATMENT PLANTS (SHINYO SHORI SHISETSU NO DASSHU TAISAKI NI TSUITE),
For primary bibliographic entry see Field 5G.
W78-06468

ENVIRONMENTAL MANAGEMENT IN A MEDITERRANEAN PORT CITY: HAIFA,
United Nations Environment Programs, Geneva (Switzerland). International Labor Office.
For primary bibliographic entry see Field 5G
W78-06470

THICKENING OF WASTE ACTIVATED SLUDGE WITH A DISSOLVED AIR FLOTATION UNIT,
Geuetyn, Forsyth and Joubert, Inc., Pretoria, (South Africa).
O. Langenegger, and J. M. P. Viviers.
Water Pollution Control, Vol 77, No 1, p 79-86, 1978. 7 fig, 3 ref.

Descriptors: *Activated sludge, *Flotation, *Sludge disposal, *Pilot plants, *Aeration, Suspended solids, Physical properties, Volatility, Waste water treatment, Sludge treatment, Municipal wastes.

An air floatation system for concentrating waste activated sludge was designed in relation to the specific properties of activated sludge. Sludge volume index, suspended solids, volatile suspended solids, and sludge age were used as design criteria. Mixed sludge liquor reacted with a pressurized air-water solution was introduced to a clarification tank equipped with scrapers. Four samples of activated sludge from different treatment plants were treated in the air flotation pilot plant. A solids loading rate of 10 kg/sq m/hr required an air-solids ratio of 0.03; a downward flow rate of 6 m/hr in the clarifier reduced suspended solids by 98%. Water levels in the flotation tanks were adjusted to contact the varying float layer with the fixed level scraper. The scraper was operated at a speed of 1 m/min and a depth of 5 mm. Weirs were recommended for full scale plants so that water levels could maintain float layers above the water line and limit the total layer to 600 mm to facilitate drainage. Adequate turbulence in the reactor zone was reommended to promote adhesion of the sludge particles and the air bubbles. (Lisk-FIRL)
W78-06471

AUTOMATION OF WASTE WATER TREATMENT PLANTS--PART 1--DATA COLLECTION AND USE,
Anglian Water Authority, Norwich (England). Norwich Sewage Div.
P. Cotton.
Effluent and Water Treatment Journal, Vol 17, No 7, p 331-332, 335, July, 1977.

Descriptors: *Analog computers, *Digital computers, *Automation, *Monitoring, *Data collections, Flowmeters, Sewage sludge, Electric power, Dissolved oxygen, Suspended solids, Waste water treatment, Treatment facilities, Municipal wastes.

The collection and storage of data in waste water reatment facilities by automatic computer operaion is evaluated. Analog and digital computer data an be displayed at the monitoring site or transnitted to the central control room for processing r display. Printed logs of treatment facility data re processed and provided by central processing nits. Analog systems are being replaced by digital nd direct digital control systems that are more reabile. Data collected in the treatment facility can e used for automatic control, daily operation in nanually-controlled plants, evaluation of plant efciency, accumulation of a data base for future esign reference, and specific data investigations. hysical parameters measured in treatment facilies include: flows and volumes; settled sewage, ludge, and process liquor measurement; and enery usage. Analyses provided by computer control nclude: dissolved oxygen levels; suspended solids ontents; sludge density; and thermal digestor gas alues. (Lisk-FIRL)
/78-06472

HE MEMBRANE FILTER PLATE,
evern-Trent Water Authority, Birmingham England).
. R. Edmondson, and D. R. Brooks.
/ater Services, Vol 81, No 975, p 272, 274-278, lay, 1977. 3 fig, 6 tab.

escriptors: *Membrane processes, *Dewatering, Sludge treatment, *Filters, *Membranes, lastics, Pressure, Lime, Copper, Separation chniques, Waste water treatment, Municipal astes.

sludge press equipped with membrane filter ates which can be stopped at the optimum point the cycle is evaluated. Recess and membrane ter plates are mounted alternately within the ess to provide flexible and fixed surfaces. At a edetermined sludge level, the press apparatus is opped and the sludge is squeezed at a pressure of 7 kilopascals for a duration required to produce e desired cake solids content. The dewatering efciency of the membrane filter plate system was amined in pilot plant tests conducted with udge which had been conditioned with lime and opper. A comparison of the membrane filter plate d the recess press showed a 37-133% increase in y solids produced by the membrane filter press feed times of 150-180 min. Further tests incated that the press cycle could be reduced to 45 n for sludges that are easily dewatered. The dry lids content of the sludge cake could be conlled by the pressing time. A press converted to e membrane filter plate process could produce increase in output of up to 50% over conven-nal press operation; this output could increase 100% under automated operation. (Lisk-FIRL)
78-06473

ODIFYING MANNING'S EQUATION FOR OW RATE ESTIMATES,
r primary bibliographic entry see Field 8B.
78-06475

OW CHLORINE AFFECTS SOLUBLE COD IN GAL LADEN SYSTEMS,
. Wigkt, B. A. Johnson, J. H. Reynolds, and E. Middlebrooks.
ater and Sewage Works, Vol 125, No 3, p 48-52, March, 1978. 14 fig, 3 tab, 20 ref.

scriptors: *Chlorination, *Disinfection, hemical oxygen demand, *Laboratory tests, n-site tests, Chlorine, Algae, Biochemical oxen demand, *Sewage lagoons, Treatment facili-s, Waste water treatment, Municipal wastes, Ilois.

e impact of chlorination on soluble COD contrations in waste water containing high levels lgae was analyzed in laboratory tests and in eximents conducted at the Logan City, Illinois, municipal sewage treatment lagoons. When chlorine doses of 4.2, 16.9, and 50.8 mg/liter. In the laboratory studies, soluble COD concentrations in the chlorinated algae-bearing effluent increased from an initial 24.31 mg/liter to a high of 38.73 mg/liter and from an initial 52.70 mg/liter to a high of 70.37 mg/liter after treatment with chlorine at a dose of 50.8 mg/liter. COD concentrations increased substantially during the first 15 min of chlorine contact. Corresponding increases were not observed in field studies of COD concentrations after chlorine disinfection. In field experiments, soluble COD increases in algal laden waste water were apparent only for unfiltered sewage lagoon effluent having a free chlorine residual. Oxidation of organic substances by free chlorine residual. Oxidation of organic substances by free chlorine residuals where sand filtration was not employed contributed to the soluble COD increases. (Lisk-FIRL)
W78-06477

FILTRATION MEDIUM FOR BIOLOGICAL TREATMENT OF WASTE WATER -- SUPPORT ESPECIALLY OF PLASTIC COATED WITH GRANULAR MATERIAL.
Belgian Patent BE-855-426. Issued December 6, 1977. Derwent Belgian Patents Abstracts, Vol Y, No 50, p 1, January, 1978.

Descriptors: *Activated carbon, *Biological treatment, *Plastics, *Patents, Sands, Filtration, Solids contact processes, Adsorption, Biological membranes, Microbial degradation, Porous media, Chemical wastes, Waste water treatment.

A patent has been issued for a plastic-supported biological filtration system having a granular coating which effectively increases the surface area available for microorganism growth. The waste water is treated in an aerated filter coated with a granular material, such as activated carbon and sand. The surface area of the roughened activated carbon coating is increased by a factor of 30,000. The granular surface of the biological filter provides a more conductive environment for microorganism attachment. The filtration medium is mounted on a plastic or ceramic material, such as polyvinyl chloride, polystyrene, or polypropylene. The granular activated carbon coating on the filter media is also more effective in the treatment of chemical contaminants in the waste water. (Lisk-FIRL)
W78-06478

AEROBIC BIOLOGICAL PURIFICATION OF FLUID WASTES--BY INTENSIVE CIRCULATION IN TANK CONTAINING HIGH CONCENTRATION OF MICROORGANISMS.
French Patent FR-2342-254. Issued October 28, 1977. Derwent French Patents Abstracts, Vol Y, No 50, p 4, January, 1978.

Descriptors: *Biological treatment, *Aerobic treatment, *Activated sludge, *Patents, *Aeration, Oxygen, Centrifugation, Pumps, Circulation, Design data, Equipment, Waste water treatment.

A patent has been issued for an activated sludge aeration process which employs intensive circulation and high microbial concentrations to treat organic waste water. Waste water is introduced through an overspill into an aeration tank containing a bacteria count of 10,000-100,000 mg/liter. Air is mixed with the liquid as it is pumped through a distributor into the tank. The aerated waste water is fed into the tank at a rate rapid enough to promote intensive circulation. Constant circulation in the tank is maintained by sprinklers, connected to the pump, which spiral the waste water back into the tank. The liquid is delivered to a flotation tank where a centrifugal decanter removes sludge from the waste water for recycling. The clarified water is removed via an outlet at the bottom of the tank. The process does not require compressors of filters, reduces operating and capital costs, and produces a dewatered sludge. (Lisk-FIRL)
W78-06479

PRESSING LIQUID FROM SLUDGE ESPECIALLY SEWAGE SLUDGE--IN DECREASING GAP BETWEEN TWO RISING SURFACES, E.G., DRUM AND BELT.
French Patent FR-2343-701. Issued November 10, 1977. Derwent French Patents Abstracts, Vol. A, No. 1, p 3, February, 1978.

Descriptors: *Sewage sludge, *Dewatering, *Filtration, *Screens, *Patents, Impervious membranes, Sludge treatment, Pressure, Design data, Equipment, Waste water treatment.

A patent has been issued for a sludge dewatering device consisting of impermeable membranes or filter screens mounted on a drum and a conveyor belt. The device provides lateral water removal as well as screen filtration. The impermeable pressing surface is mounted on the circumference of a rotary drum. The second surface is a peforated, continuous conveyor belt which is driven by a motorized pulley. Increasing contact between the drum and belt as the sludge moves from the inlet to the outlet provides increasing pressure. As the pressure increases, the water in the sludge is expelled laterally from the press surfaces and is blown into a collection tank by compressed air jets. The press reduces filter screen clogging by allowing more water to escape laterally from the sludge. (Lisk-FIRL)
W78-06480

DEEP SHAFT SYSTEM USES GRP.
Water and Waste Treatment, Vol. 21, No. 1, p 25, January, 1978.

Descriptors: *Glass-reinforced plastics, *Aeration, *Waste disposal wells, *Underground waste disposal, *Injection wells, *Corrosion control, Chlorides, Industrial wastes, Plastics, Resins, Reinforcement, Protective coatings, Waste water treatment, Municipal wastes.

Corrosion resistant glass-reinforced plastic was employed in the construction of a deep shaft effluent treatment facility where the equipment would be exposed to high chloride concentrations in the industrial effluent treated with municipal wastes at the Marsh Farm Sewage Works in Tilbury, Essex, England. Effluent is aerated as it is passed down through the 132 m downcomer with a 1,200 mm diameter. The downcomer construction required corrosion resistance for an anticipated life span of 30 years. Glass-reinforced plastic tubes, in 10 m lenghts, provided the required resistance to the corrosive chloride concentrations and the necessary mechanical strength to hang freely in alignment with the supporting shaft. The plastic sections were joined together by locks and injected with resin, providing durability under high tensile loads. The bell-mounted T piece, through which the effluent enters the downcomer, was also constructed of glass-reinforced plastic. (Lisk-FIRL)
W78-06481

SEPTAGE COMPOSTING,
Pio Lombardo and Associates, Boston, MA.
P. Lombardo.
Compost Science, Vol. 18, No. 6, p 12-14, November-December, 1977. 4 fig, 2 tab, 5 ref.

Descriptors: *Septic tanks, *Degradation(Decomposition), *Sludge treatment, *Aeration, *Domestic wastes, Volatility, Suspended solids, Biochemical oxygen demand, Chemical oxygen demand, Farm wastes, Sawdust, Wood wastes, Waste water treatment, Pilot plants.

Pilot plant studies were conducted in Rehoboth, Massachusetts, to evaluate the treatment of domestic wastes from septic tanks by aerated and static pile composting with sawdust, woodchips, and animal manure. The dumping of septic wastes from three towns in the municipal waste treatment facility was prohibited because of the quantities of suspended, volatile, and total solids, as well as mean BOD and COD concentrations of 5,000 mg/liter and 45,000 mg/liter, respectively. Composting treatment of the septic wastes was preferred over chlorination, chemical treatment, anaerobic or aerobic treatment, lagooning, sand drying, land application, and disposal in a waste treatment facility or sanitary landfill. The high moisture content of the waste was reduced by the addition of sawdust and woodchips for moisture absorption; nitrogen was supplied by manure. Forced aeration and static pile composting were used at an asphalt drainage site. After manual mixing, the compost reached a maximum temperature of 163F at 5-10 days after pile construction. The estimated cost of a composting facility with a daily capacity of 15,000 gal from the three towns was $240,000. (Lisk-FIRL)
W78-06482

USING PLANTS FOR WASTEWATER TREATMENT,
California Univ., Berkeley. Sanitary Engineering Research Lab.
For primary bibliographic entry see Field 5G.
W78-06483

MECHANIZED SLUDGE COMPOSTING AT DURHAM, NEW HAMPSHIRE,
R. Wolf.
Compost Science, Vol. 18, No. 6, p 25-26, November-December, 1977.

Descriptors: *Aeration, *Biodegradation, *Sewage treatment, *Sludge treatment, *Treatment facilities, Sludge digestion, Degradation(Decomposition), Waste water treatment, Municipal wastes.

A municipal sewage treatment facility planned for Durham, New Hampshire, will combine a secondary treatment plant with a sludge composting facility located within the plant. An aerated pile composting system with woodchip amendments was chosen for the sludge treatment system. The filtered sludge and woodchip mixture will be stored and aerated for 21 days on a concrete pad outside the plant and will have channels and screens for mounting the aerators. The daily loading time required for processing the 30 cu yds of sewage sludge produced each day is estimated at one hour. Six employees will be required to run both the secondary treatment plant, costing more than $6 million, and the composting system, costing $600,000. Wood and brush deposited at the municipal incinerator will be shredded to provide woodchips for the sludge composting process. Sludge processing costs are estimated to decrease from the experimental $15/yd to $8/yd with woodchip production and reuse. The composted sludge will be sold for turf production, erosion control, and landscaping. (Lisk-FIRL)
W78-06484

A GRAYWATER SOIL TREATMENT SYSTEM,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
R. Laak.
Compost Science, Vol. 18, No. 6, p 29-32, November-December, 1977. 2 fig, 4 tab, 23 ref, 1 append.

Descriptors: *Septic tanks, *Domestic wastes, *Anaerobic conditions, *Biochemical oxygen demand, *Suspended solids, Flow separation, Soil disposal fields, Waste water treatment, Sewage disposal, Water utilization.

A pretreatment tank, an anaerobic upflow filter, and a leaching field system were developed for the separate treatment of domestic graywater. The pollutant parameters of gray water, comprising 40-70% of the total domestic waste flow, were considerably lower than those for combined sewage containing black water. The soluble BOD concentration of the gray water was higher than that of sewage. The required pretreatment tank capacity for a 6 person residence was calculated at 600 gal, providing a three year cleaning period for solids removal was established. Heat transfer to the surrounding soil and exit velocity reduction was accomplished by a tank length-to-width ratio of 3:1 and an inlet-outlet height difference of 0.1-0.2 m. Effective BOD and suspended solids reduction in the gray water after pretreatment was achieved by an anaerobic upflow filter. The fixed media filter reduced BOD levels in pretreated gray water from 150 mg/liter to 100 mg/liter and suspended solids from 120 mg/liter to 80 mg/liter. The treated gray water was then discharged into a leaching field that required a 40% smaller length and 50% smaller interface area than the conventional septic tank soil field. Phosphorus and nitrogen loading of the soil by gray water was six times less than that of septic wastes. (Lisk-FIRL)
W78-06485

BASIC SEWAGE TREATMENT FOR SMALL COMMUNITIES.
Water Services, Vol. 81, No. 982, p 760-761, December, 1977.

Descriptors: *Pumping plants, *Rural areas, *Sewage treatment, *Pipes, *Valves, Distribution, Waste water treatment, Sludge treatment, Equipment, Design data, Treatment facilities, Settling basins, Municipal wastes.

A compressed air-operated sewage ejector type pumping plant for rural use where small sewage volumes are encountered is described. The plant, manufactured by Adams-Hydraulics Ltd, utilizes a 100 mm diameter pipe and valves; storage of sewage effluent is not required and clogging is avoided. The single or duplicate ejector systems of the duplicate centrifugal pumps are now available as prefabricated units, eliminating the need for constructing a permanent housing. The ejector system of the pumping plant, used in conjunction with settling tanks for full sewage treatment in isolated areas, is equipped with a rotary distributor providing overhead self-dosing and feed. An air release valve has been designed for use with sewage mains. The valve provides an 'in-line' flow pattern, as well as the conventional small and large orifices. The ejector can be located adjacent to the air compressor, which can be run on industrial air supplies in factories or at a distance from the air compressor plant. (Lisk-FIRL)
W78-06486

ORANGE COUNTY AUGMENTS WATER SUPPLY WITH RECLAMATION SYSTEM.
Water and Sewage Works, Vol. 125, No. 1, p 34-37, January, 1978. 1 fig, 1 tab.

Descriptors: *Reverse osmosis, *Saline water intrusion, *Saline water barriers, *Inorganic compounds, *Water management(Applied), Water supply, Water supply development, Water table, Injection, Saline water-freshwater interfaces, Hydrodynamics, Mineralogy, Membrane processes, Cellulose, Waste water treatment, Municipal wastes.

A reverse osmosis-demineralization operation in Fountain Valley, California, provides high quality waste water which, when mixed with well water and injected into the ground, prevents sea water intrusion and supplements the county water supplies. Sewage effluent is initially treated in the municipal waste water treatment plant by chemical clarification, ammonia removal, recarbonation, filtration, activated carbon adsorption, and chlorine disinfection. Before reverse osmosis membrane filtration, the waste water is treated with scale inhibitors, cartridge filtration, chlorination, and pH adjustment. Dissolved minerals in the waste water are removed by the reverse osmosis system consisting of 210 cellulose acetate elements housed in fiberglass-reinforced plastic pressure tubes 21 ft long with 8 in diameters. After 90% mineral removal, the effluent is mixed with water obtained from four deep zone wells, each providing 2 million gal of water daily. The water mixture is injected into the groundwater through a series of 23 injection wells which distribute 10% of the water mixture to the ocean as a hydraulic barrier system. The reverse osmosis demineralization system, with a capacity of 2045 gal/min, cost $3 million and is the largest system of its kind in full operation. (Lisk-FIRL)
W78-06487

TRUCK-TANKERS CLEAN SEPTIC TANKS IN RURAL AREAS,
R. Dyment.
Water and Sewage Works, Vol. 125, No. 1, p 49, January, 1978.

Descriptors: *Septic tanks, *Pumps, *Rural areas, *Rotors, *Domestic wastes, Sludge disposal, Filters, Return flow, Fertilizers, Landfills, Treatment facilities, Waste water treatment, Municipal wastes.

A 4,000 gal sewage tanker truck is used by Rural Sanitation Service, Inc, of Clarence, New York, to clean septic and holding tanks in unsewered areas. Sewage is removed from the septic tanks by a rotary stainless steel Vane pump with continuous vacuum pressure. The rotor is equipped with sliding vanes mounted aong the rotor's circumference. When the vanes are pushed outward by centrifugal force, the rotor casing is divided into separate compartments. The volumetric capacity of these compression compartments is maximized during rotation, causing air to be drawn in and compressed. Air is cleaned in the compressor by an oil filter and is prevented from flowing out through the air receiver by a non-return vlave. Sewage pumped from the septic tanks to the tanker truck is removed either to a municipal treatment facility, a sanitary landfill, or to a farm where it is used in land applications. The sewage sludge is buried in trenches 8-10 inches below the field surface in batches of 1500 gal for land fertilization. (Lisk-FIRL)
W78-06488

SEWAGE ODOR CONTROL WORKS IN BELOIT, WISCONSIN,
Will Ross, Inc., Milwaukee, WS.
For primary bibliographic entry see Field 5G.
W78-06489

CAROUSEL FOR CIRENCESTER.
Water and Waste Treatment, Vol 20, No 12, p 31, 34, December, 1977. 1 fig.

Descriptors: *Activated sludge, *Aeration, *Treatment facilities, *Screens, *Irrigation practices, Sludge treatment, Domestic wastes, Sludge disposal, Waste water treatment, Municipal wastes.

A patented Carousel activated sludge aeration system has been installed in the new Cirencester sewage treatment plant in England which was designed to provide service for a population of 25,000. The English-Dutch Carousel treatment process provides extended aeration and activated sludge purification in a large tank containing four channels for circular aeration. Primary treatment consists of grit removal and screening, with solids removed to a landfill. After aeration, the effluent is pumped to settling tanks for sludge and liquid separation. The liquid is filtered in a land area for removal of dissolved nutrients and suspended

solids. A screeing unit will be installed to remove large solids such as plastics and rags from the sludge before application to agricultural land. The waste treatment plant is automatically controlled and requires only one attendant. (Lisk-FIRL)
W78-06490

FOOTPATH GOES THROUGH SEWAGE WORKS.
Water and Waste Treatment, Vol 20, No 12, p 35-37, December, 1977.

Descriptors: *Biological treatment, *Treatment facilities, *Piles(Foundations), *Concrete structures, *Settling basins, Sewerage, Reinforcement, Storm water, Sludge treatment, Dewatering, Waste water treatment, Municipal wastes.

Piled foundation and combined treatment structures were incorporated into the design of the new municipal waste treatment facility at Saffron Walden, Essex, England. Pile foundations from 26-30 m deep were required to compensate peat and alluvial soil upon which the 5.16 million liter/day treatment facility was constructed. The visual impact of the plant was modified by the construction of low profile structures. Treatment processes, such as the pumping operation and the effluent polishing microstrainers, were combined within the same structure to accomodatate the restricted plant area. Influent is screened and degritted before passing to the primary settling basins. The four bioliogical membranes filters required 325 concrete piles for foundation support. Two humus filters and two microstrainers provide secondary treatment and polishing. Sludge from the settling basins is thickened and retained in three storage tanks for landfill disposal of further treatment. Flows that exceed three times the dry weather flow are routed to storm water storage tanks for eventual treatment or overland flow filtration. (Lisk-FIRL)
W78-06491

UPRATING SEDIMENTATION TANKS.
Water and Waste Treatment, Vol 20, No 12, p 40, December, 1977. 5 fig.

Descriptors: *Settling basins, *Flocculation, *Suspended solids, *Construction materials, *Plastics, Flow augmentation, Sludge, Separation techniques, Settling velocity, Particle size, Waste water treatment, Municipal wastes.

A sedimentation tank adjunct, the TPS module developed by CJB Developments Ltd of Portsmouth, England, enlarges the surface area in a humus tank for increased suspended solids flocculation without increasing tank volume. The stationary TPS unit is constructed of durable plastic. Suspended solids, in the effluent descent through the module until they hit a series of spaced, inclined plates. The inclined plates direct the particles into corrugated plates containing troughs locted beneath the inclined plates. As the solids collection in the trough increases, larger flocs with high settling velocities form. The settling rate of the flocs exceeds the upward flow rate of the incoming waste water. The TPS modules increase the settling capacity of upward flow humus tanks when installed just below the surface level. Horizontal flow tanks can be improved by installed just below the surface level. Horizontal flow tanks can be improved by installing the module in the second part of the tank with a baffle extended across the width to create an upward flow chamber. The TPS module was designed to correct flow conditions in overloaded tanks. (Lisk-FIRL)
W78-06492

80 ACTUATORS AT ONE WORKS.
Water and Waste Treatment, Vol 20, No 12, p 37, December, 1977.

Descriptors: *Treatment facilities, *Penstocks, *Valves, *Automatic control, *Storm water, Aerators, Settling basins, Sewage treatment, Automation, Waste water treatment, Municipal wastes.

The Penybont sewage treatment works at Ogmore-by-Sea, Wales, includes an automatic flow system controlled by Rotork motorized penstock and valve actuators. The treatment facility, which processes wastes that were formerly discharged directly into the Bristol Channel, has a present capacity of 12 mgd and a designed expansion up to 16-21.5 mgd. Over 80 Rotork actuators control all the valves and penstocks within the main treatment plant. The treatment facility has a capacity of 108 mgd storm water flow, of which 36 mgd receive full treatment while the rest is stored in settling tanks before discharge. The aeration tanks and the feedback channels from the storm water tanks are equipped with the Rotork valve actuators which provide fully automatic control. Rates of flow from the aeration tanks are automatically controlled by outlet weirs that operate according to the dissolved oxygen level in the activated sludge. Monitors also assess treatment capacity in the plant and channel stored storm water into the treatment process when capacity is not at maximum. (Lisk-FIRL)
W78-06493

SEWAGE FARMING...WHY IT MAY BE IN YOUR FUTURE.
For primary bibliographic entry see Field 5G.
W78-06494

EFFLUENT AND WATER TREATMENT AT AERE HARWELL,
Atomic Energy Research Establishment Harwell (England).
J. B. Lewis.
Effluent and Water Treatment Journal, Vol 17, No 7, p 348-351, July 1977.

Descriptors: *Radioactive waste disposal, *Radioactive wastes, *Surface runoff, *Domestic wastes, *Chemical wastes, Treatment facilities, Sludge disposal, Chemical precipitation, Ion exchange, Waste water treatment.

A sewage treatment installation at the Atomic Energy Research Establishment in Harwell, England, separates the various active and inactive waste flows and stores them for individual treatment. The daily water supply of 7,000 cu m is supplied from the Thames River by a water works 10 km away. Drainage systems installed at the research station separate into individual treatment tanks the surface and roof runoff, the domestic sewage, the inactive trade wastes from laboratories, workshops and cooling circuits, and the radioactive effluents. The surface runoff is checked for radioactivity before discharge into a land ditch near the treatment works. Treated domestic sewage is retained in holding tanks for radioactive testing before discharge into the land ditch. Sludge is treated with aluminum chlorohydrate, dried on sand filters, and buried nearby. Industrial wastes are clarified and chemically treated before discharge through a 10 km pipeline to the Thames River. The active wastes, containing between 0.0001-0.00001 microcuries of radioactive particles/ml, are pumped to two brick tanks for ferric hydroxide precipitation. The effluent is discharged to the Thames and the sludge is dewatered and buried in Cumbria. Radioactive effluent with levels higher than 0.0001 microcuries/ml is precipitated with calcium phosphate-ferric hydroxide or calcium phosphate-copper ferrocyanide. (Lisk-FIRL)
W78-06496

ORGANIC FLOCCULANTS MARKET SET FOR BIG GROWTH,
W. J. Storck.
Chemical Engineering News, Vol 56, No 4, p 9, 11, 1978.

Descriptors: *Polymers, *Coagulation, *Flocculation, *Lime, *Sludge, Industrial wastes, Waste water treatment, Sludge disposal, Treatment facilities, Municipal wastes.

The efficiency and economics of organic flocculants were compared to those of alum as a coagulant. Traditional coagulation chemicals are alum, lime, and some ferric or ferrous compounds. Organic flocculants such as polyamines, polyacrylamides, and polyepichlorohydrins are more efficient because of their electrical charge. Organic coagulants can be anionic, cationic, or nonionic polymers with mixed charges. A dose of 100 ppm of polymer can replace up to 1,000-5,000 of alum, although many plants are designed to handle the large sludge-producing alum or lime treatments. Alum costs about $129/ton, compared to polymers which may up to $2,700-5,000/ton. Polymers are preferred as flocculants over raw material monomers; they have the primary advanantage of significantly reducing the production of sludge, a major disadvantage of alum and lime treatment. (Lisk-FIRL)
W78-06497

$30 MILLION ONE-MAN WASTE TREATMENT PLANT.
Journal of the Institution of Engineers (Australia), Vol 49, No 28, p 6, December, 1977.

Descriptors: *Sludge digestion, *Treatment facilities, *Screens, *Settling basins, *Digestion tanks, Methane, Carbon dioxide, Drying, Incineration, Fertilizers, Municipal wastes.

A $30 million waste water treatment plant under construction at the mouth of Australia's Brisbane River will contain a digger elevator, an aluminum gantry, and a transfer carriage for the automated treatment of effluent from a population of 430,000. Municipal and industrial wastes are automatically screened upon entering the plant. The removed solids are pressed and incinerated and the waste water undergoes grit removal. The degritted effluent is subjected to primary sedimentation in a series of tanks which remove about two-thirds of the suspended solids. Scapers convey the settled solids to six primary digestion tanks. The sludge is retained in the digestion are used as fuel for electric power generators. After digestion, the sludge is stored in two open tanks and later dried on an 11-acre drying bed. The dried sludge is used as a fertilizer or land fill. (Lisk-FIRL)
W78-06498

REMOVAL OF POWDERED ACTIVATED CARBON FROM WATER BY FOAM SEPARATION,
New Hampshire Univ., Durham. Dept. of Civil Engineering.
P. L. Bishop.
Separation Science and Technology, Vol. 13, No. 1, p 47-57, 1978. 5 fig, 2 tab, 14 ref.

Descriptors: *Activated carbon, *Foam separation, *Surfactants, *Aeration, *Separation techniques, Foaming, Cations, Hydraulic systems, Suspended solids, Waste water treatment, Municipal wastes.

The use of powdered rather than granular activated carbon in water and waste water treatment is limited by available techniques for removing the carbon from the treated suspension for regeneration. Foam separation with a cationic surfactant was evaluated for carbon suspension in tests with a continuous reaction. Compressed air was introduced into the bass of the 10 cm-diam reactor column at a rate of 0.4-0.8 standard cu ft/min/sq ft. The cationic surfactant, ethylhexadecyldimethyllammonium bromide, was added as the foaming agent in doses of 30, 50, and 70 mg/liter. Powdered carbon was completely removed from the effluent with a surfactant dose of 30 mg/liter and a liquid flow rate of 0.3-0.6 gal/min/sq ft. About 1% of the influent load was removed as foam; a 30 mg/liter

surfactant dose resulted in an effluent surfactant content of 8.6-12.1 mg/liter. Column design modifications and more efficient aeration were suggested for greater removal of the surfactant from the effluent. Activated carbon regeneration was enhanced by a lower aeration rate and surfactant dosage; effluent quality was improved by higher aeration rates, lower hydraulic loading, and lower surfactant dosages. Foam separation with a surfactant was more efficient in powdered activated carbon removal than air flotation alone. (Lisk-FIRL)
W78-06500

BUTANE IS NEARLY 'IDEAL' FOR DIRECT SLURRY FREEZING,
Virginia Polytechnic Inst. and State Univ., Blacksburg.
C. W. Randall.
Water and Wastes Engineering, Vol. 15, No. 3, p 43-44, 47-49, March, 1978. 4 fig, 1 tab.

Descriptors: *Freezing, *Sludge treatment, *Continuous flow, *Dewatering, *Suspended solids, Activated sludge, Heat transfer, Boiling, Ice, Treatment, Analytical techniques, Waste water treatment, Municipal wastes.

Direct slurry freezing of waste water sludge with butane as the cooling agent was evaluated with batch and continuous flow reactors. The batch reactor, with a sludge volume of 1.5 liters, had a large surface area than the 2 liter continuous flow reactor; the larger surface area increased the heat transfer rate, minimizing sludge detention times. The effectiveness of batch treatment was dependent upon the sludge detention time in the reactor and the quality of the filtrates. Higher suspended and dissolved solids concentrations in the sludge required longer detention times in the continuous flow reactor for adequate treatment. A sludge cake solids concentration of 77% was achieved after vacuum filtration and gravity drainage in batch tests, compared to 18% concentration without sludge conditioning and 40% for continuous flow tests. Recovery of 40-60% of the butane after treatment was accomplished with a single compressor. The addition of a second compressor increased butane recovery to 70-80%. The direct slurry freezing process was competitive with other sludge treatment methods at an estimated cost of $6-20/ton dry solids processed. (Lisk-FIRL)
W78-06501

WHAT TO CONSIDER IN BASKET CENTRIFUGE DESIGN,
Envirex, Inc., Waukesha, WI.
L. G. Hagstrom, and N. A. Mignone.
Water and Wastes Engineering, Vol. 15, No. 3, p 58, 60, 62, 1978. 3 fig, 5 ref.

Descriptors: *Centrifugation, *Sludge treatment, *Dewatering, *Turbulence, *Activated sludge, Solid wastes, Gravity, Separation techniques, Waste water treatment, Municipal wastes.

Parameters involved in the effective design of a bottom feed, continuous batch basket centrifuge for sludge dewatering were examined in studies with sludge samples from five municipal treatment facilities. Basket centrifugation, which removes cavity and capillary water, is used to dewater or thicken feed slurry, skimmings dewatered cake, and centrate. The slurry to be dewatered during centrifugation is passed into a bowl via a continuous 360 degree slot in the bowl floor. Turbulence and slippage of the sludge in the bowl is reduced by this entrance scheme. Samples of contact stabilized, extended aerated, and activated sludge from the five treatment facilities were dewatered in the basket centrifuge tests. Results indicated that cationic polymer additions enhanced machine throughputs and solids recovery. At constant feed rates and polymer additions, increasing sludge ages decreased the machine throughput and significantly affected solids recovery but not cake concentration. (Lisk-FIRL)
W78-06502

WASTEWATER PURIFICATION IN BIOLOGICAL TREATMENT PONDS WITH ALGAL GROWTH (OCHISTKA STOCHNJIKH VOD V APBGAPIZIROBANNJIKH BIOPRUDAKH),
A. N. Tereshina.
Vodosnabzhenie i Sanitarnaia Tekhnika, No. 9, p 25-26, 1977. 1 tab, 9 ref.

Descriptors: *Sewage lagoons, *Algae, *Nutrient removal, *Biological treatment, *Sewage treatment, Design data, Sewage bacteria, E. coli, Waste water treatment.

Experiences with the use of algal ponds in the biological treatment of municipal waste water are presented. The algal ponds have depths in the range of 0.6-0.9 m and are sectioned. They are established on impermeable ground where possible and are sealed with polyethylene foil in permeable regions. They are initially seeded with algae (Cyanophyta, Diatomaea, and Chlorophyta) at a dosage of 300 mg/25 cu m of water. The waste water throughput is generally in the range of 400-1,000 cu m/day at a hydraulic load of 800-1,375 cu m/ha/day and an organic matter load of 106-137 kg/ha/day. After 99.9% of the E. coli are destroyed, the treated waste water is drained off via pipes installed above the bottom. The treatment efficiency and chlorophyll synthesis rates are comparable for algal ponds in the Baltic region and in Central Asia, in spite of the considerable differences in climate and temperature. (Takacs-FIRL)
W78-06503

MINI SEWAGE WORKS.
Water Services, Vol. 81, No. 982, p 760, December, 1977. 1 fig.

Descriptors: *Aeration, *Screens, *Settling basins, *Weirs, *Treatment facilities, Separation techniques, Aerated lagoons, Equipment, Design data, Hydraulic structures, Waste water treatment, Sludge treatment, Municipal wastes.

A municipal sewage treatment unit, developed by Simon-Hartley of Stoke-on-Trent, England, provides extended aeration for small volumes of municipal effluent. The treatment unit is designed for simple operation in municipal facilities where volumes of sludge produced are limited or in warm climates where sludge is used for irrigation. The compact unit treats fluctuating flows in communities where sewage output may increase several fold at certain periods of the day. The Capitox treatment unit uses initial coarse screening of influent, followed by the mixing of the raw sewage with recirculated sludge before aeration. A Simcar earator is employed; a weir box passes the liquid effluent into the settling basin containing an inlet stilling box and a weir. Solids are screened before leaving the aeration tank; sludge is removed from the settling tank and returned to the beginning of the treatment cycle for mixing with the influent. Tanks are constructed of either steel or concrete from a variety of components, dependent upon the specific application. (Lisk-FIRL)
W78-06504

SOLVING SLUDGE BULKING PROBLEMS,
J. L. Barnard.
Water Pollution Control, Vol. 77, No. 1, p 103-106, 1978. 1 fig, 2 ref.

Descriptors: *Bulk density, *Sludge treatment, *Treatment facilities, *Bacteria, *Sphaerotilus, Activated sludge, Dissolved oxygen, Nitrates, Industrial wastes, Nitrification, Sulfides, Carbohydrates, Nutrient requirements, Biochemical oxygen demand, Waste water treatment, Municipal wastes.

The identification and elimination of sludge bulking problems caused by treatment deficiencies or by bacterial population shifts were reviewed. Low dissolved oxygen levels in mixed liquor were conducive to the growth of Sphaerotilus natans, a filamentous bacteria causing bulking. Increasing the oxygen load or adding 5-19 mg/liter of chlorine to the return sludge was effective in inhibiting the growth of filamentous bacteria. Incorporating a nitrification-denitrification phase of operation into the treatment system was also an effective debulking method. Sulfide loads in the effluent feed from septic wastes or pulp mill effluents were reduced by oxidation to sulfates in a biological filter or by aeration without the addition of activated sludge. Nutrient deficiencies in the waste water were alleviated by maintaining a nitrogen:phosphorus:BOD ratio in excess of 5:1:150. Pretreatment of high carbohydrate effluents with anaerobic processes or biological filtration reduced sludge bulking problems. Sludge age up to 60 days, identified as a bulking problem, was rectified by more frequent wasting of sludge under 30 days old. Dairy wastes contributing to shock loads were effectively treated with batch aeration followed by settling. PH variations caused by excessive nitrate formation were controlled by providing an anoxic zone to denitrify the nitrates and increase the pH to a neutral value. (Lisk-FIRL)
W78-06506

BIODEGRADATION OF SOME CATIONIC SURFACTANT AGENTS (BIODEGRADATION DE QUELQUES AGENTS DE SURFACE CATIONIQUES),
Monpellier-2 Univ. (France). Lab. d'Hydrobiologie.
For primary bibliographic entry see Field 5B.
W78-06507

LEAK DETECTOR.
For primary bibliographic entry see Field 5G.
W78-06508

VERSATILE WASTEWATER FLOWMETER,
Water Services, Vol 81, No 981, p 685-686, November, 1977.

Descriptors: *Digital computers, *Flowmeters, *Flow measurement, *Flow rates, *Depth, Analytical techniques, Pipelines, Channel flow, Flumes, Hydraulic gradient, Measurement, Data collections, Monitoring, Automation.

The digital QSFM4 waste water flowmeter, developed by Quantum Science Ltd., accurately measures the depth of flow in pipes, channels, or flumes. The digital system employs a series of 20 vertical thermistors, each representing 5% increments in flow. Data obtained by the thermistors on flow increments is transcribed by the digital instrument into gal/hr, gal/day, liters/hr, or liters/day. Total and maximum flows are automatically computed; note is made of the number of times the flow has exceeded a preset flow limit. The digital flowmeter is capable of operating external automatic analyzers or samplers within a preset schedule. The flowmeter can be modified to show rate of loss of a substance, such as calories. Accuracy is maintained by the digital unit to ensure integrated readings. (Lisk-FIRL)
W78-06511

A STUDY ON THE LOADING AND PERFORMANCE OF SEWAGE TREATMENT PLANTS,
For primary bibliographic entry see Field 5A.
W78-06512

COMPUTER CONTROLS PIPELINE FLOW.
For primary bibliographic entry see Field 8G.
W78-06513

AIRBORNE ENTERIC BACTERIA AND VIRUSES FROM SPRAY IRRIGATION WITH WASTEWATER,
Hadassah Medical School, Jerusalem (Israel). Environmental Health Lab.
For primary bibliographic entry see Field 5A.
W78-06515

NOVEL COMBINATION METHOD ASSESSES SEWAGE ODORS,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5A.
W78-06516

PROGRAMMING PHOSPHATE TREATMENT SAVES MONEY,
Camp, Dresser and McKee, Inc., Boston, MA.
R. H. Culver, and D. Chaplick.
Water and Sewage Works, Vol 125, No 3, p 84-87, March, 1978. 2 fig, 3 tab, 1 ref.

Descriptors: *Phosphorus, *Nutrient removal, *Coagulation, *Flocculation, *Chemical precipitation, Treatment facilities, Phosphates, Analytical techniques, Sludge, Sampling, Waste water treatment, Municipal wastes.

An alum treatment schedule based on observed hourly variations in phosphorus concentrations was developed for the Pittsfield, Massachusetts, municipal waste water treatment plant. Random sampling of the effluent for phosphorus concentration data proved to be an inefficient basis upon which to calculate alum requirements. Alum additions of 300 mg/liter prior to screening and grit removal reduced effluent phosphorus to 0.8 mg/liter but produced large volumes of sludge with a solids content of 2%. To avoid anerobic digester failure, alum doses were reduced to 200 mg/liter, reducing effluent phosphorus to 1.5 mg/liter. Hourly sampling of the influent over a seven day period indicated that the peak phosphorus flows occurred from 10 a.m. to 12 midnight. With a 20:1 alum-to-phosphorus ratio for treatment, alum was wasted when additions were made on the bais of daily average phosphorus flow. An individual schedule for each day of the week established adequate alum doses with respect to hourly phosphorus data. Simplification of the schedule to eight daily manual additions of the varying alum doses provided the most effective reduction of phosphorus with the most efficient plant operation. (Lisk-FIRL)
W78-06517

ORGANOCHLORINATED RESIDUES IN WASTEWATERS BEFORE AND AFTER TREATMENT,
Laval Univ., Quebec. Dept. des Vivres.
G. B. Martin, and C. Gosselin.
Journal of Environmental Sciences and Health, Vol A13, No 1, p 1-11, 1978. 2 fig, 3 tab, 8 ref.

Descriptors: *Polychlorinated biphenyls, *DDD, *DDT, *Organic pesticides, *Chlorinated hydrocarbon pesticides, Waste water treatment, Gas chromatography, Sampling, On-site investigations, Sewage treatment, Chlorination, Municipal wastes, Analytical techniques.

The removal efficiency of polychlorinated biphenyls, DDT, and other organochlorine compounds present in municipal waste water was studied at a treatment facility in Valcartier, Quebec, Canada. Samples of waste water were collected at the plant inlet and outlet over a five-day period and over a 24-hour period. All samples were analyzed by gas chromatography with electron capture detectors. The municipal facility provided primary and secondary treatment with chlorination. Daily sampling over the five-day collection period yielded a polychlorinated biphenyl concentration range of 1.50-2.00 ppb at the inlet and 0.02-0.60 ppb at the outlet. DDD ranged from traces to 0.07 ppb at the inlet and 0.03 ppb at the outlet. DDT concentrations were as high as 0.08 ppb at the inlet and 0.02 ppb at the outlet. Mean reductions from the inlet to the outlet of the organochlorine compounds during the 24 hr collection were 0.29-1.38 ppb for polychlorinated biphenyl and 0.03-0.08 ppb for DDD. According to the chromatographs, the higher chlorinated polychlorinated biphenyls were more easily removed during treatment than the lower chlorinated compounds. Concentrations of lower chlorinated compounds were increased by the treatment process. A 75% reduction of polychlorinated biphenyls was achieved by the treatment process; DDD and DDT were also eliminated. (Lisk-FIRL)
W78-06518

PROCESS SYNTHESIS AND INNOVATION IN FLUE GAS DESULFURIZATION,
California Univ., Berkeley.
G. T. Rochelle.
Available from University Microfilms International, Ann Arbor, MI 48106; Order No. 77-31519. PhD Thesis, 1977, 577 p.

Descriptors: *Sulfur compound, *Air pollution, *Slurries, *Steam stripping process, *Hydrogen sulfide, Ammonia, Sodium compounds, Magnesium compounds, Oxidation, Waste treatment, Industrial wastes.

Innovations and alternatives in stack gas desulfurization processes are evaluated. Conventional desulfurization processes, such as aqueous scrubbing with disposal of CaS03 and CaS04, hydrogen sulfide regeneration, and steam stripping, are considered. Sulfopropionic acid, oxalic acid, and adipic acids are suggested as supplementary buffereing agents. Magnesium oxide, ammonia, sodium carbonate, and ethylenediamine are recommended as alkali additives. A suggested improvement in the aqueous scrubbing process involves the oxidation of the scrubbing slurry and buffer additives in the scrubber loop. Partial hydrogen sulfide regeneration of the recycled solution is recommended to eliminate bisulfite. Steam stripping process improvements include the use of boiler evaporation for stripping the slurry of buffer acid or pyrosulfite and the return of condensates from the process to the stripper. (Lisk-FIRL)
W78-06519

COMPARISON BETWEEN ADSORPTION OF POLIOVIRUS AND ROTAVIRUS BY ALUMINUM HYDROXIDE AND ACTIVATED SLUDGE FLOCS,
Texas Univ. Health Science Center at Houston. Dept. of Virology and Epidemiology.
S. R. Farrah, S. M. Goyal, C. P. Gerba, R. H. Conklin, and E. M. Smith.
Applied and Environmental Microbiology, Vol 35, No 2, p 360-363, February, 1978. 4 tab, 25 ref.

Descriptors: *Polioviruses, *Viruses, *Activated sludge, *Aluminum, *Flocculation, *Enteric bacteria, Analytical techniques, *Adsorption, Diseases, Microorganisms, Treatment, Waste water treatment, Municipal wastes.

Aluminum hydroxide and activated sludge floc adsorption of poliovirus and simian rotavirus (SA-11) was studied in laboratory experiments. The simian rotavirus was used in place of human rotavirus which was difficult to isolate and culture. Aluminum hydroxide adsorption reduced the titer of added poliovirus by three logs. A one log reduction in simian rotavirus concentrations was achieved with aluminum hydroxide. Human rotavirus was not significantly adsorbed onto aluminum hydroxide flocs. Activated sludge flocs adsorption of the viruses resulted in an 0.7-1.8 log reduction in poliovirus and a 0.5 log reduction in simian rotavirus. The results indicated that poliovirus was more readily adsorbed than rotavirus. An estimated reduction of the viruses by adsorption onto both activated sludge and aluminum hydroxide flocs predicted the predomination of rotavirus after waste water treatment. The use of model viruses such as reovirus to predict the fate of viruses in waste water treatment was considered. (Lisk-FIRL)
W78-06520

IS INADEQUATE SLUDGE AGE AND DISSOLVED OXYGEN CONTROL PREVENTING OPERATORS FROM GETTING THE BEST FROM THEIR ACTIVATED-SLUDGE PLANTS,
A. R. Pitman.
Water Pollution Control, Vol 77, No 1, p 97-99, 1978. 1 fig.

Descriptors: *Activated sludge, *Dissolved oxygen, *Flocculation, *Suspended solids, *Optimization, Oxygen demand, Bacteria, Protozoa, Waste water treatment, Sludge digestion, Municipal wastes.

The optimization of the activated sludge waste water treatment process is considered with respect to sludge age and dissolved oxygen control. Clarifier capacity increases at a constant feed rate of homogenous sludge and a dissolved oxygen level of 2 mg/liter. As sludge age increases under these circumstances, effluent clarity improves due to increased bioflocculation efficiency; the sludge settling rate increases with higher floc density; and the quantity of sludge produced decreases. The oxidation of organic nitrogen and ammonia also improves while the floc oxygen demand and mixed liquor suspended solids increase. As sludge age increases, optimum conditions are approached. These include the reduction of the protozoa population, the presence of bacteria in the endogenous growth phase, the deterioration of bioflocculation, and the continuing increase of floc density, suspended solids, total oxygen demand, and clarifier solids levels. When sludge age exceeds the optimum conditions, deflocculation occurs. Two examples of effluent deflocculation are presented. In one case, control of the dissolved oxygen level below capacity improves the clarified effluent quality. In the second case, reducing sludge age improves the ambient dissolved oxygen level. (Lisk-FIRL)
W78-06521

PRODUCTION OF SYNRINGEALDEHYDE FROM HARDWOOD WASTE PULPING LIQUORS,
Domtar Ltd., Montreal (Quebec). (Assignee).
H. B. Marshall, and D. L. Vincent.
United States Patent 4,075,248. Issued February 21, 1978. Official Gazette of the United States Patent Office, Vol 967, No 3, p 1105, February, 1978. 1 fig.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Lignins, *Organic compounds, *Hardwood, Patents, Waste water treatment, Design data, Alkalis(Bases), Sodium compounds, Inorganic compounds, Industrial wastes, Solvent extraction, Oxidation.

A process for the production of syringealdehyde from lignin-bearing kraft pulping liquors has been patented. The hardwood draft pulping liquor is mixed with an alkali and introduced into an oxidation reactor. The liquor is oxidized under high temperature and presure and then neutralized. The oxidized, neutralized liquor is removed with an organic solvent which separates the organic fraction of the liquor from the lignin-bearing aqueous fraction containing incorganic chemicals. The aqueous solution is returned to the kraft pulping process for the recovery of alkalis. The organic fraction is treated with sodium bisulfite in an aqueous solution to form an aqueous solution containing the sodium the bisulfite complex of syringealdehyde and vanillin. The organic fracton is removed and the aqueous solution is washed with an aliphatic alcohol containing a chain of 4-6 carbons. Acidification of the aqueous solution results in the break-

down of the complex to an oil consisting of syringealdehyde and vanillin. Fractional distillation is employed to separate the syringealdehyde from the vanillin. (Lisk-FIRL)
W78-06542

DEWATERING OF WASTEWATER TREATMENT WASTES,
Swift and Co., Chicago, IL. (Assignee).
E. R. Ramirez.
United States Patent 4,071,447. Issued January 31, 1978. Official Gazette of the United States Patent Office, Vol 966, No 5, p 1873-1874, January, 1978. 1 fig.

Descriptors: *Dewatering, *Sludge treatment, *Patents, *Aeration, *Design data, Bubbles, Equipment, Sludge, Waste water treatment, Municipal wastes.

A patent has been issued for a process to dewater effluent treatment wastes, such as sludges or skimmings, using aeration and a vertical column. Coagulated waste resulting from primary treatment of precipitation is introduced into the lower inlet of a vertical chimney. An aeration source, located below the waste inlet, supplies air bubbles to the dispersed wastes. A polymer flocculant is added, below the waste inlet and above the aeration source, to bring about the formation of buoyant composites with the coagulated materials in the waste. These buoyant composites are confined within the vertical column by the limitation of horizontal movement. The waste-bearing air bubbles move upwardly through the vertical chimney, forming an upper stratum of impurities. The lower stratum within the vertical column, containing clarified water, is separated from the waste-bearing upper stratum. (Lisk-FIRL)
W78-06543

METHOD AND DEVICE FOR THE WET COMPOSTING OF ORGANIC SLUDGE,
H. Gujer.
United States Patent 4,072,494. Issued February 7, 1978. Official Gazette of the United States Patent Office, Vol 967, No 1, p 207-208, February, 1978.

Descriptors: *Biodegradation, *Sludge treatment, *Oxidation, *Patents, *Hydrostatic pressure, Equipment, Design data, Flow control, Waste water treatment, Sludge disposal.

A continuous flow, wet composting method for organic sludge treatment has been patented. Oxygen-bearing gas is introduced into sludge contained in an air-tight mixing tank. A composting reaction is promoted as the oxygen is passed through the sludge flowing through an air-tight container. Static pressure is built up by the composting reaction and maintained at 1-6 atmospheres. A temperature of more than 55C and less than 75C is maintained within the air-tight tank as the composting reaction occurs. (Lisk-FIRL)
W78-06544

REGULATING OXYGEN INPUT IN TREATMENT OF EFFLUENT,
Farbenfabriken Bayer A.G., Leverkusen (West Germany). (Assignee).
T. Gorski, A. Heinem, and K. Mack.
United States Patent 4,071,443. Issued January 31, 1978. Official Gazette of the United States Patent Office, Vol. 966, No. 5, p 1872-1873, January, 1978. 1 fig.

Descriptors: *Oxygen, *Aeration, *Oxidation, *Patents, *Sludge treatment, Activated sludge, Design data, Equipment, Waste water treatment, Shear strength, Shear, Municipal wastes.

A patent has been issued for a waste water aeration treatment system which improves oxygen use and diminishes activated sludge particle size. Sewage effluent containing activated sludge is mixed in a double tank aeration chamber and oxygenated with a gas containing 20% oxygen. Gas bearing 40-80% oxygen by volume is introduced into the gas space within the first vessel containing the waste water. Gas is applied until the effluent has an oxygen content of 1-4 mg/liter. The aerated effluent is passed from the first tank into the second tank where the gas in the air space has an oxygen content of 30-60% by volume. The effluent is again sprayed with gas and oxygen until the oxygen content reaches 4-8 mg/liter. Effluent in the second tank is returned to the first treatment stage where it is mixed with fresh effluent in the amount of 10-300% by volume. Activated sludge solids are reduced to between one-third and one-twentieth of their original size by the shear force. (Lisk-FIRL)
W78-06560

A BRANCH AND BOUND METHOD FOR USE IN PLANNING REGIONAL WASTEWATER TREATMENT SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
E. D. Brill, Jr., and M. Nakamura.
Water Resources Research, Vol. 14, No. 1, p 109-118, February 1978. 7 fig, 1 tab, 24 ref.

Descriptors: *Alternative planning, *Waste water treatment, *Branch and bound method, *Cost minimization, Regional systems, Economies of scale, Networks, Constraints, Linear programming, Evaluation, Optimization, Algorithms, Mathematical models, Equations, Systems analysis.

A branch and bound method is presented for evaluating alternative regional wastewater treatment systems, accounting for economies of scale in constructing treatment plants and interceptor sewers. A branch and bound tree is 'grown' an algorithm which is very efficient computationally because it uses a powerful inspection step and a network algorithm to solve subproblems. Each infeasible solution found by using the method is converted to a feasible regional configuration of plants and interceptors. The alternative plans can be compared to examine tradeoffs between cost and other qualitative and quantitative planning objectives. Also the tree itself can be extended to generate additional planning alternatives. Rather than to find mathematically optimal solutions, the principal uses of the method are to generate systematically attractive alternative plans and potentially to assist in evaluating tradeoffs between different planning objectives. The method is used herein to minimize the total cost of treatment plants and piping; the concave cost functions are piecewise linear. (Bell-Cornell)
W78-06565

CLEANING APPARATUS FOR SEWER PIPES AND THE LIKE,
For primary bibliographic entry see Field 8G.
W78-06568

OZONATION OF MAKE-UPWATER FOR SALMONIC FISH REARING FACILITIES,
Idaho Univ., Moscow. Dept. of Bacteriology and Biochemistry.
P. J. Colberg, L. L. Edwards, A. J. Lingg, T. J. Morrison, and A. T. Wallace.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 555, Price codes: A04 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, August 1977. 51 p, 10 fig, 22 ref, 3 append. OWRT A-053-IDA(3). 14-34-0001-6013.

Descriptors: *Ozone, *Fish hatcheries, Fish management, Salmonids, Ammonia, Algae, Nitrates, Nitrites, *Economic efficiency, *Idaho, Fishkill, *Water pollution, Clearwater River(Idaho), Dworshak National Fish Hatchery(Idaho), Biochemical oxygen demand, *Ozonation, Pilot plants, Water reuse, Recycling, *Waste water treatment, *Cost comparisons

An ozone pilot plant was installed at the Dworshak National Fish Hatchery to examine the efficacy of sterilizing makeup water entering this recycle hatchery. The pilot plant consisted of two separate systems operated together. A recycle system consisting of two fish tanks, a clarifier and biofilter was in operation prior to this study. An ozone system consisting of a Grace ozone generator (later replaced by a Welsbach generator) and a Grace contacting column was installed for this study. The ozone pilot plant supplied the makeup water to the existing recycle system. The pilot plant was run with approximately 125 pounds of cutthroat and one-half pound of steelhead fry. Recycle rate was 30 GPM and makeup rate was 3 GPM. At the conclusion of the pilot plant study, an economic comparison was made of an ozone system and an ultraviolet system. The basis for comparison was proposed 650 GPM system to be installed at Dworshak. Although the ozone treatment system requires a capital investment of $164,000 as opposed to $90,000 for an equivalent size ultraviolet system and an annual cost of almost $17,000 as opposed to $12,000 for the UV system, this study demonstrates the increased cost may be justified. The ozone system gave consistently greater sterilization efficiency than the ultraviolet system. It also showed consistently lower ammonia level and more uniform BOD concentrations. All of these effects would enhance fish survival.
W78-06579

EVALUATION OF THE EFFICACY OF SULFITE PULP MILL POLLUTION ABATEMENT USING OYSTER LARVAE,
Washington State Dept. of Fisheries, Brinnon.
For primary bibliographic entry see Field 5C.
W78-06609

STUDY OF FOAM SEPARATION AS A MEANS OF DETOXIFYING BLEACHED KRAFT MILL EFFLUENTS: THEORETICAL ASSESSMENT OF ENGINEERING REQUIREMENTS AND AVAILABILITY OF COMMERCIAL EQUIPMENT.
B. C. Research Ltd., Vancouver.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report to March 31, 1975. 96 p, 25 fig, 6 illus, 21 ref, 9 tab, 8 append.

Descriptors: *Pulp wastes, *Bleaching wastes, *Foam separation, *Waste water treatment, *Toxicity, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Turbine, Costs, Operating costs, Water purification, Equipment, Engineering, Engineers estimates, Aeration, Centrifugation, Separation techniques, Water quality control, Kraft mills, Black liquor.

Foam separation is a technically and economically feasible process for toxicant removal from total bleached kraft mill effluents. Process requirements and equipment specifications for foam separation treatment of 94,500 cu m/day (25 M gal/day) of effluent from a bleached kraft mill of 750 tons/day (680 tons/day) capacity were defined and submitted to various equipment suppliers. The system had to be capable of generating 30 sq m/liter/hr of gas-liquid interfacial area at gas/liquid ratios of ca. 5 within 1-hr retention time while operating with minimum attention and practically trouble-free under all northern climatic conditions. Its foam-breaking subsystem had to collapse ca. 56.6 cu m/min (2000 cu ft/min) of foam entrained with 5% of liquid. Manufacturers quotations, laboratory results, and literature data were reviewed and used to evaluate various available systems. Turbine, helical, and jet aeration systems all appeared to meet these requirements in conjunction with foam-rupturing systems based on

impact, shearing, and compression forces. Recommended for pilot-plant evaluation was a jet aerator system which produces micron-size bubbles, permits long contact times for enhanced toxicant absorption, leaves the liquid surface free of impediments to foam removal, and is simple to install and operate. Along with it, a centrifugal turbine foam breaker marketed as skum slaker was recommended, based on its successful operation in several North American kraft mills for foam control in black liquor oxidation towers and effluent foaming towers. Operating costs for a 12-jet foam-generating aerator and 18 skum slakers of 22.4 kw (30-hp) at a 750-ton/day kraft mill discharging 25 M gal/day effluent were estimated at $2.10/metric ton of pulp ($2.31/tonne). (Brown-IPC)
W78-06610

DETOXIFICATION AND DECOLORIZATION OF KRAFT PULP MILL EFFLUENTS USING ACTIVATED CARBON,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong, T. Tenn, R. A. Wostradowski, and S. Prahacs.
Canadian Forestry Service, Ottawa, Ontario K1A OH3, Cooperative Pollution Abatement Research (CPAR) Project Report 246-1, Final Report October 1973 - July 31, 1974. 79 p, 9 fig, 39 ref, 10 tab, 7 append.

Descriptors: *Pulp wastes, *Waste water treatment, *Toxicity, *Color, *Activated carbon, *Kraft mills, Wastes, Industrial wastes, Pulp and paper industry, Effluents, Water pollution treatment, Water pollution sources, Canada, Foreign countries, Bleaching wastes, Softwood, Carbon, Hydrogen ion concentration, Fly ash, Costs, Capital costs, Operating costs, Aeration, Biochemical oxygen demand, Aluminum, Sulfates, Resin acids, Fatty acids.

A micro-pilot apparatus for testing the Pulp and Paper Research Institute of Canada carbon treatment process has been constructed and started up. Eight series of test runs were completed, using samples of combined-mill or bleachery effluents from an Eastern Canadian kraft mill. Aeration in presence of catalytic amounts of C, followed by addition of alum plus electrolyte, detoxified combined-mill and bleachery effluents to meet Federal government regulations which specify 80% or better survival of test fish over a 96-hr exposure at 65% bioassay concentration. The optimum dosages for softwood bleached kraft effluent were 200 mg of C and 300 mg of alum/liter. Resin and fatty acid concentrations did not correlate with effluent toxicity. The process functioned well within the pH range 3.8-6.8, which is typical of most bleached kraft combined mill effluents. Flyash (bark char from hog-fuel furnaces) seemed an acceptable substitute for commercial activated C. Decoloration depended primarily on the alum dose applied. The doses required for detoxification (300 mg alum plus 200 mg C/liter) typically achieved 75-85% color removal, but only 20-30% BOD removal. The preferred process scheme, viz., a single-pass treatment with mixtures of 85% flyash plus 15% commercial activated C, is estimated to require $1.9 million in capital expenditure for a bleached kraft mill of 500 air-dry tons/day capacity, plus ca. $5.10/air-dry ton of operating cost. An alternative scheme involving on-site production and regeneration of carbon would be more expensive, but would assure independence of quantitative and qualitative changes in bark char supplies from hog-fuel furnaces. (Brown-IPC)
W78-06611

REDUCTION OF TOXICITY OF CONDENSATES FROM SULFITE WASTE LIQUOR EVAPORATORS,
Eco-Research Ltd., Pointe Claire (Quebec).
M. A. Wilson, R. LeBlanc, and I. Middelraad.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 324-1, Final Report to March 31, 1975, 45 p, 3 fig, 7 ref, 10 tab.

Descriptors: *Sulfite liquors, *Pulp wastes, *Toxicity, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Biochemical oxygen demand, Activated sludge, Waste water treatment, Toxicity, Evaporation, Hydrogen ion concentration, Chemical oxygen demand, Aeration, Organic matter, Carbon, Condensates, Sulfite pulp mills, Acetic acid, Furfural, Eugenol, Juvabione, Abietic acid, Spent sulfite liquor.

Spent sulfite liquor evaporator condensates were found to contribute less than 10% to total sulfite pulp mill effluent toxicity, but 28% to the total effluent's BOD. Toxic constituents of condensate were identified as acetic acid, furfural, eugenol, juvabione, and abietic acid. Neither steam stripping nor extended-aeration activated sludge treatments produced nontoxic condensate. However, evaporation of spent sulfite liquor at pH 7 reduced the COD and total organic carbon (TOC) of the condensates and hence of the total mill effluent. (Brown-IPC)
W78-06613

DETERMINATION OF TOXICITY LOADS FOR BLEACH PLANT EFFLUENTS,
B. C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5A.
W78-06616

THE FATE OF SUPPLEMENTAL NUTRIENTS IN AERATED LAGOONS.
Beak Consultants Ltd., Montreal (Quebec).
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 387-1, Final Report to September 30, 1975. 60 p, 5 fig, 40 ref, 14 tab, append.

Descriptors: *Pulp wastes, *Aerated lagoons, *Waste water treatment, *Nutrients, Waste treatment, Waste, Industrial wastes, Water pollution sources, Water pollution treatment, Nitrogen compounds, Phosphorus compounds, Biological treatment, Publications, On-site investigation, Pulp and paper industry, Effluents, Biochemical oxygen demand.

The fate of P and N compounds added to effluent-treating biological aeration lagoons was investigated by (1) a literature survey, (2) a questionnaire survey sent to 23 pulp and paper mills (of which 14 responded), and (3) a field evaluation of two operating aerated lagoons. There was no correlation between amounts of supplemental nutrients added and treatment efficiency or other system criteria. However, both N and P are required for microbial growth. The total concentration of these two nutrients remains essentially constant throughout an aerated lagoon. Changes in P and N compounds do take place, however, and are related to the extent of aeration and the 5-day BOD loading. High-rate processes require more nutrients than low-rate treatments. Recommendations for proper nutrient addtion are presented. (Brown-IPC)
W78-06618

THE EFFECT OF CHEMICAL TREATMENT ON THE TOXICITY OF PULP AND PAPER MILL EFFLUENTS,
Beak Consultants Ltd., Vancouver (British Columbia).
J. C. Coss, and D. F. Wilson.
Canadian Forestry Service, Ottawa, Ontario, Cooperative Pollution Abatement Research (CPAR) Project Report 393-1, Final Report to November 30, 1975. 48 p, 6 fig, 19 ref, 7 tab, 3 append.

Descriptors: *Pulp wastes, *Waste water treatment, *Toxicity, Coagulation, Wastes, Waste treatment, Water pollution treatment, Water pollution sources, Lethal limit, Fish, Color, Pulp and paper industry, Effluents, Iron compounds, Aluminum, Sulfates, Organic matter, Chemical precipitation, Iron chloride, Resin acids.

The detoxification of a bleached kraft mill waste water by treatment with alum of ferric chloride is reported. Either coagulant eliminated the effluent's original toxicity which was ca. 30% in terms of LC(50), i.e., the concentration at which 50% of test fish survived 96-hour exposure. In addition, up to 95% of resin acids and color, 50-70% of total organic matter, and 20-30% of biodegradable matter were removed, depending on effluent characteristics. (Brown-IPC)
W78-06619

IDENTIFICATION OF TOXIC MATERIALS IN SULFITE PULP MILL EFFLUENTS,
B.C. Research Ltd., Vancouver.
For primary bibliographic entry see Field 5A.
W78-06620

TREATMENT OF EFFLUENT,
D. Parnaby.
United States Patent 4,075,095. Issued February 21, 1978. Official Gazette of the United States Patent Office, Vol 967, No 2, p 1064-1065, February, 1978. 1 fig.

Descriptors: *Filtration, *Settling basins, *Sludge disposal, *Separation techniques, *Patents, Design data, Equipment, Sands, Filters, Scum, Waste water treatment, Municipal wastes.

A patent has been issued for a settling tank containing a sand filter bed and scum trough for the separation of sludge from clarified water. The settling tank is divided into a scum tank and a ballast chamber. The scum tank contains a filter bed and medium on a perforated support at the top. Effluent is introduced into the tank through a feed valve located below the perforated filter. The effluent is fed into the filter and sludge settles to the lower portion of the scum tank. The filtered liquor is pumped through a scum trough. Scum is removed by the perforated support before effluent is discharged via a weir. The ballast chamber, located below the support, contains an outlet and a back pressure monitor. A valved gas outlet releases gas when a predetermined back pressure is attained. The filter is backwashed when required by dropping the level of effluent in the tank. (Lisk-FIRL)
W78-06621

SETTLING TANK SLUDGE COLLECTOR,
E. D. Blalock.
United States Patent 4,075,109. Issued February 12, 1978. Official Gazette of the United States Patent Office, Vol 967, No 3, p 1069, February, 1978. 1 fig.

Descriptors: *Sludge treatment, *Settling basins, *Sumps, *Patents, Equipment, Waste water treatment, Design data, Sludge disposal, Electric motors, Municipal wastes.

A patent has been issued for a flat bottomed tank which provides settling and scraping of treated sewage sludge. The tank is equipped with a bracket mounted, electric motor-driven bridge which traverses the length of the chamber. A wheel containing a pneumatic tire rotates around a vertical axis attached to the bridge and parallel to the tank wall and operates by the bridge motor. The tire is maintained in contact with the adjacent wall by a gravitational force established by a rotating plate connecting the support bracket to the wheel and motor. A sludge scraper frame equipped with a transverse center bar and a scraper blade is mounted on one of the longitudinal side members of the frame; it is supported in a horizontal position by the bridge. During sludge scraping, the

sludge scraper rotates about an inclined axis as it moves toward a sump at one end of the tank. The scraper returns to an idle position as it moves away from the sump. An elongated, curved cam plate, projecting out from the end wall to the side of the scraper frame, controls the angle of the sludge scraper frame. (Lisk-FIRL)
W78-06622

NEW BASIC TECHNIQUE FOR TREATMENT OF EFFLUENTS FROM PULP AND PAPER MILLS (NUEVA TECNICA BASICA PARA EL TRATAMIENTO DE EFLUENTES DE FABRICAS PASTERO-PAPELERAS),
La Plata Univ. (Argentina).
J. A. Montani Leguizamon, and M. F. Colmenarejo Morcillo.
Contaminacion y Prevencion, Vol 5, No 40, p 23-28, March, 1976. 2 fig, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Chemical precipitation, Wastes, Industrial wastes, Pulp and paper industry, Effluents, Water pollution sources, Water pollution treatment, Hydrogen ion concentration, Polyelectrolytes, Flocculation, Sedimentation, Carbon dioxide, Biochemical oxygen demand, Color, Economics, Water pollution control, Waste treatment, Kraft mills.

Following a review of the types of effluents stemming from the manufacture of pulp and paper (particularly from the manufacture of bleached kraft pulp), studies are outlined which led to a new basic technique for treating such effluents. The treatment is based on adjusting the effluent to a pH of 12.5 using causticizing mud and adding a polyelectrolytic flocculant. Solid contaminants are then removed via sedimentation, and the pH of the clarified effluent is adjusted to 6.5 using carbon dioxide (e.g., recovery boiler emissions). Such a treatment can reduce effluent BOD by 53% and total color by 97%. Pilot-plant and industrial applications of the process are discussed along with economic considerations. (Speckhard-IPC)
W78-06623

SLUDGE DEWATERING--AN IMPORTANT CONTRIBUTION TO ENVIRONMENTAL PROTECTION (SCHLAMMENTWAESSERUNG--EIN WICHTIGER BEITRAG ZUM UMWELTSCHUTZ).
Das Oesterreichische Papier, Vol 14, No 9, p 24, September, 1977. 1 fig, 1 tab.

Descriptors: *Sludge treatment, *Dewatering, *Equipment, *Pulp wastes, Wastes, Waste treatment, Water pollution sources, Water pollution treatment, Water pollution control, Performance, Pulp and paper industry, Sludge, Industrial wastes, Solid wastes, Dewatering press, Pressure, Presses, Pressing.

The Bellmer convergent-belt press is described, and some data on its performance in dewatering pulp and paper mill sludges are given. Throughput capacities range around 15-20 cu m/hr/m of belt width contacted by sludge; final dry solids contents amount to 30-35%. (Ward-IPC)
W78-06624

CONTROL OF CHEMICAL OXYGEN DEMAND IN PULP AND PAPER MILL EFFLUENTS (CONTROL DE LA DEMANDA QUIMICA DE OXIGENO EN LOS VERTIDOS DE CELULOSA Y PAPEL),
Instituto Nacional Investigaciones Agrarias, Madrid (Spain).
For primary bibliographic entry see Field 5A.
W78-06625

SEWAGE SLUDGE DISPOSAL,
Thiokol Corp., Newton, PA. (Assignee).
For primary bibliographic entry see Field 5E
W78-06626

PROBLEMS WITH REUSE OF VETRNI PAPER MILL EFFLUENTS IN THE PULP MILL CONSIDERING THE CONCENTRATION OF SULFATE IONS (PROBLEMATIKA RECIRKULACIE VOD MEDZI PAPIERNOU A CELULOZKOU VO VETRNI Z HL'ADISKA OBEHU SIRANOVYCH IONOV),
Vyskumny Ustav Papiera a Celulozy, Bratislava (Czechoslovakia).
For primary bibliographic entry see Field 3E.
W78-06627

PAPER AND BOARD MILL EFFLUENT TREATMENT USING THE SONOFLOT EQUIPMENT (CISTENI ODPADNICH VOD Z VYROBY PAPIRU A LEPENKY NA FLOTACNIM ZARIZENI SONOFLOT),
Papcel Litovel (Czechoslovakia).
V. Gottfried.
Papir a Celuloza, Vol. 32, No. 7-8, p 199-201, 1977. 1 fig, 1 illus, 1 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Flotation, *Equipment, Wastes, Industrial wastes, Water pollution treatment, Water pollution sources, Waste treatment, Foreign countries, Europe, Pulp and paper industry, Effluents, Suspended solids, Sludge, Water pollution control, Czechoslovakia.

The Sonoflot unit was developed in Czechoslovakia, especially for paper mill effluent treatment. The unit works as a flotator with relatively high efficiency and small space requirements, which make it a good choice for individual paper or board machine effluent treatment. Since 1969, when the first unit was manufactured by the Papcel Company, numerous Czechoslovakian and foreign mills, including secondary-fiber board mills, have had favorable experience with these machines. The Sonoflot units are supplied in four sizes with throughputs ranging from 15 to 150 cu m/hr containing up to 1500 mg/liter of suspended solids. The capture rate of the flotator ranges from 85 to 98% and the sludge consistency is 0.5-3.0%. The unique part of the Sonoflot flotator is the generator of hydrodynamic pulses designed to disperse air into small bubbles. (Trubacek-IPC)
W78-06628

PROCESSING OF PAPER MILL EFFLUENT TREATMENT SLUDGES (ZPRACOVANI ODPADNICH KALU Z CISTENI PAPIRENSKYCH ODPADNICH VOD),
IRAPA, Prague (Czechoslovakia). Vyvojovy a Racionalizacni.
For primary bibliographic entry see Field 5E.
W78-06629

PAPER MILL SLUDGE DEWATERING IN THE JINDRICHOV MILL (ZAHUSTOVANI PAPIRENSKYCH KALU V ZAVODE JINDRICHOV),
Olsanske Papirny (Czechoslovakia).
For primary bibliographic entry see Field 5E.
W78-06631

TREATMENT OF EFFLUENT FROM THE PRODUCTION OF FINE PAPER (CISTENI ODPANICH VOD Z VYROBY TENKYCH PAPIRU),
Olsanske Papirny (Czechoslovakia).
J. Homolova.
Papir a Celuloza, Vol. 32, No. 7-8, p 220-222, 1977. 1 fig, 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Treatment facilities, *Sludge treatment, *Dewatering, Wastes, Industrial wastes, Pulp and paper industry, Effluents, Water pollution treatment, Water pollution sources, Foreign countries, Europe, Sedimentation, Centrifugation, Equipment, Czechoslovakia.

The Olsany paper mill (Czechoslovakia) has an effluent treatment plant consisting of three sedimentation tanks. Two of the tanks are of the Satyr type, which consists of a circular welded tank divided vertically into three conical-bottom compartments. Sludge from all three funnel tips is pumped for dewatering while the water goes through the compartments in series. The third sedimentation unit is similar to the Satyr, but is equipped with a sludge rake mechanism. The sludge from all sedimentation tanks at a consistency of 1.8-1.9%, containing 30.2-35.8% of inorganics (determined as ash), was used for sludge dewatering pilot plant tests, carried out with the Andritz press were favorable for sludge from the production of fine papers. In comparison with the centrifuge, the SEM press gave higher final solids, quiet and reliable operation at lower energy usage, and performance relatively unaffected by intake consistency fluctuation. (Trubacek-IPC)
W78-06632

EFFLUENT TREATMENT PLANT SLUDGE MANAGEMENT IN THE PAPER MILL AT VRANE ON THE VLTAVA RIVER (KALOVE HOSPODARSTVI CISTIRNY ODPADNICH VOD V ZAVODE VRANE NA VLTAVOU),
Zapadoceske Papirny (Czechoslovakia).
For primary bibliographic entry see Field 5E.
W78-06633

PURE OXYGEN AND CONVENTIONAL AIR ACTIVATED SLUDGE TREATMENT PILOT PLANT EVALUATION FOR A PULP AND PAPER MILL WASTE,
Hydroscience, Inc., Westwood, NJ.
J. P. Watkins, T. J. Mulligan, and J. Shema.
Proceedings of the 31st Industrial Waste Conference, May 4-6, 1976, Purdue University (Lafayette, Indiana), p 206-217. 8 fig, 1 ref, 5 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, Biological treatment, Wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Oxygen, Air, New York, Pilot plants, Design, Operation and maintenance, Economics, Biochemical oxygen demand, Chemical oxygen demand, Sludge, Dewatering, Costs, Capital costs, Operating costs, Temperatures, Reliability, Sulfite pulp mills, Paper mills.

A comparison of oxygen- vs. air-aided biological sludge treatments was conducted at Finch Pruyn & Co. Inc.'s pulp and paper mill in Glen Falls, New York, which makes high-grade printing paper from ammonia-base sulfite pulp produced in a continuous digester (200 tons/day) and subjected to multistage bleaching with chlorine, NaOH, and hypochlorite. The pure-oxygen process used a package pilot facility supplied by Linde Division of Union Carbide Corp. (UNOX system). Design and operating parameters, including economics, of the two systems are contrasted. Although either system achieved BOD removals above 95% with proper operation, along with COD removals of ca. 80%, the combined primary plus UNOX secondary sludges were dewatered considerably better than the combined primary plus air-system secondary sludges. Vacuum filter loading rates were 2-5 times higher for the UNOX than the air-system sludge, and the former required no chemical conditioning. At nearly identical capital cost requirements, the UNOX system's operating costs were estimated significantly lower (471,600 vs. $556,700). Operating reliability should be equal, provided temperatures are properly controlled, which requires a precoling tower for the UNOX system. (Brown-IPC)
W78-06634

THE APPLICATION OF THE ICI DEEP SHAFT PROCESS TO INDUSTRIAL EFFLUENTS,
Imperial Chemical Industries Ltd., Billingham (England). Agricultural Div.
D. H. Bolton, D. A. Hines, and J. P. Bouchard.

Proceedings of the 31st Industrial Waste Conference, May 4-6, 1976, Purdue University (Lafayette, Indiana), p 344-351. 7 fig, 2 tab.

Descriptors: *Waste water treatment, *Biological treatment, *Industrial wastes, *Pulp wastes, Wastes, Pulp and paper industry, Water pollution sources, Water pollution treatment, Microorganisms, Costs, Waste treatment, Effluents, Foreign projects, Europe, Effluents, Pilot plants, Sulfite pulp mills, Condensates, England, Germany.

The ICI deep-shaft biological effluent treatment process, developed as a spin-off from single-cell protein research makes use of a deep drilled shaft (70 ft or more) with concentric or adjacent upflow (riser) and downflow (downcomer) sections, in which a culture of effluent-purifying microorganisms is maintained. A British pilot plant has been operating on domestic sewage since mid-1974, and a full-scale German plant for starch waste has been built in 1975. The deep-shaft process is said to be suitable for wastes of other industries as well, including pulp and paper mill effluents. Cost estimates and process parameters for treating sulfite mill evaporator condensates are included among the examples given. (Brown-IPC)
W78-06635

AN OZONE REACTOR FOR COLOR REMOVAL FROM PULP BLEACHERY WASTES,
Case Western Reserve Univ., Cleveland, OH. Dept. of Chemical Engineering.
P. B. Melnyk, D. Judkins, and A. Netzer.
Proceedings of the 31st Industrial Waste Conference, May 4-6, 1976, Purdue University (Lafayette, Indiana), p 434-443. 14 fig, 10 ref, 3 tab.

Descriptors: *Ozone, *Waste water treatment, *Color, *Bleaching wastes, Wastes, Industrial wastes, Pulp wastes, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Costs, Operating costs, Capital costs, Temperature, Biochemical oxygen demand, Chemical oxygen demand, Oxygen, Recycling, Design, Chemical reactions.

The design of an ozone reactor along with estimates of capital and operating costs are presented, based on data for color removals and ozone consumptions measured on a kraft-mill caustic bleachery waste at 2 temperatures (29.5 and 60.5C) and two initial ozone concentrations (0.0106 and 0.0174 mole fractions). Changes in BOD and COD accompanying the decoloring effect are also reported. The reaction of ozone with color bodies is rapid. Its observable rate is a combined of the rates of chemical kinetics and mass transport. The oxygen-recycle system offers savings in both capital and operating expense over the air-feed system. (Brown-IPC)
W78-06636

REMOVAL OF COLLOIDAL TITANIUM DIOXIDE PIGMENT FROM AN INDUSTRIAL WASTE EFFLUENT,
Northeastern Univ., Boston, MA.
M. D. Walters, and I. W. Wei.
Proceedings of the 31st Industrial Waste Conference, May 4-6, 1976, Purdue University (Lafayette, Indiana), p 583-595. 13 fig, 12 ref, 3 tab.

Descriptors: *Pulp waste, *Titanium, *Waste water treatment, *Colloids, Pigments, Zeta potential, Coagulation, Turbidity, Filters, Sludge, Costs, Filtration, Water pollution sources, Water pollution treatment, Wastes, Industrial wastes, Pulp and paper industry, Settling velocity, Effluents, Operation and maintenance, Waste treatment, Newsprint, Titanium dioxide.

Although zeta-potential is a useful parameter for evaluating colloid stability, it could not be used for accurate predictions of either the coagulating point or the coagulant dose for the titania solutions studied. Turbidity was a valuable parameter to evaluate titania removals from the studied effluents. Settling rates of completely coagulated pigment solutions were rapid and produced rather clear supernatant effluents. The Trommel rotary filter was found to be well suited to removal of coagulated pigment sludges, but dimensions and operating criteria should be selected individually for each practical application. In analyzing the costs of newsprint for filtering dry solids, a relationship between solids yield and filtrate yield vs. form time was found which indicates that operation beyond 30 sec form time will minimize newsprint paper costs. (Brown-IPC)
W78-06637

PLANT CLOSES LOOP ON ITS WASTEWATER TREATMENT.
Environmental Science and Technology, Vol. 12, No. 3, p 260-263, 1978. 2 fig.

Descriptors: *Chemical wastes, *Fertilizers, *Ammonia, *Sulfur compounds, *Phosphorus compounds, Nitrogen, Potassium, Air pollution, Cooling towers, Fluorine, Waste water treatment, Industrial wastes, Water reuse.

Mississippi Chemical in Pascagoula, a manufacturer of sulfuric acid, phosphoric acid, anhydrous ammonia, and nitrogen, phosphorus, and potassium mixed fertilizers, has installed a 10-unit closed water treatment system. Scrubbing water from the fertilizer plants is pumped to a cooling tower where it is neutralized and the fluorine concentration reduced with caustic. Phosphoric acid production waste water is also circulated to a cooling tower. A storm water collection system routes all precipitation to a storage tank for use as makeup water in the fertilizer cooling tower. Decanted gypsum slurry water is retained in a holding tank before reuse as process water and gypsum slurry water. Chromate, added during ammonia production as an anti-corrosive, is reduced to less than 0.05 ppm by electrolytic precipitation. A neutralization facility removes acid impurities from the waste streams with lime precipitation, flocculation, clarification, and sludge removal. Oil and water from ammonia production are separated and filtered in a collection tank. Shell and tube heat exchanger water is conveyed to a cooling tower before discharge. Acidic emissions from the phosphate plant are scrubbed; scrubber water is maintained at pH in a storage pond. Ammonium phosphate fertilizer dust is purified by fabric filters located in seven baghouses. Emissions from the granulation, drying, and neutralizing operations are first scrubbed with phosphoric acid for solids removal, and then with a weaker solution of phosphoric acid for the removal of fluorine, ammonia, and dust. (Lisk-FIRL)
W78-06641

REMOVING SUSPENDED IMPURITIES FROM WASTE WATER FROM ACETYLENE PRODUCTION--BY CLARIFICATION AND TREATMENT WITH IRON SALTS AND POLYACRYLAMIDE.
Soviet Patent SU-247-866. Issued June 6, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 3, p 2, February, 1978.

Descriptors: *Chemical industry, *Iron, *Chemical wastes, *Patents, *Water purification, *Calcium carbonate, Filtration, Slurries, Waste water treatment, Industrial wastes.

A process has been patented for the clarification of acetylene production waste water with iron salts and polyacrylamide. Cleaned waste water is treated with an iron salt, preferably in the amount of 0.5-0.8 mg/liter rather than 5-10 mg/liter. The waste water is further clarified by the addition of a polyacrylamide at a concentration of 0.05-0.1 mg/liter. The reduced iron salt requirement increases the degree of purification while reducing the treatment cost. The lower iron salt addition also prevents calcium carbonate deposition of the equipment and decreases the loss of acetylene to the slurry. Acetylene can be recovered by filtration. The slurry in the screening area is concentrated to 470 g/liter from 380 g/liter; the amount of clarification required is reduced to 0.20 mg/liter from 200-500 mg/liter. An example of the use of the process for the purification of acetylene production waste water is presented. (Lisk-FIRL)
W78-06642

MATHEMATICAL MODELS USEFUL IN EVALUATION OF ORGANIC WASTEWATER,
Chulalongkorn Univ., Bangkok (Thailand).
S. Sujarittanonta, J. H. Sherrard, and D. F. Kincannon.
Water and Sewage Works, Vol. 125, No. 1, p 38, 40-42, January, 1978. 6 fig, 2 tab, 11 ref.

Descriptors: *Food processing industry, *Mathematical models, *Activated sludge, *Organic wastes, *Chemical oxygen demand, Microbial degradation, Biological treatment, Analytical techniques, Kinetics, Waste water treatment, Industrial wastes.

The application of mathematical models for biological treatment of waste water to slaughterhouse effluent containing beef blood was evaluated in laboratory tests with activated sludge treatment. Beef blood, with COD values ranging from 10,000 mg to more than 70,000 mg/liter, was diluted to COD concentrations of 460, 1100, and 1570 mg/liter and introduced into activated sludge units containing microorganisms from an acclimated continuous flow unit. Retention times of the blood-bearing effluent in the activated sludge cells ranged from 4.6 to 15.0 days was nearly constant for the three organic loadings tested. Higher COD concentrations in the effluent increased the removal efficiency to greater than 91%. Effluent concentrations of COD were maintained below 50 mg/liter. The observed biological treatment data was compared to mathematical predictions that were based on mean cell residence time and biokinetic coefficients. Calculated values for the maximum microorganism yield coefficients were similar to observed values; energy coefficients for microorganism maintenance were lower. The beef blood in the effluent, the source of carbon and energy for microorganism metabolism, was thought to provide sufficient quantities of nutrients for growth without the need for synthesis reactions. (Lisk-FIRL)
W78-06643

EVALUATION OF BIRD CHILLER WATER FOR RECYCLING IN GIBLET FLUMES,
Richard B. Russell Agricultural Research Center, Athens, GA.
H. S. Lillard.
Journal of Food Science, Vol. 43, No. 2, p 401-403, 1978. 5 tab, 4 ref.

Descriptors: *Food processing industry, *Poultry, *Salmonella, *Coliforms, *Cooling water, Aerobic bacteria, Flumes, Biochemical oxygen demand, Chemical oxygen demand, Recycling, Waste water treatment, Bactericides, Industrial wastes.

The feasibility of recycling water from the processing of poultry, especially from the gizzard splitter and bird chiller stages to the giblet flumes, was examined by water quality analyses of each processing stage. A comparison of microbiological parameters in the water from giblet flumes and chillers indicated that the water in the gizzard, liver-heart, and neck flumes was of higher quality than the water in the corresponding chillers. Fecal coliform and aerobic bacteria counts for the bird chiller water were significantly higher than for the giblet flumes. Salmonella was detected in four out of 26 samples taken of bird chiller water; neck flume water, with one Salmonella incidence in 26

samples, was the only flume water exhibiting the pathogenic bacteria. Gizzard splitter samples displayed higher microbiological quality than any of the flume waters except for the gizzard flume. All chiller waters were found to contain Salmonella, evidenced as the serotypes S. bornum, S. california, S. heidelberg, S. infantis, S. senctenberg, and S. typhimurium. The gizzard splitter water was considered acceptable for recycling to the giblet flumes without bactericidal treatment. A comparison of BOD and COD levels in the water samples indicated that gizzard flume and bird chiller water contained the lowest levels of organic matter; gizzard splitter and neck chiller samples exhibited the highest organic loadings. Because of its lower BOD and COD content, bird chiller water was preferred over gizzard splitter water for bactericidal treatment and recycling to the giblet flumes. (Lisk-FIRL)
W78-06644

USE OF SPENT PICKLE LIQUOR IN WASTE TREATMENT, EVALUATION OF ELECTROLESS COPPER AND COPPER ETCHANT,
Agricultural Research Service, Peoria, IL. Northern Regional Research Center.
R. E. Wing, and W. E. Rayford.
Metal Finishing, Vol. 76, No. 3, p 31-33, March, 1978. 2 tab, 39 ref.

Descriptors: *Copper, *Iron compounds, *Copper compounds, *Ammonia, *Metals, Lime, Iron oxides, Reduction(Chemical), Waste water treatment, Industrial wastes.

Spent pickle liquor containing 5.5-8.0% ferrous iron was evaluated as a treatment medium in the removal of copper from quadrol-based electroless copper rinse water and from copper ammonia etchant rinse water. The disposal of pickling liquor, used in the removal of oxide scale from steel products, has been limited by stricker waste disposal regulations. Byproducts recovered from spent pickling liquor are iron compounds and ions, sulfuric acid, hydrochloric acid, and ammonium sulfate. The reduction of chromate in wastes can be accomplished by treatment with spent ferrous sulfate pickling liquor and neutralization. Quadrol-based electroless copper plating rinse waters, with concentrations of 50-1000 mg/liter, can be treated at pH 11.2-12.0 with pickling liquor additions of 10.6-53.0 ml to copper concentrations of 0.04-0.50 mg/liter. Neutralization to the indicated pH was accomplished with sodium hydroxide or lime. The treatment of copper ammonia etchant wash waters with pickling liquor additions of 2.65-10.6 ml reduced copper concentrations from 50 mg/liter to 0.15-27.21 mg/liter at pH 9.4-11.7. Results indicated that 3 gallons of spent pickling liquor with a ferrous ion content of 6.6% were required for the treatment of 1000 gallons waste water containing a 50 mg/liter concentration of copper-quadrol or copper ammonia rinse. (Lisk-FIRL)
W78-06645

RECOVERING NI/CR FROM PLATING WASTES.
Canadian Chemical Processing, Vol. 62, No. 2, p 28-31, February, 1978.

Descriptors: *Nickel, *Chromium, *Ion exchange, *Reverse osmosis, *Evaporation, Resins, Cellulose, Chemical wastes, Membranes, Metals, Waste water treatment, Industrial wastes.

The recovery of nickel and chromium from plating wastes with small, refined ion exchange, reverse osmosis, or evaporation units is reviewed. An ion exchange unit, developed by Eco-Tec Ltd of Toronto, Canada, utilizes a reciprocal flow ion exchanger that requires a small amount of resin. The rapid circulation of the waste water stream through the loading, regeneration, and washing processes produces a smaller amount of concentrated, bound metal on the exchange resin. The process for nickel recovery is completed within about 15 min; ion exchange recovery of chromium requires about 30-60 min. At least 99% of the nickel in the effluent stream is recovered at a cost of approximately $0.28 /kg of recovered nickel. The Eco-Tec system recovers 6 kg/hr of chromium oxide at a cost of $0.68/kg. Reverse osmosis systems are capable of recovering dissolved materials in the plating waste stream. A reverse osmosis system developed by Electrohomel Ltd of Kitchener, Ontario, utilizes a cellulose acetate membrane for almost complete recovery and 90% water recovery. A polybenzimidazolone membrane developed in Japan has a higher temperature range and a pH tolerance of 1-12. An evaporation unit, manufactured by Corning Glass Co of New York, has a capacity of 80 liters/hr and produces a highly concentrated solution; a steam supply of 90 kg/hr and 40 liters/min of cooling water are required for operation. Up to 525 g/liter of chromic acid can be maintained in the plating tank. (Lisk-FIRL)
W78-06646

ANALYSIS OF CYANIDES IN COKE PLANT WASTEWATER EFFLUENTS,
Envirodyne Engineers, Inc., St. Louis, MO.
For primary bibliographic entry see Field 5A.
W78-06647

REMOVAL OF EMULSIFIED OIL WITH ORGANIC COAGULANTS AND DISSOLVED AIR FLOTATION,
Carnegie-Mellon Univ., Pittsburgh, PA. Dept. of Civil Engineering.
R. G. Luthy, R. E. Selleck, and T. R. Galloway.
Journal Water Pollution Control Federation, Vol. 50, No. 2, p 331-346, February, 1978. 9 fig, 5 tab, 30 ref.

Descriptors: *Oil industry, *Oil wastes, *Polyelectrolytes, *Flocculation, *Flotation, Anions, Cations, Emulsions, Waste water treatment, Industrial wastes.

Laboratory and pilot plant experiments tested the effectiveness of dissolved air flotation with prior polyelectrolytic coagulation for the removal of emulsified oil recovered from petroleum waste water by American Petroleum Institute (API) separators. The kinetics of oil droplet-air bubble interfaces were also examined. The separator effluent contaning emuslified oil was coagulated with a series of anionic, nonionic, and cationic polyelectrolytes. A dosage of 15 mg/liter of the cationic polyelectrolyte WT 2640, consisting of 75% of a polydiallyldimethylammonium compound, provided the best reversal of electrokinetic mobility of the oil droplets at pH 8.0. Dissolved air flotation with the 75% charged WT 2640 of the emulsified oil effluent removed an average of 98.6% of the suspended oil. The pilot plant results indicated that good oil droplet coagulation and flocculation increased oil removal during dissolved air flotation. Polyelectrolyte dosage requirements were found to be independent of the concentratuion or composition of the emulsified oil. The dissolved air flotation involved saturation of the effluent with air at 345 kilopascals and release of the aerated effluent at atmospheric pressure into a flotation chamber. Air bubbles rising toward the surface carried emulsified oil droplets. The resulting surface foam containing the emulsified oil was removed by separators. Oil droplets coagulation to zero net charge established the most conducive oil droplet-air bubble interfaces for the dissolved air flotation process. (Lisk-FIRL)
W78-06648

PETROLEUM PROCESSING WASTE WATER PURIFICATION--BY NEUTRALISING WITH SULPHURIC ACID AND ELECTROLYSIS TO REMOVE NAPHTHENATES.
Soviet Patent SU-543-687. Issued March 10, 1977.
Derwent Soviet Inventions Illustrated, Vol. Y, No. 51, p 6, February, 1978.

Descriptors: *Oil industry, *Oil wastes, *Electrolysis, *Patents, *Organic acids, Anodes, Cathodes, Sulfur compounds, Waste water treatment, Industrial wastes.

A patent has been issued for a process to remove naphthenates from oil industry waste water by neutralization followed by electrolysis with long anodic impulse duration. The alkaline aqueous effluent from oil refineries, containing the naphthenates, is first neutralized to pH 7.0-7.5 with sulfuric acid. The naphthenates are then separated from the waste water by electrolysis with steel electrodes at a current density of 2.0-2.5 A/sq dm. The electrolytic separation process is accelerated by the use of an anodic impulse duration that is four times longer than the cathodic impulse duration through current reversal at 6-12 volts. This procedure also prevents the deposition of mud on the electrodes. Use of the treatment process is described for petroleum waste water containing 6,500 mg of naphthenic acid/liter with a pH of 12.3 and a transparency of 21 cm. After neutralization to pH 7.0-7.5, the effluent was electrolyzed for 12 min, yielding waste water with a transparency of 35 cm and a precipitate containing 95% naphthenates and 5% iron hydroxide. (Lisk-FIRL)
W78-06649

GAS FLOTATION TO RAISE AND REMOVE SLUDGE FROM TREATMENT TANKS--PARTICICULARLY OILY SLUDGE FROM OIL REFINERY SEPARATORS.
Netherlands Patent NL-7706-525. Issued December 20, 1977. Derwent Netherlands Patents Report, Vol. A, No. 2, p 2, February, 1978.

Descriptors: *Sludge disposal, *Sludge, *Oil wastes, *Oil industry, *Patents, Design data, Equipment, Aeration, Waste water treatment, Industrial wastes.

A patent has been issued for a flotation process to remove sludge, particularly oil refinery sludge, from the bottom of treatment tanks. The bottom of the tank is equipped wit air sparge pipes which inject compressed air into inverted collecting gutters that are angled upwards. Aeration of the sludge by the compressed gas causes an upward motion toward a riser. The collecting gutters direct the sludge toward the riser, which in turn channels the aerated sludge into disposal gutters located above the surface of the liquid. Slude is removed from the tank via the disposal gutters. This sludge aeration and removal process is effective for the cleaning of petroleum refinery oil separation tanks, as well as for settling tanks used in waste water treatment plants. (Lisk-FIRL)
W78-06650

KINETICS FOR ACTIVATED SLUDGE PROCESS DESIGN: EXPERIMENTAL APPLICATION TO STRAW PAPER WASTEWATER TREATMENT,
Genoa Univ. (Italy). Tecnologie dell Ingegneria Chimica.
M. Del Borghi, G. Migliorini, G. Isola, and G. Ferraiolo.
Biotechnology and Engineering, Vol. 20, No. 2, p 203-215, 1978. 11 fig, 2 tab, 20 ref.

Descriptors: *Activated sludge, *Pulp and paper industry, *Pulp wastes, *Kinetics, *Mathematical models, Biodegradation, Analytical techniques, Biochemical oxygen demand, Chemical oxygen demand, Waste water treatment, Industrial wastes.

Kinetic models were developed for batch and continuous feed process in activated sludge treatment of straw paper waste water. The sample waste water, containing multicomponent substrates with varying biodegradation rates, had BOD loads ranging 630-1380 mg/liter and COD loads of 1500-2900 mg/liter. Activated sludge treatment of the waste

samples in batch tests produced significant initial reduction in BOD and COD. Reduction rates decreased as the relative pollutant concentrations decreased. The reduction of BOD and COD was found to be directly dependent upon the initial concentration of the waste; the results of the batch tests could be expressed as a substrate kinetics equation. Similar activated sludge treatment of the straw paper wastes was evaluated with continuous tests. The liquor concentration in continuous tests reached a steady state concentrattion which was dependent upon the retention time in the reactor. The rate of substrate biodegradation was found to be higher in continuous tests than in batch tests. Kinetic models of continuous and batch tests became coincident only for high residence times when the reaction rate was controlled by complex substrates. The kinetic model for continuous test substrate removal accurately simulated continuous reactor results, whereas the kinetic model for batch tests dictated an aeration unit that was larger than necessary because of the model's prediction of a slow reaction rate. (Lisk-FIRL)
W78-06651

THE ENSO-BIOX METHOD: A BIOLOGICAL TREATMENT USING SOFTWOOD BARK PRETREATED WITH NUTRIENTS AS A FILTER MEDIUM REMOVED 90% OF MALODOROUS SULPHUR COMPOUNDS IN MILL TESTS FOR PURIFYING KRAFT PULP MILL CONDENSATES,
Enso-Gutzeit Osakeyhtio, Imatra (Finland).
I. Vettenranta.
Pulp and Paper of Canada, Vol. 79, No. 1, p 53-55, January, 1978. 3 fig, 4 tab, 4 ref.

Descriptors: *Pulp and paper industry, *Pulp wastes, *Sulfur compounds, *Softwood, *Biological treatment, Filters, Biodegradation, Sulfur bacteria, Pilot plants, Laboratory tests, Gases, Waste treatment, Air pollution, Odor, Industrial wastes.

Laboratory, pilot plant, and full scale tests were performed with the Enso-biox biofilter technique, developed by Enso-Gutzeit Research Center of Finland, for deodorizing Kraft mill effluents. Odorous sulfur compounds produced by sulfate pulping processes were removed from gases and condensates in a unit employing sulfur bacteria on softwood bark filters. Condensates from the pulping effluent trickled through softwood bark filters that had been treated with microorganism-sustaining nutrients. Upward aeration of the odorous gas through the filter medium occurred simultaneously with the downward trickling of the odor-bearing waste. After passing through the filter and condensate, the gas was passed into another chamber for filtration. Toxic sulfur compounds were removed in the filtration process by a strain of sulfur bacteria on the softwood bark that metabolized the toxic waste. Odorous sulfur compounds from the gases and condensates of pulping processes were reduced by 88-98% in the laboratory, pilot plant, and full scale tests of the biofilter. A 73-75% reduction of methanol and a 73-82% reductionof acetone was achieved by employing two liquid biofilters in series. (Lisk-FIRL)
W78-06652

BACTERIOLOGY AND ENZYMOLOGY OF FELLMONGERY ACTIVATED SLUDGE SYSTEMS,
Rhodes Univ., Grahamstown (South Africa). Leather Industries Research Inst.
D. E. Rawlings, and D. R. Woods.
Journal of Applied Bacteriology, Vol 44, No 1, p 131-139, 1978. 3 fig, 5 tab, 25 ref.

Descriptors: *Activated sludge, *Tannery wastes, *Pseudomonas, *Enzymes, *Bacteria, Lipids, Proteins, Biodegradation, Aerobic bacteria, Biological treatment, Waste water treatment, Industrial wastes.

A quantitative analysis of activated sludge treated fellmongery wastes included studies on enzyme activity and enzyme-producing bacteria. Composite samples of waste water from sheepskin soaking and washing, as well as from the lime-sulfide unhairing operation, were obtained from a fellmongery in Port Elizabeth, South Africa. The fellmongery effluent contained sulfide, bisulfide, calcium ions, dissolved albumin, mucoids, mucopolysaccharides, keratin, dissolved and emulsified fats, and soluble and insoluble organic and inorganic compounds. Significant increases in bacterial and saprophytic protozoan counts with increases in catalase, protease, and phosphates activity indicated that these protozoa played an important role in the oxidation and hydrolytic changes during effluent treatment. The absence of keratinase activity was attributed to the absence of keratinase-producing bacteria. Bacteria colonies in the fellmongery activated sludge predominantly degraded proteins and lipids rather than detergents, nucleic acids, starches and cellulose. The bacterial balance of the fellmongery effluent was dominated by a relationship between pseudomonas and Acinetobacter. (Lisk-FIRL)
W78-06654

THE TREATMENT OF TANNERY EFFLUENTS WITH FLOCCULANTS,
Barrie Tanning Ltd., (Ontario).
S. A. Shivas.
Journal of the American Leather Chemist's Association, Vol 73, No 2, p 70-76, 1978. 3 tab, 4 ref.

Descriptors: *Tannery wastes, *Flocculation, *Polyelectrolytes, *Alum, *Chemical precipitation, Coagulation, Zeta potential, Colloids, Dewatering, Sludge treatment, Waste water treatment, Industrial wastes.

Flocculation of waste streams from tannery processes with alum, acid, and polyelectrolytes was evaluated. Brine washes and alkali soaks, containing high salt concentrations, soaps and emulsifiers, were successfully flocculated with alum. Suspended solids were reduced by 88% in the brine wastes and 60% in the alkali soak. Bate liquors could be treated with alum when large quantities of degreasing agents were present or with 6 ppm of a cationic polyelectrolyte for an 87% suspended solids removal. Flocculation of hair-pulp electrolyte for an 87% suspended solids removal. Flocculation of hair-pulp sol with anionic polyelectrolytes was highly successful when sulfides were removed before treatment and phosphate was added. An 88% removal rate was achieved for flocculation with an electrolyte; more effective flocculation was achieved with the more costly sulfuric acid treatment. The remaining tannery effluent streams, consisting of retan, dye, and fatliquor wastes, were effectively treated with 1-2 ppm of an anionic polyelectrolyte having a high molecular weight and charge density. A 75% removal rate was realized for polyelectrolyte flocculation of these combined waste streams. The addition of 20-60 ppm of a cationic polyelectrolyte to fresh sludge increased its dewaterability. (Lisk-FIRL)
W78-06655

TREATING AQUEOUS EFFLUENT CONTAINING ALBUMIN, ESPECIALLY GELATIN--BY ADDING BASIC POLYMERIC COMPOUNDS AND SEPARATING AGGLOMERATE.
Belgian Patent BE-856-361. Issued January 2, 1978. Derwent Belgian Patents Abstracts, Vol A, No 2, p 3, February, 1978.

Descriptors: *Food processing industry, *Polymers, *Electrolysis, *Nitrogen compounds, *Patents, Ureas, Ammonium compounds, Cathodes, Anodes, Waste water treatment, Industrial wastes.

A process for the treatment of albumin-bearing effluent with a basic polymeric compound to form a removable agglomerate has been patented. The process was developed for the treatment of effluent from the manufacture of gelatin and photographic products, and from the brewing, malting, leather tanning, and slaughterhouse industries. The polymeric compounds used in the process are basic water-soluble aminoplasts synthesized from a formaldehyde-dicyanodiamide condensate, formed optionally with urea, an alkalenepolyamine, and ammonium chloride. The treatment process also requires a polymeric compound formed from formaldehyde, dicyanodiamide, ammonium chloride, and ethylene diamine. A polyamide or polyamine, with an amine value of 200-650 mg KOG/gm, formed from a polymeric fatty acid and a polyamide is also recommended as a treatment polymer. The treatment process involves the addition of 3-6 g of the polymeric compound per liter of waste water at pH 6-9. Electrolytic treatment of the effluent with an aluminum alloy anode and an iron, copper, nickel, or stainless steel cathode is also recommended. (Lisk-FIRL)
W78-06656

THE DEVELOPMENT OF CANE WASH WATER TREATMENT SYSTEMS IN HAWAII,
Door-Oliver, Inc., Honokaa (Hawaii). Sugar Div.
L. Engel.
Sugar y Azucar, Vol 73, No 1, p 28, 30-31, 34-35, 1978. 2 fig, 3 ref.

Descriptors: *Food processing industry, *Sugarcane, *Sugar crops, *Filtration, *Polymers, Flocculation, Lime, Screens, Filters, Suspended load, Waste water treatment, Pilot plants, Industrial wastes, Hawaii.

Door-Oliver waste water treatment equipment was evaluated for sugarcane wash effluent in pilot plant tests. About 4.5 mgd of wash water was required for the daily cane harvest of 4,373 tons, of which 31% was soil and waste matter. The addition of a polymer or lime to the waste water was required for flocculation of soil particles before clarification. The addition of an anionic or nonionic polymer, considered more cost-effective than lime treatment, produced efficient settling at doses of 1 ppm. Filtration with cloth media was found to be inefficient and uneconomical. Perforated stainless steel screens provided higher filtration rates, thick sludge cakes, and freedom from plugging. The disadvantage of the stainless steel screens was the production of a high turbidity filtrate which had to be returned to the clarifier for suspended solids removal. Two diaphragm pumps transferred the clarifier underflow to the filtration operation. Liquid cyclone separators replaced stainless steel screens which were inadequate because of abrasion and clogging by material being pretreated. (Lisk-FIRL)
W78-06657

SOME ASPECTS OF WATER AND EFFLUENT MANAGEMENT IN THE IRON AND STEEL INDUSTRY,
South African Iron and Steel Corp. (Johannesburg).
J. J. C. Heynike.
Water Pollution Control, Vol 77, No 1, p 56-60, 1978. 4 tab, 1 ref.

Descriptors: *Steel, *Iron, *Water reuse, *Metals, *Air pollution, Evaporation, Sulfur compounds, Acids, Steam, Biological treatment, Biochemical oxygen demand, Waste water treatment, Industrial wastes.

Improvements in iron and steel industry treatment facilities for waste removal and water reuse are reviewed. The Iscor steel mill in Vanderbijlpark, South Africa, loses about 30% of the daily 63,000 cu m of intake water through evaporation. Water treatment for reuse in steel processing in the South African plant is based on the counter-current rinse system or cascade system in conjunction with acid

regeneration. A comparison of hydrochloric acid and sulfuric acid as pickling agents for steel production is presented; the vacuum cooling-crystallization process for acid recovery is preferred. Other processing and treatment methods providing water conservation are air cooling, basic oxygen furnaces, and evaporative cooling. Air cooling, requiring treatment of the waste water with sulfite and a dispersant, is preferred over the open wet cooling systems. Basic oxygen furnaces employ air coolers in a closed circulation system and venturi gas scrubbers and clarifiers in a closed system. Thermal energy recovery from steam produced during evaporative cooling is not as cost-effective as blast furnace evaporative cooling. Heat absorbing cooling water is separated into steam and water in the blast furnace process. The steam may be condensed in air-cooled heat exchangers for thermal recovery. Biological treatment of coke oven wastes is the most effective method for producing an acceptable effluent. Although ammonia is not ionized, BOD is reduced by 90%, phenol by 99%, and thiocyanate by 85-90%. A dephenolization process involving gravel filtration and solvent extraction is described. (Lisk-FIRL)
W78-06658

SEDIMENTATION APPARATUS WITH FLOCCULATING FEED WELL,
Dorr-Oliver Inc., Stamford, CT. (Assignee).
H. H. Oltmann.
U.S. Patent No. 4,054,514, 9 p, 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 963, No 3, p 991-992, October 18, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water quality control, Industrial wastes, Water purification, Flocculation, Sedimentation, Equipment.

This invention relates to sedimentation apparatus for the continuous clarification of liquids or waste streams carrying suspended solids which require treatment with suitable flocculating agents so that these solids are caused to form settleable flocs. A rotary sludge raking structure and its drive mechanism are supported by a bridge or super structure spanning the tank, with the vertical shaft of the rake structure extending downward through the feed well cylinder. Rotation of the rake structure moves the sludge over the tank bottom to a sludge outlet in the center for withdrawal. The flocculated feed suspension entering the clarifier tank through a feed well at the center normally spreads out radially in all directions, allowing separated liquid from other liquor to overflow. The flocculated material settles to a sludge bed on the tank bottom where it may be withdrawn at a suitable rate. (Sinha-OEIS)
W78-06661

CHROME REMOVAL AND RECOVERY,
Cunningham (John), Portsmouth, OH. (Assignee).
E. J. Feltz, and R. Cunningham.
U.S. Patent No. 4,054,517, 6 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 963, No 3, p 992-993, October 18, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Chemical wastes, Water pollution treatment, Chromium, Chemical reactions, Chrome plating industry, Metal recovery, Backwash.

A process for removing and optionally recovering hexavalent chromium from chromium waste water is described. The invention involves the use of a treatment mixture comprising the combination of barium carbonate and/or barium hydrate, plus one or more certain specified acetates. The process involves contacting the chrome waste water to be treated with the treatment mixture at an acetic pH not exceeding 6.0, and usually from 4.0 to 6.0, followed by filtration through an acid-resistant filter. The chromium removed by this filter in the form of barium chromate can be regenerated into chromic acid by backwashing the filter into an agitated tank and treating to produce chromic acid and barium sulfate. The thus-generated chromic acid can then be returned to the chrome plating tank for reuse after passing through a filter to remove the barium sulfate. (Sinha-OEIS)
W78-06663

APPARATUS AND METHODS FOR SANITIZING SEWAGE EFFLUENT AND COMPOSITIONS FOR USE THEREIN,
L. P. Gould.
U.S. Patent No. 4,054,518, 6 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 963, No 3, p 993, October 18, 1977.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Sewage effluent, Water pollution treatment, Environmental sanitation, Bactericides, Equipment.

An apparatus and method to treat sewage effluent comprises a rack fabricated of a material impervious to both sewage effluent and a chlorine releasing bactericidal agent, preferably fabricated of plastic containing tablets of trichloroisocyanuric acid. the rack is seated within a conduit for the flow of sewage. The tablets are positioned in a row generally along the direction of effluent flow. The tablets extend generally transversely across a substantial portion of the conduit so that the greater the depth of effluent in the conduit, the greater the surface area of tablets exposed. The number of tablets employed in a row is a function of the demand for bactericidal agent which must be satisfied. In periods of relatively high effluent flow rate, the tablets may be nearly or completely submerged thereby dissolving at a maximum rate. However, at low flow periods only a small portion of the tablet would be exposed and a correspondingly low rate of dissolution experienced. The bactericidal agent is trichlorosiocyanuric acid which, in the presence of water, forms hypochlorite solution leaving cyanuric acid which is tasteless, odorless, colorless and non-toxic. (Sinha-OEIS)
W78-06664

APPARATUS FOR PURIFYING WASTE WATER CONTAINING ORGANIC CONTAMINANTS,
Agrotechnika, narodny podnik, Zvolen (Czechoslovakia). (Assignee).
S. Mackrie, V. Mackrie, and O. Dracka.
U.S. Patent No. 4,054,524, 9 p, 8 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 963, No 3, p 995, October 18, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water purification, Organic wastes, Aeration, Denitrification, Equipment.

A cylindrical reaction chamber for purifying waste water has a separating zone extending along its entire length and bounded transversely by first and second downward converging partition walls. The space in the vessel between the vessel wall and the first and second walls form separate waste water activation zones, in at least one contains an aerating device. Such zones are so configured that separate, oppositely directed transverse swirls of the waste water are established in the respective activating zones. A portion of the agitated water, after suitable treatment by baffle plats to remove the transverse swirling component, is introduced into the bottom of the separating zone for purification via fluid filtration. A pair of guide channels extend obliquely downward adjacent both ends of the separating zone, thereby providing a longitudinal circulation of waste water which promotes denitrification of certain contaminants in the waste water in the absence of aeration of the second activation zone. (Sinha-OEIS)
W78-06666

TRANSFORMATION OF ORGANOTIN COMPOUNDS IN WATER, (IN RUSSIAN),
Moskovskii Gosudarstvennyi Meditsinskii Inst. (I) (USSR). Dept. of Public Hygiene.
V. T. Mazaev, O. V. Golovanov, A. S. Igumnov, and V. N. Tsai.
Gig Sanit 3, p 17-20, 1976.

Descriptors: *Organotin compounds, Tin, Biological treatment, Ultraviolet radiation, Waste water treatment, Organic wastes, *Alkylation(Tin), *Hydrolysis, Microorganisms.

Hydrolysis was the determined factor of destruction of organic Sn compounds in water. Biochemical processes (due to microorganisms) affected only trialkyl compounds present at concentrations causing no biocidal action. UV radiation affected the stability of the Sn organic compounds. Stability depended on the extent of their alkylation and the form of alkyl.--Copyright 1978, Biological Abstracts, Inc.
W78-06671

THICKENING DEVICE AND METHOD,
Envirotech Corp., Menlo Park, CA. (Assignee).
R. C. Emmett, Jr.
U.S. Patent No. 4,055,494, 7 p, 3 fig, 21 ref; Official Gazette of the United States Patent Office, Vol 963, No 4, p 1324, October 25, 1977.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Flocculation, Suspended solids, Sedimentation, Water purification, Pulp and paper industry.

A primary object of the invention is to provide by gravity separation, an improved sedimentation machine for treating mineral slurries, industrial wastes and sewage, and the like, where the sedimentation device has the capacity to handle high flow rates of influent liquor per unit volume of the liquid-holding tank while still providing good clarity in the supernatant liquid. Slurries of finely divided solids which the sediment machine of the invention is intended to treat include, ore slurries, pulp and paper recausticizing slurries, flue gas scrubbing slurries, coal refuse slurries, and municipal and industrial wastewaters. The machine includes a liquid-holding tank having an upstanding tubular column mounted for receiving the feed liquor. An inlet is formed in the upper portion of the column to admit clarified supernatant into the column for mixing with, and dilution of, the feed liquor. Several adjacent compartments include reagent introduction and mixing to receive the feed liquor and to mix a chemical flocculating reagent. At the bottom of the column is an outlet to discharge the floculated liquor directly into a pulp blanket stratum established within the tank. (Sinha-OEIS)
W78-06673

METHOD FOR PREPARING AQUEOUS, RADIOACTIVE WASTE SOLUTIONS FROM NUCLEAR PLANTS FOR SOLIDIFICATION,
Gesellschaft fuer Kernforschung m.b.H., Karlsruhe (West Germany). (Assignee).
H. Schmieder, and R. Kroebel.
U.S. Patent No. 4,056,482, 5 p, 6 ref; Official Gazette of the United States Patent Office, Vol 964, No 1, p 217, November 1, 1977.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Radioactive wastes, *Nuclear wastes, *Electrolysis, Cathodes, Anodes, Oxidation, Reduction(Chemical).

A method is provided for preparing aqueous, radioactive waste solutions, from reprocessing plants for spent nuclear fuel and/or breeder materials and other nuclear plants, for noncontaminating solidification and/or removal of such solutions. The total quantity of the various inorganic and organic substances in the waste solution is reduced by the destruction of nitric acid,

nitrates and nitrites and the formation of a waste gas mixture which is practically free of higher nitrous oxides. To bring this about, the radioactive waste solution are subjected to an electrolysis current at such current densities at the anode and at the cathode that in one process step the substances of the group hydrazine, hydroxylamine, oxalic acid, oxalates, tartaric acid and tartrates are oxidized at the anode and the substances of the group nitric acid, nitrates and nitrites are reduced at the cathode. (Sinha-OEIS)
W78-06678

CATALYTIC DEODORIZING SYSTEM FOR HUMAN MANURE GAS, (SHOKUBAI SANKA NI YORU SHINYO GASU NO DASSHU SHISUTEMU),
H. Watake, and T. Horikawa.
Toshiba Rebyu, (Toshiba Review), Vol. 32, No. 10, p 824-824, 1977. 7 fig, 1 tab, 3 ref.

Descriptors: *Odor, *Oxidation, *Catalysts, *Waste reatment, *Hydrogen sulfide, Air environment, Municipal wastes, Treatment facilities, Sewage treatment, Waste water treatment.

High concentrations of hydrogen sulfide in sewage gas have generally required pretreatment before contact with a catalytic oxidation system. A system developed by the Toshiba Company of Japan eliminates the need for pretreatment of sewage gas before deodorizing by catalytic oxidation. A corrugated honeycomb catalyst is used in the Toshiba deodorizing system. The new system is operated at higher than usual temperatures and can effectively reduce the high concentrations of hydrogen sulfide in the sewage gas without deleterious effects on the catalyst. The Toshiba deodorizing system has been installed at Amagasaki City in Japan. (Lisk-FIRL)
W78-06698

BIODEGRADATION OF ORGANIC SUBSTANCES BY BIOLOGICAL TREATMENT AND IN NATURAL WATERS (GESUIDO SHORI JO OYOBI KOKYOYO SUIIKI NI OKERU YUKIODOKU BUSSHITSU NO BUNKAI KATEI NI KANSURU KENKYU),
K. Murakami, K. Hasegawa, H. Watanabe, and K. Komori.
Showa 51 Nendo Kankyo Hozen Kenkyu Seika Shu II, (A Collection of Results on the 1976 Environmental Conservation Researcher), Vol. 1, No. 95, p 1-17, 1977. 24 fig, 8 tab, 3 ref.

Descriptors: *Biochemical oxygen demand, *Chemical oxygen demand, *Carbon, *Organic matter, *Biodegradation, Analytical techniques, Aerobic conditions, Chromatography, Algae, Chlorophyta, Cyanophyta, Waste water treatment, Municipal wastes.

Organic components which are resistant to waste treatment were identified and their properties investigated. Samples of secondary sewage effluent and receiving waters were exposed to aerobic, dark conditions at 20C. It was found that the rate coefficient of decay by first-order reaction was greater for short-term decomposition of BOD than for COD due to manganese and total organic carbon. The decomposition rate for total organic carbon was greater than that of COD under the preceeding conditions, but both were approximately more accurately with longer decomposition periods and higher-order reactions. Using gel filtration chromatography, soluble organic compounds were categorized into two groups of biodegradable substances and two groups of nondegradable substances. Gel chromatographs were similar for polluted receiving water and secondary effluent and showed that the order of removal of compounds for size separation by gel filtration chromatography was based not on molecular weight, but on molecular structure and functional group. Aerobic decomposition of freshwater green and blue-green algae in lake water occurred within ten days during summer. The activated sludge process was effective in removing contributors to TOC which did not exhibit much ultraviolet absorbence at 260 nm. (Lisk-FIRL)
W78-06700

5E. Ultimate Disposal Of Wastes

SURVIVAL AND MOVEMENT OF FECAL INDICATOR BACTERIA IN SOIL UNDER CONDITIONS OF SATURATED FLOW,
Oregon State Univ., Corvallis. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W78-06224

THE USE OF REMOTE SENSING TECHNIQUES FOR DETECTION AND IDENTIFICATION OF POLLUTANT DISCHARGES,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 5A.
W78-06230

NEARSHORE DISPOSAL: ONSHORE SEDIMENT TRANSPORT,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 5B.
W78-06243

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX A--MAIN SHIP CHANNEL (SAN FRANCISCO BAR).
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5C.
W78-06253

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX C--WATER COLUMN.
Army Engineer District, San Francisco, CA.
For primary bibliographic entry see Field 5B.
W78-06254

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX D--BIOLOGICAL COMMUNITY,
Stanford Research Inst., Menlo Park, CA.
For primary bibliographic entry see Field 5C.
W78-06255

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY, APPENDIX F--CRYSTALLINE MATRIX,
Battelle Pacific Northwest Labs., Richland, WA.
For primary bibliographic entry see Field 5B.
W78-06256

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX I--POLLUTANT AVAILABILITY,
California Univ., Berkeley. Lawrence Berkeley Lab.; California Univ., Berkeley. Div. of Energy and Environmental; and California Univ., Bodega Bay. Inst. of Pollution Ecology.
For primary bibliographic entry see Field 5B.
W78-06257

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX J--LAND DISPOSAL,
International Engineering Co., Inc., San Francisco, CA.
R. Samuelson.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-038 313, Price codes: A18 in paper copy, A01 in microfiche. Army Corps of Engineers, San Francisco, California, Engineer District, October 1974. 378 p, 5 fig, 17 tab, 24 plates, 6 append. DACW-7-73-C-0079.

Descriptors: *Landfills, *Waste disposal, Dredging, *California, Estuarine environment, Pollution abatement, Economics, Dredge disposal, *San Francisco Bay(CA).

The evaluation of the economic, technical and environmental feasibility of land disposal of dredged material from San Francisco Bay is evaluated. An economic comparison model of various dredging methods and transport modes for different combinations of alternative land and water disposal systems is developed. Studies included costing of dredging equipment and transport modes; mapping potential land sites around the Bay; and evaluating sites in terms of the physical properties of the sediments, site operation and site constraints. (Sinha-OEIS)
W78-06258

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX M--DREDGING TECHNOLOGY.
JBF Scientific Corp., Wilmington, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-038 315, Price codes: A17 in paper copy, A01 in microfiche. Army Corps of Engineers, San Francisco, California, Engineer District, September 1975. 380 p, 122 fig, 32 tab, 3 append. DACW 07-75-C-0045.

Descriptors: *Waste disposal, *Dredging, *Estuaries, *Estuarine environment, Pollution abatement, Water pollution sources, Baseline studies, Resources development, *California, *Dredging disposal, *Dredging technology, *San Francisco Bay(CA), Marsh development, Ocean dumping, Environmental protection.

A study was conducted to investigate dredging technology and to advance the state of knowledge regarding the short-term fate of dredged materials dumped from barges or hopper dredges. Particular attention was given to application of the study findings to protection of the aquatic environment in the San Francisco Bay Area. Field tests evaluated physical and chemical properties of dredged materials in many conditions. Parameters observed in characterizing the data included descent velocity, cloud size, impact velocity, horizontal velocity following impact, and settling patterns. Moisture content appeared to be the primary variable determining behavior of dumped materials. Engineering aspects of intertidal disposal for the purpose of marsh creation were evaluated. Other considerations in marsh building were discussed, including tidal inlet design, means of excavating in marsh areas, and movement of salt through dredged material. Certain aspects of land disposal were investigated with reference to conditions in the San Francisco Bay Area. Treatment processes for removing contaminants and for hastening drying were discussed and evaluated. Productive uses of dredged material were also considered. (Sinha-OEIS)
W78-06259

INVESTIGATING WASTE OIL DISPOSAL BY DIRECT INCINERATION,
Army Mobility Equipment Research and Development Center, Fort Belvoir, VA. Petroleum and Materials Dept.
M. E. LePera, and G. DeBono.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-011 236, Price codes: A02 in paper copy, A01 in microfiche. Report No 2127, February 1975. 20 p, 1 fig, 8 tab, 7 ref, 1 append. IT662611AH69.

Descriptors: *Incineration, *Oil wastes, Fuels, *Waste disposal, *Air pollution, *Particulate emissions, Waste oil, Fuel oil, *Waste oil disposal, *Fuel oil disposal, Emission rates, Aberdeen Proving Ground(MD).

A combustion-emission test program, conducted at Aberdeen Proving Ground in Maryland evaluated the feasibility of disposal of waste oil products by direct incineration. It was indicated that most waste oils can be incinerated as fuel-oil-blending components without attendant stack emission problems. A 'referee' or 'wort case' 20% waste oil/fuel oil blend, composed primarily of automotive crankcase drains blended into No. 2 Fuel Oil, was combusted in a burner-boiler powerplant utilizing a rotary-cup atomizer. During this steady-state combustion of 'heavy waste oil' stack emissions were monitored by the Army Environmental Hygiene Agency to define the effects of the waste oil fraction on the particulate emission rates. The use of 20% waste oil/fuel oil blend in the burner system produced emission rates which could be in violation, depending on whether the particular blend is defined as a residual or distillate product. High particulate emissions were in part attributable to the inefficient operation of the rotary-cup atomizers employed in the burner system, which can significantly affect and/or alter the emissions produced from the same mixture. Other burner systems employing the steam-assist atomizers would produce substantially lower particulate emissions. Basically particulate emissions increased significantly with the addition of the waste oil component; waste oil stratification could also present a problem. Additional tests are mandated to quantify the relationships between particulate emission rates, boiler-configuration and endurance, and long-term operation on waste oil/fuel oil blends to identify potential burner nozzle and heat-transfer-surface problems. (Seip-IPA)
W78-06261

GAS AND LEACHATE FROM LANDFILLS: FORMATION, COLLECTION, AND TREATMENT,
Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.
For primary bibliographic entry see Field 5B.
W78-06263

DRAFT ENVIRONMENTAL IMPACT STATEMENT - CHEMICAL WASTE INCINERATOR SHIP PROJECT (VOLUME 1 OF 2 - ENVIRONMENTAL ANALYSIS AND APPENDICES I, II, AND III, U.S. ENVIRONMENTAL PROTECTION AGENCY: DISPOSAL OF ORGANOCHLORINE WASTES BY INCINERATION AT SEA).
Maritime Administration, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-246 727, Price codes: A11 in paper copy, A01 in microfiche. Report No MA-EIS-7302-76-08D, July, 1975, 224 p. 3 fig, 6 tab, 31 ref, 3 append.

Descriptors: *Incineration, Chemical wastes, Environmental effects, Waste disposal, Ultimate disposal, Hazards, Analytical techniques, Safety, *Chemical Waste Incinerator Ship Project, Ocean incineration, Organochlorine wastes, Marine protection, Research and Sanctuaries Act, Public Law 92-532.

The potential for safe disposal of toxic chemical wastes by incineration at sea was investigated by the Chemical Waste Incinerator Ship Project; environmental impact was assessed for both fresh water and marine ecosystems. A limited adverse effect on the local environment of U.S. shipyards would result from the construction/conversion, operation, maintenance, repair, and scrapping of the vessels to be built under the Project. Once the vessels become operational, there would exist a potential hazard to the marine environment from the accidental release of harmful substances due to casualties and mishaps; the extent and impact of such spills depends on the degree of pollution, type of pollutant spilled, spill location, duration of spill, and physical conditions under which the spill occurs. The high temperature combustion in the open ocean of toxic chemical wastes, under strictly observed safety regulations, has minimal adverse impact on the marine environment. For chlorinated hydrocarbons, conversion is principally to water vapor, CO2, and HCl; combustion efficiencies are in excess of 99.9%. Safety and control measures and alternative methods of disposal are described. Three appendices contain lists of noxious and other liquid substances carried in bulk by water, hazard ratings of chemical shipped in bulk by water, and hazardous waste stream constituents for which incineration is considered an acceptable waste treatment alternative. Appendix IV (Volume 2) presents a detailed analysis of the environmental impact of sea incineration of organochlorine wastes produced by Shell Chemical Company. (See also W78-06266) (Seip-IPA)
W78-06265

DRAFT ENVIRONMENTAL IMPACT STATEMENT - CHEMICAL WASTE INCINERATOR SHIP PROJECT (VOLUME 2 OF 2 - APPENDIX IV, U.S. ENVIRONMENTAL PROTECTION AGENCY: DISPOSAL OF ORGANOCHLORINE WASTES BY INCINERATION AT SEA).
Maritime Administration, Washington, D.C.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 979, Price codes: A10 in paper copy, A01 in microfiche. Report No EPA - 430/9-75-014, July, 1975. 226 p, 11 fig, 15 tab, 16 ref, 6 append.

Descriptors: *Chlorides, *Incineration, *Chemical wastes, *Environmental effects, Waste disposal, Ultimate disposal, Gulf of Mexico, Oxidation, Analytical techniques, Chemical Wastes Incinerator Ship Project, *Organochlorine wastes, *Organochlorides, *Ocean incineration, M/T Volcanus, Marine Protection Research and Sanctuaries Act, Public Law 92-532.

Ocean incineration of organochlorine wastes (produced by the Shell Chemical Company's Deep Park, Texas plant) was investigated aboard the M/T Vulcanus in the Gulf of Mexico from October 1974 through January 1975, under an EPA-issued ocean dumping permit. A total of 16,800 metric tons of waste (primarily a mixture of chlorinated hydrocarbons with trichloropropane, trichloroethane, and dichloroethane) were incinerated at a maximum rate of 25 metric tons/hour with a 1200C minimum and a 1350C average flame temperature. Stack gas emissions were monitored for O, CO, CO2, Cl, HCl, unburned organochlorine compounds, plume dispersion and characteristics, and combustion efficiency. Results indicate that more than 99.9% of the wastes were oxidized; the resulting emissions consisted primarily of HCl, CO2, and H2O, and were discharged directly into the atmosphere without scrubbing. Studies monitoring the impact of emissions on the marine environment indicate that there were no measureable increases in concentrations of trace metals and organochlorides in the water and marine life; no adverse effects on migratory birds were noted. Ocean incineration of wastes, if conducted in accordance with the conditions of the EPA dumping permit, was found to be an effective and environmentally safe means of disposal of organochloride wastes. Recommendations for improvement of incinerator design and operation, monitoring techniques and equipment, and communications and navigation methods are outlined. Volume I contains an environmental analysis of waste disposal at sea and 3 appendices. (See also W78-06265) (Seip-IPA)
W78-06266

DISPERSION OF BUOYANT WASTE WATER DISCHARGED FROM OUTFALL DIFFUSERS OF FINITE LENGTH,
California Inst. of Tech., Pasadena
For primary bibliographic entry see Field 5B
W78-06269

AN ENVIRONMENTAL SURVEY OF EFFECTS OF DREDGING AND SPOIL DISPOSAL, NEW LONDON, CONNECTICUT: 4TH QUARTERLY REPORT.
National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.
For primary bibliographic entry see Field 5C.
W78-06274

CARBON AND NITROGEN TRANSFORMATIONS IN SOILS AMENDED WITH SEWAGE SLUDGE,
Purdue Univ., Lafayette, IN.
R. E. Terry.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-15,484. PhD Thesis, 1976, 180 p.

Descriptors: *Carbon, *Nitrogen, *Sludge disposal, *Fertilizers, *Chemical reactions, Soils, Ammonia, Nitrogen compounds, Soil chemical properties, Soil physical properties, Sewage disposal, Waste water treatment.

The effects of soil characteristics, sludge management procedures, and environmental conditions on the decomposition rate of sludge in soils and on transformations in sludge-amended soils were investigated in laboratory experiments with synthetically-prepared sludges. Studies indicated that sludge decomposed rapidly during the first 28 days of incubation and slowly for the remainder of the incubation period. With synthetic sludges, 44% of the organic carbon was evolved s CO2 after 224 days of incubation as compared with 26-42% after 130 days for soil-applied municipal sludges. Although increased temperatures accelerated sludge decomposition, little effect was produced by soil pH, texture, and moisture content. Nitrification rates and the breakdown of native soil organic matter were increased in sludge-amended soils. Ammonia losses by volatilization in sludge-amended soils were greater in samples receiving multiple sludge applications and under conditions of high soil pH, rapid drying, and low clay content. Sludge addition resulted in higher concentrations of all nitrogen forms. (Schulz-FIRL)
W78-06282

MERCURY RECOVERY FROM CONTAMINATED WASTE WATER AND SLUDGES,
Georgia-Pacific Corp., Bellingham, WA. Bellingham Div.
For primary bibliographic entry see Field 5D.
W78-06286

MUNICIPAL SLUDGE MANAGEMENT: EPA CONSTRUCTION GRANTS PROGRAM. AN OVERVIEW OF THE SLUDGE MANAGEMENT SITUATION,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W78-06290

TRENCH INCORPORATION OF SEWAGE SLUDGE IN MARGINAL AGRICULTURAL LAND,
Agricultural Research Service, Beltsville, MD. Biological Waste Management Lab.
For primary bibliographic entry see Field 5B.
W78-06297

PROCEEDINGS OF THE BIOCONVERSION ENERGY RESEARCH CONFERENCE HELD AT

MASSACHUSETTS UNIVERSITY, AMHERST ON 25r26 JUNE 1973.
National Science Foundation, Washington, DC. Research Applied to National Needs.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-231 149, Price codes: A07 in paper copy, A01 in microfiche. Report No. NSF-RA-N-73-007, June 26, 1973. 120 p, 4 fig, 5 tab, 28 ref. GI 39215.

Descriptors: *Energy conversion, *Conferences, Anaerobic bacteria, Anaerobic conditions, Anaerobic digestion, Waste treatment, Fuels, Methane, Massachusetts, Fermentation, Resources, Industrial wastes, Management, Solar radiation, Model studies, Computer models, *Bioconversion, Amherst(MA), Resource recovery, Refuse, Fuel gases.

Summaries are provided of papers presented at the Bioconversion Energy Research Conference held June 25-26, 1973. The conference investigated the feasibility and applicability of anaerobic conversion of waste materials to methane gas; technical papers were presented and discussion sessions followed. The articles are titled: 'Methane Fermentation - Future Promise or Relic of the Past.' 'Terminal Anaerobic Dissimulation of Organic Molecules'; 'Resource Recovery from Municipal Solid Waste'; Anaerobic Processing of Organic Refuse'; 'Dynamic Modeling Control Strategies for the Anaerobic Digestion Process;' 'Methane Production from the Anaerobic Treatment of Petrochemical Industry Wastewaters'; 'Bioconversion Energy Studies at the University of California, Berkeley'; 'Thermophilic Anaerobic Digestion of Solid Waste'; 'Conversion of Solar Energy to Fuel Gas'; and 'Anaerobic Fermentation of Wastes'. A list of conference participants is provided. (Wares-IPA)
W78-06298

GUIDANCE REGARDING THE SETTING UP OF ENCAMPMENT HYGIENE AT A PERMANENT ENCAMPMENT AREA (OHJE LEIRIHYGIENIAN JARJESTELYSTA PYSYVILLA LEIRIALUEILLA),
Research Center of the Defence Forces, Helsinki (Finland).
For primary bibliographic entry see Field 5D.
W78-06300

STATUS REPORT ON COMPLIANCE WITH THE CHLOR-ALKALI MERCURY REGULATIONS - 1975.
Department of the Environment, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5G.
W78-06308

FATE AND BEHAVIOR OF SELECTED HEAVY METALS IN INCINERATED SEWAGE SLUDGE,
Rutgers - The State Univ., New Brunswick, NJ.
For primary bibliographic entry see Field 5A.
W78-06315

TRANSLOCATION AND ATTENUATION OF WASTEWATER PHOSPHORUS IN STREAMS,
Rensselaer Polytechnic Inst., Troy, NY.
For primary bibliographic entry see Field 5B.
W78-06320

ANNUAL REPORT, 1973, INSTITUTE FOR WASTE REMOVAL (SVA), THE NETHERLANDS.
Institute for Waste Removal (SVA), Amersfoort (Netherlands).
For primary bibliographic entry see Field 5D.
W78-06343

CLEANING COAL WITH COAL: COAL HUMIC ACIDS FOR REMOVAL OF ACIDS, ALKALI, SALINITY, AND HEAVY METAL POLLUTANTS ASSOCIATED WITH THE USE OF COAL AS A FUEL,
Missouri Univ.-Columbia. Dept. of Chemistry.
For primary bibliographic entry see Field 5D.
W78-06347

MARINE POLLUTION: DIAGNOSIS AND TREATMENT, (MEERESVERSCHMUTZUNG: DIAGNOSE AND THERAPIE),
For primary bibliographic entry see Field 5G.
W78-06361

THE EFFECT OF SEEPAGE ON THE DESIGN OF STORM WATER PONDS IN FLORIDA,
Florida Univ., Gainesville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-06369

CHLORIDES IN THE KRAFT RECOVERY SYSTEM,
Institutet for Vatten- Och Luftvardsforskning, Stockholm (Sweden).
For primary bibliographic entry see Field 5D.
W78-06374

VIRUS ADSORPTION BY FIVE SOILS,
Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5B.
W78-06422

ENVIRONMENTAL POLLUTION CONTROL IN METROPOLITAN ATHENS,
Environmental Pollution Control Project, Athens (Greece).
For primary bibliographic entry see Field 5G.
W78-06425

SEAWATER PLUS SEWAGE YIELDS LOTS OF THE FUEL GAS.
Machine Design, Vol 50, No 3, p 10, February, 1978.

Descriptors: *Hydrogen, *Igneous rocks, *Basalts, *Sea water, *Biomass, Sewage sludge, Steam, Methane, Drilling, Boreholes, Sludge disposal.

A technique for hydrogen gas production by reacting sea water with molten ferrous iron in subsurface magma has been developed by Sandia Laboratories of Albuquerque, New Mexico. It is estimated that 500 lb/hr of hydrogen gas would be produced by pumping 150,000 lb/hr of water into basaltic magma at a temperature of 1,200C. Hydrogen production in magma containing 2-12% ferrous iron can be increased by the addition of biomass to the water. Suggested sources of biomass are sewage sludge, waste byproducts from crop harvesting and processing, and seaweed. The cellulose of the plants releases its hydrogen during the reaction with the magma. The reaction of water containing 10% biomass with magma at 1,300C would yield gases containing 10% hydrogen. Reduction of the magma temperature at 600C would produce a higher methane gas content. An annual production rate of 26 billion cu ft of hydrogen is predicted for large basaltic magma chambers with a 12% ferrous iron content at 1,200C. Magma sources are thought to be located approximately 2-3 km below the ocean floor, within the range of current drilling technology. Steam, a byproduct of the process, can be used in electrical power generation. (Lisk-FIRL)
W78-06426

EXPERIMENT TO PRODUCE COMMERCIAL SOIL CONDITIONER FROM SEWAGE SLUDGE PROVES SUCCESSFUL.
Water and Pollution Control, Vol 116, No 2, p 22, January, 1978.

Descriptors: *Sewage sludge, *Fertilizers, *Biodegradation, *Crop response, *Soil amendments, Sludge treatment, Incineration, Growth rates, Canada, Waste water treatment, Treatment facilities, Waste water disposal, Municipal wastes.

A soil conditioner developed by Enrich Development Corporation of Delta, British Columbia, Canada, from sewage sludge produced by the Greater Vancouver Regional District's Iona Island waste treatment plant in Richmond is evaluated. The sludge is mixed with sawdust and composted in six- to eight-foot piles for two to three months. The stabilized, non-odorous composted sludge is then screened for the removal of large particles. Tests conducted with the soil fertilizer indicate increased plant growth and improved water retention by the soil. The soil conditioner, commercially marketed as 'Grow-Rich,' is suitable for use in agriculture, horticulture, landscaping, and lawn conditioning. Incineration of one dry ton of sludge by the waste treatment facilities costs about $100 while the cost of producing one dry ton of the fertilizer from sewage sludge is about $17. The Iona Island treatment plant produces about 370 cu yd/day of sludge. The market price of the soil conditioner is expected to be competitive with the price of truck-load top soil, which sells for $7-10/yd. (Lisk-FIRL)
W78-06458

ENVIRONMENT GETS TOP TREATMENT IN HAWAIIAN SEWAGE OUTFALL JOB.
For primary bibliographic entry see Field 5D.
W78-06465

DEEP SHAFT SYSTEM USES GRP.
For primary bibliographic entry see Field 5D.
W78-06481

TRUCK-TANKERS CLEAN SEPTIC TANKS IN RURAL AREAS,
For primary bibliographic entry see Field 5D.
W78-06488

LET THEM EAT SEWAGE DOWN AT THE FISH FARM.
New Scientist, Vol 77, No 1085, p 70, January, 1978.

Descriptors: *Fish farming, *Fish diets, *Proteins, *Feeds, *Sewage sludge, Worms, Sludge disposal, Livestock, Waste water treatment, Waste water disposal, Municipal wastes.

As estimated 1.4 million tons of dried sewage is disposed of each year in England, representing 1 million tons of primary treated effluent and 0.4 million tons secondary treated sewage. Primary effluent contains about 16% available protein; secondary sludge contains about 40% available protein. Sewage sludge is discussed as a possible source of food for the production of fish protein in fish farms. The supplemental feeding of sewage effluent to fish which are raised as a protein source for human consumption was suggested as an energy and food conserving measure. As an alternative to the direct feeding of sewage sludge to fish, it was suggested that feed worms and fly larvae be reared on the solid wastes. A food chain system such as this could produce an estimated 30 tons of fish/50 of tons sewage sludge. Although human consumption of the sewage-fed fish may not be acceptable, the fish could be marketable as fish meal in animal feeds. (Lisk-FIRL)
W78-06495

PROCESS SYNTHESIS AND INNOVATION IN FLUE GAS DESULFURIZATION,
California Univ., Berkeley.
For primary bibliographic entry see Field 5D.
W78-06519

TREATMENT OF EFFLUENT,
For primary bibliographic entry see Field 5D.
W78-06621

SEWAGE SLUDGE DISPOSAL,
Thiokol Corp., Newton, PA. (Assignee).
W. F. Wagner.
United States Patent 4,073,242. Issued February 14, 1978. Official Gazette of the United States Patent Office, Vol 967, No 2, p 454, February, 1978. 1 fig.

Descriptors: *Sludge disposal, *Incineration, *Dewatering, *Patents, *Design data, Pressure conduits, Sludge dewatering, Pipes, Flow control, Waste water treatment, Municipal wastes.

A patent has been issued for a sludge disposal system in which dewatered sludge is incinerated in small, regulated amounts. The effluent is passed through a sieve for liquid-solids separation; the sludge is pulverized. The dewatered and ground sludge, with a uniform density and consistency maintained by agitation, is pumped at a high velocity from the sludge collection tank through a pipe back into the collection tank. The velocity of the agitated sludge in the pipe is great enough to prevent clogging. Small amounts of sludge are occassionally diverted to a second pipe at the same velocity but a smaller volumetric flow. Sludge in the second pipe is conveyed to an incinerator where compressed air sprays the sludge into the combustion chamber. The volume of sludge sprayed into the incinerator is less than the volume of sludge flowing through the first pipe. The smaller volume of sludge that is periodically combusted allows for a smaller incineration unit than would be necessary were the entire volume of sludge in the first pipe incinerated. (Lisk-FIRL)
W78-06626

PROCESSING OF PAPER MILL EFFLUENT TREATMENT SLUDGES (ZPRACOVANI ODPADNICH KALU Z CISTENI PAPIRENSKYCH ODPADNICH VOD),
IRAPA, Prague (Czechoslovakia). Vyvojovy a Racionalizacni.
J. Kirchnerova.
Papir a Celuloza, Vol. 32, No. 7-8, p 202-204, 1977. 1 fig, 3 ref.

Descriptors: *Sludge treatment, *Pulp wastes, *Dewatering, *Sludge disposal, Wastes, Industrial wastes, Pulp and paper industry, Solid wastes, Suspended solids, Filters, Centrifugation, Wood wastes, Burning, Sludge, Soil disposal field, Waste treatment, Equipment, Landfills, Feeds, Soil conditioners, Building materials.

From 2 to 6% of the production of paper or paperboard leaves the mill with waste water in the form of suspended solids. These solids are separated in the mechanical treatment plant as waste sludge. A typical paper mill sludge contains mainly fines and inorganic fillers. Dewatering of waste sludges can be done on sludge fields or using frame presses, vacuum filters, belt presses, centrifuges, etc. Recent attention has been paid to belt presses with two convergent screens. Among the listed manufacturers of such presses are Andritz (Austria), Bellmer, Prefiltex, and Klein (West Germany). The disposal on a landfill is common, but highly dewatered sludges or those mixed with wood wastes can also be burned. Attempts to utilize sludge for the production of paperboard, fodder material, building materials, and as soil conditioner are noted. (Trubacek-IPC)
W78-06629

PAPER MILL SLUDGE DEWATERING IN THE JINDRICHOV MILL (ZAHUSTOVANI PAPIRENSKYCH KALU V ZAVODE JINDRICHOV),
Olsanske Papirny (Czechoslovakia).
M. Vymetal.
Papir a Celuloza, Vol. 32, No. 7-8, p 218-219, 222, 1977. 2 fig, 5 ref.

Descriptors: *Sludge treatment, *Pulp wastes, *Dewatering, Wastes, Industrial wastes, Solid wastes, Pulp and paper industry, Foreign countries, Europe, Centrifugation, Operating costs, Capital costs, Costs, Sludge, Polyelectrolytes, Cations, Equipment, Czechoslovakia.

The Jindrichov paper mill (Czechoslovakia) effluent is treated in three Dorr-Oliver clarifiers. The sludge contains 40-50% inorganic fillers. The organic part includes mainly fines and fiber fragments. To dewater the sludge, a centrifuge, Wangner filter, or SEM dewatering press manufactured by the Andritz Co. (Austria) could be used. The SEM press was selected because of the relatively highest dewatering efficiency and lowest operating and capital costs. Currently about 470 cu m/hr of paper mill effluent are clarified, and the resulting sludge at a consistency of 1.8% is pumped to the SEM press. The dewatered sludge with a consistency of 35% amounts to 160 kg/hr (dry weight). Percol 140 cationic polyelectrolyte is added (0.93 g/kg) as a sludge conditioner. (Trubacek-IPC)
W78-06631

EFFLUENT TREATMENT PLANT SLUDGE MANAGEMENT IN THE PAPER MILL AT VRANE ON THE VLTAVA RIVER (KALOVE HOSPODARSTVI CISTIRNY ODPADNICH VOD V ZAVODE VRANE NA VLTAVOU),
Zapadoceske Papirny (Czechoslovakia).
V. Setelik, and V. Mlejnska.
Papir a Celuloza, Vol 32, No 7-8, p 223-224, 228, 1977. 4 tab.

Descriptors: *Sludge treatment, *Pulp wastes, *Dewatering, Wastes, Industrial wastes, Solid wastes, Waste treatment, Pulp and paper industry, Foreign countries, Europe, Filters, Centrifugation, Costs, Energy, Operating costs, Equipment, Sludge, Filters, Czechoslovakia, Vltava River(Czechoslovakia).

Effluent treatment sludge from the production of groundwood-free nonsized papers from a highly refined furnish was found difficult to dewater on a vacuum filter, even with the addition of sawdust. A continuous centrifuge and the SEM Andritz press were considered as a replacement for the filter. Both the centrifuge and the press were found to be substantially better than the filter. In spite of the relatively high polycoagulant cost and high energy usage, the centrifuge was selected, because a suitable used model was available. The SEM Andritz belt press which gave the best results will be used to replace the centrifuge in the future. A table is given showing operating cost breakdown for a vaccum filter, centrifuge, and belt press. (Trubacek-IPC)
W78-06633

TLM TEST OF TANNERY WASTE WATERS BY USING FISH,
Showa Women's Univ., Tokyo (Japan).
For primary bibliographic entry see Field 5A.
W78-06653

GAS CHROMATOGRAPHIC DETERMINATION OF RESIDUAL AMINE LEVELS IN PLANTS (IN RUSSIAN),
All-Union Research Inst. of Agricultural Use Sewage. Staraya Kupavan (USSR).
For primary bibliographic entry see Field 5A.
W78-06699

5F. Water Treatment and Quality Alteration

ANALYTICAL QUALITY ASSURANCE FOR TRACE ORGANICS ANALYSIS BY GAS CHROMATOGRAPHY/MASS SPECTROMETRY,
Environmental Monitoring and Support Lab., Cincinnati, OH.
For primary bibliographic entry see Field 5A.
W78-06267

COSTS OF RADIUM REMOVAL FROM POTABLE WATER SUPPLIES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W78-06280

ELECTRO-REGENERATED ION-EXCHANGE DEIONIZATION OF DRINKING WATER,
Southern Research Inst., Birmingham, AL.
T. A. Davis.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 910, Price codes: A05 in paper copy, A01 in microfiche. Report No. EPA-600/1-77-035, June, 1977. 72 p, 10 fig, 12 tab, 8 ref, 4 append. 68-03-2209.

Descriptors: *Demineralization, *Ion exchange, *Reverse osmosis, *Resins, *Organic compounds, Organic matter, Membrane processes, Bioassay, *Desalination processes, *Water treatment, Waste water treatment, *Deionization, *Electro-Regenerated Ion-exchange Deionization, *Organic solutes, Resin beads.

Development of an Electro-Regenerated Ion-exchange Deionization (ERID) device is described. ERID is an effective process of continuous deionization and removal of salts from drinking water prior to treatment with reverse osmosis (RO) to recover trace organic solutes for bioassay; the device is basically an electrodialyzer with thick depleting compartments packed with a mixture of anion- and cation-exchange resin beads. These provide a conductive medium for electrical transport of ions out of the demineralized water, through ion-exchange membranes, and into a concentrated waste stream. The electroregenerability, the affinity for organic solutes, and the release of contaminants were evaluated for several ion-exchange resin types. The electrical conductivity of the resins equilibrated with solutions of HCl and NaOH provided an indication of the electro-regenerability of the resins. The uptake of test organic solutes and the release of contaminants was measured in batch and continuous experiments with aqueous media. The best resin combination (a 2:1 mixture of Amberlite IRA-68 and Duolite C-433) could be continuously regenerated while deionizing tap water containing large amounts of calcium, sulfate, and bicarbonate. CaCo3 precipitation in the waste compartments was prevented by acidification of the waste feed. With combined ERID-DO treatment, greater than 90% demineralization was achieved. Uncharged organic solutes tended to pass through with little change in concentration; they could be concentrated by the RO unit if their molecular weights were high enough to permit rejection by the RO membranes. Organic acids and bases removed from solution could be recovered by rinsing with acidic or basic solutions. (Seip-IPA)
W78-06281

WATER QUALITY MONITORING IN DISTRIBUTION SYSTEMS,
National Sanitation Foundation, Ann Arbor, MI.
For primary bibliographic entry see Field 5A.
W78-06284

DESALINATION TECHNIQUES FOR CONVERSION OF BRACKISH WATER INTO POTABLE WATER FOR SMALL COMMUNITIES,
For primary bibliographic entry see Field 3A.
W78-06340

DIRECT FILTRATION OF LAKE MICHIGAN WATER,
Townsend and Associates, Chicago, IL.
R. D. Tanner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 229, Price codes: A02 in paper copy, A01 in microfiche. Research Report, 1974. 20 p, 10 fig, 1 tab, 5 ref. OWRT A-062-ILL(2).

Descriptors: *Filtration, *Polyelectrolytes, Coagulation, Water treatment, Turbidity, Polymers, Lake Michigan, *Clarification.

The effectiveness of the direct filtration process (which uses a single media sand filter bed), was evaluated as to its capability to clarify Lake Michigan water when cationic polyelectrolytes are used as the sole coagulant. Zeta potential (ZP) measurements controlled polymer dosage according to variations in quantity of suspended particles in the raw water; effluent turbidity and head loss after filtration served as the measures of process effectiveness. During the research period influent water turbidities ranged from 0.65 to 35 FTU. Two identical pilot plant filters, made of plexiglass filled with sand, were utilized. One received only chlorinated lake water; the other received polymer-treated water. Results showed: the four cationic polyelectrolytes studied had a narrow effective concentration range resulting in effluent turbidities at 6.5 hours of filtration less than 0.10 FTU, and concentrations outside this range resulted in higher effluent turbidities (independent of influent turbidity). The relationship between ZP of the particles and the concentration of polyelectrolyte was useful in determining the polyelectrolyte concentration needed to achieve a low effluent turbidity. The ripening period for the filter was reduced/eliminated by using a concentration resulting in a ZP of particles between 5 and 15 mv for all polyelectrolytes studied. The head loss developed during a filter run varied significantly between each of the polymers studied. Effective polyelectrolyte filtration, then, can be achieved by careful attention to polyelectrolyte dosage. (Wares-IPA)
W78-06344

A COMPARISON OF ALUMINUM SULFATE AND ACTIVATED CARBON FOR ORGANIC COLOR REMOVAL FROM GROUNDWATERS,
Mississippi State Univ., Mississippi State. Dept. of Civil Engineering.
J. E. Bowie, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 367, Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, December, 1975. 86 p, 27 fig, 7 tab, 27 ref, 5 append. OWRT A-084-MISS(2).

Descriptors: *Groundwater, *Color, *Mississippi, Water quality standards, Water sampling, Water supply, *Water treatment, Polyelectrolytes, Economics, *Alum treatment, *Activated carbon treatment, Color removal, Cat-Floc.

Groundwaters that are distributed by municipalities in Mississippi and exceed the U.S. Public Health Service recommended standard of color for drinking water of 15 units were characterized and studied with regard to aluminum sulfate treatability, granular activated carbon treatability, and comparison of the two treatments. The color in the seven waters tested was attributed to hydroxylated aromatic type compounds; the concentration of these substances was directly proportional to the color. The colored groundwaters were soft and of alkaline pH. The aluminum sulfate treatability study resulted in development of a color removal system using alum and a polyelectrolyte 'Cat-Floc.' Ninety percent color removal was achieved at a pH of 6.5, alum dosage of 70 mg/l, and polyelectrolyte of 14 mg/l for water with an initial color of 140 units. Alum alone at a pH of 6.5 produced similar results at doses above 300 mg/l. A specific color polymer interaction was the proposed mechanism of color removal. The activated carbon treatability study utilized both isotherm and column studies with granular carbon. Activated carbon made complete color removal possible. The carbon color equilibrium followed the Langmuir and Freundlich isotherm with correlation coefficents above 90%. Field and lab column studies has similar results. Comparison of the treatments indicated that activated carbon was two to 20 times as expensive in terms of chemical costs, indicating preferability of alum-polyelectrolyte treatment of water to remove color. The appendices contain methodological descriptions and test calculations. (Wares-IPA)
W78-06348

APPLICATION OF COMPUTER MODELING FOR CAPACITY STAGING OF DENVER, COLO., WATER-TREATMENT FACILITIES,
Colorado School of Mines, Golden. Dept. of Basic Engineering.
J. N. Brooks, K. J. Miller, R. C. McWhinnie, E. R. Bennett, and K. D. Linstedt.
Journal of the American Water Works Association, Vol. 70, No. 4, p 184-191, April 1978. 7 fig, 1 tab, 4 ref.

Descriptors: *Water treatment, *Water supply, Cost minimization, *Computer models, *Dynamic programming, *Capacity staging, Long-term planning, Capital costs, Water demand, Decision making, Constraints, Equations, Operation and maintenance, Simulation analysis, Linear programming, *Denver(Colo), *Treatment facilities, Optimization, Systems analysis.

With the high rate of cost escalation for construction and operation of water supply facilities, optimal decisions concerning capital expenditures for expansion of facilities are imperative. Several methods are available which provide for minimizing the capital costs of proposed future facilities for meeting a predicted water demand. Presented is a dynamic programming model that might serve as a guide for evaluating capacity-staging desicions; it was used to examine the utilization of existing and proposed treatment plants within the Denver, Colorado system in order to assess the effectiveness of the system in meeting demand at minimum cost. Results discussed here are intended to show the type of information obtainable from an optimization model. Given are the steps in developing the model: (1) describing the physical system; (2) introducing bounds in the form of constraint equations to limit the ranges of assumed values for the variables; (3) definition of a suitable objective function to be minimized, relating to the total system costs in meeting the prescribed water demand over the planning horizon. Discussed are the specific supplies, demands, treatment components, and constraints of the system. Finally, the scope and limitations of the method are given. (Bell-Cornell)
W78-06559

5G. Water Quality Control

ENERGY RELATED ACTIVITIES AND AN ASSESSMENT OF THE WATER RESOURCE MANAGEMENT ALTERNATIVES IN SOUTH LOUISIANA,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 6B.
W78-06201

PUERTO RICO'S WATER RESOURCES PROBLEMS AND RESEARCH NEEDS.
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.; and Department of Natural Resources, San Juan (Puerto Rico).
For primary bibliographic entry see Field 6B.
W78-06206

ANALYSIS OF PRIORITY WATER RESOURCES PROBLEMS FOR THE SOUTHERN PLAINS REGION,
Arkansas Univ., Fayetteville. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W78-06207

MANAGEMENT OF URBAN RUNOFF AND WASTEWATER IN THE OSLOFJORD AREA,
Norsk Inst. for Vannforskning, Blindern.
P. Balmer, J. Glomnes, O. Lindholm, and N. A. Saltveit.
Nordic Hydrology, Vol 8, No 4, p 237-248, 1977. 8 fig, 3 tab, 9 ref.

Descriptors: *Urban runoff, *Sewers, *Water storage, *Tunnels, Waste water, Storm runoff, Storm water, Precipitation(Atmospheric), Rainfall, Runoff, Cities, Urban drainage, Sewage treatment, Water pollution, Fjords, Water pollution control, Model studies, Mathematical models, *Oslo(Norway), Retention basins.

To alleviate the pollution in the Oslofjord region, it is planned to transport wastewater to a central treatment plant by a 35 km tunnel system. The objective of the study was to analyze the consequences of a reduced treatment plant capacity vs. the utilization of the tunnel as a retention basin. The analysis was performed by the use of a recently developed mathematical model for urban runoff and drainage. Simulations were performed for large rain events and for all rains during a summer season. The most important result of the study was that the treatment plant could be reduced to half its original capacity if the tunnel was utilized as a retention basin without any increase, in fact a decrease, in the total pollution load on the fjord. (Sims-ISWS)
W78-06214

EROSION AND SEDIMENT CONTROL AUDIOVISUAL TRAINING PROGRAM, WORKBOOK,
Hittman Associates, Inc., Columbia, MD. Environmental and Geosciences Dept.
For primary bibliographic entry see Field 4D.
W78-06228

OPTIMIZATION OF A REGIONAL WATER RESOURCE QUALITY MANAGEMENT SYSTEM,
California Univ., Berkeley.
J. J. Vasconcelos.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-15, 899. PhD Thesis, 1976, 383 p.

Descriptors: *Mathematical models, *Water quality control, *Water resources development, *Water utilization, *Optimum development plans, Water resources, Planning, Algorithms, Mathematical studies, Water management(Applied), Waste water treatment, Simulation analysis, Optimization, *California, Fresno(CA), San Joaquin Valley(CA).

A mathematical model to optimize design and minimize total costs for a regional water supply-waste water treatment management system is presented. The Fresno groundwater basin in the San Joaquin Valley in California was used in a simulation of an integrated water system with five sources of water for 22 water demands. Declining groundwater levels and increasing concentrations

of total dissolved solids and nitrates in groundwater are the major water resource problems in the area. An iterative algorithm which included a linear programming optimization model, a groundwater quantity and quality model, and a data processing-costing program was used to analyze four management alternatives which failed to meet problem constraints. (Schulz-FIRL)
W78-06234

DEVELOPMENT OF A HYDROPHOBIC SUBSTANCE TO MITIGATE PAVEMENT ICE ADHESION,
Ball Bros. Research Corp., Boulder, CO.
For primary bibliographic entry see Field 4C.
W78-06241

SEDIMENT HANDLING AND BEACH FILL DESIGN,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8B.
W78-06245

STATEMENT FOR COMPREHENSIVE WATER POLLUTION CONTROL PROGRAMS,
Public Health Service, Washington, D.C. Div. of Water Supply and Pollution Control.
K. S. Krause.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 747, Price codes: A03 in paper copy, A01 in microfiche. Report, 1963. 32 p, 5 fig.

Descriptors: *River basins, Water pollution treatment, *Water pollution control, *Pollution abatement, *Great Lakes, *Illinois, *Chesapeake Bay, *Delaware River, *Ohio River, Planning, Management, River basin development, Water management(Applied), *Susquehanna River basin, Delaware River Estuary Project, Great Lakes-Illinois River Basins, Upper Ohio River Basin, *Water Pollution Control Act.

Comprehensive river basin water pollution control programs, mandated by and funded through the Federal Water Pollution Control Act, are described. Programs, strategies, goals and an overview of pollution problems and current abatement procedures are outlined for the following river basin programs: the Chesapeake Bay-Susquehanna, the Delaware estuary, Great Lakes-Illinois, the Upper Ohio, and the Arkansas-Red Rivers. Plans for comprehensive water pollution control and future plans and abatement strategies are outlined. (Seip-IPA)
W78-06264

DRAFT ENVIRONMENTAL IMPACT STATEMENT - CHEMICAL WASTE INCINERATOR SHIP PROJECT (VOLUME 1 OF 2 - ENVIRONMENTAL ANALYSIS AND APPENDICES I, II, AND III, U.S. ENVIRONMENTAL PROTECTION AGENCY: DISPOSAL OF ORGANOCHLORINE WASTES BY INCINERATION AT SEA).
Maritime Administration, Washington, D.C.
For primary bibliographic entry see Field 5E.
W78-06265

DRAFT ENVIRONMENTAL IMPACT STATEMENT - CHEMICAL WASTE INCINERATOR SHIP PROJECT (VOLUME 2 OF 2 - APPENDIX IV, U.S. ENVIRONMENTAL PROTECTION AGENCY: DISPOSAL OF ORGANOCHLORINE WASTES BY INCINERATION AT SEA).
Maritime Administration, Washington, D.C.
For primary bibliographic entry see Field 5E.
W78-06266

INVERTED SIPHONS FOR OIL TRAPPING,
Calspan Corporation, Buffalo, NY.
For primary bibliographic entry see Field 5D.
W78-06268

SEWAGE FACILITIES CONSTRUCTION REPORT, 1971.
Environmental Protection Agency, Washington, DC. Water Quality Analysis Branch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 596, Price codes: A02 in paper copy, A01 in microfiche. Report No. EPA-440/9-73-002, 1971. 16 p, 5 fig, 15 tab, 1 append.

Descriptors: *Sewage treatment, *Treatment facilities, Construction, Cost analysis, Contracts, *Sewage facilities construction reports, Sewage facilities.

A report, prepared from contract award notifications (collected by EPA) of sewage facilities construction and related fields, is presented. Data concerning all contracts awarded in the United States are included. The data show that: (1) contract awards for sewage treatment facilities and collection sewers in the 19 years from 1952 through 1971 total 18.6 billion dollars; (2) the rate of growth in spending for sewage facilities construction has significantly exceeded the rate of inflation and the population growth rate. (The annual per capita contract awards measured in constant dollars increased 78% from 1957 to 1971.); (3) per capita sewage facilities construction awards are generally higher in the densely populated areas of the country such as the Northeast and the Great Lakes regions; and (4) Federal participation in the form of EPA construction grants has increased dramatically in the last 2 years - from 14% of total contract awards in 1969 to 55% in 1971. (Seip-IPA)
W78-06287

SEWAGE FACILITIES CONSTRUCTION REPORT 1972, 1973, 1974.
Environmental Protection Agency, Washington, DC. Point Source Analysis Branch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 683, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-440/9-75-012, 1975. 33 p, 3 fig, 30 tab, append.

Descriptors: *Sewage disposal, *Sewage treatment, *Treatment facilities, *Statistics, Contracts, Construction, Analysis, Environmental engineering.

A summary and analysis of contracts awarded by the U.S. Environmental Protection Agency during calendar years 1972, 1973, and 1974 for construction of sewage facilities are presented. Information is given by facilities category (treatment and collection); basic statistics on trends, area of award, basis of award, data variations, and federal participation are presented and compared with awards made previously. Analysis of the award statistics showed that in the three year period considered, contract awards for sewage facilities construction totalled $10 billion, representing 35% of the total amount (28.7 billion) spent on sewage facilities construction since 1952. The rate of growth in spending for sewage facilities construction has exceeded the rate of inflation and the population growth rate. The annual per capita contract awards measured in constant dollars increased 155% from 1957 to 1974. The appendix contains listings of contract awards by size, geographic area, and population size group, and indicates percentage changes in amounts of awards and their distribution. (Wares - IPA)
W78-06288

MUNICIPAL SLUDGE MANAGEMENT: EPA CONSTRUCTION GRANTS PROGRAM. AN OVERVIEW OF THE SLUDGE MANAGEMENT SITUATION,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
R. K. Bastian.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 695, Price codes: A04 in paper copy, A01 in microfiche. Report No. EPA-430/9-76-009, (McD-30), April, 1976. 64 p, 1 fig, 6 tab, 57 ref, 7 append

Descriptors: *Management, *Sludge, Waste disposal, Sewage disposal, Costs, Environmental effects, Municipal wastes, Facilities, Construction, *Cost-effectiveness

Available information on municipal sewage sludge production and alternatives for disposal and/or utilization are summarized; Office of Water Program Operations (OWPO) activities in this area are reviewed. Over 5 million dry tons of municipal sludge are estimated to be produced and disposed of annually. Current disposal methods include incineration, landfill, land application (e.g., croplands spreading), and ocean disposal. Of more than 22,000 U.S. treatment plants, over 5,000 are wastewater treatment ponds with few sludge disposal problems. Fewer than 350 of those remaining are larger capacity than 10 million gallons/day, with over 65% being less than 1 million gallons per day in design flow. Both capital and operations and maintenance costs for various sludge management alternatives vary depending on energy, transportation, land, and manpower costs, monitoring requirements, and regulatory criteria. In general, from 30 to 50% of a conventional treatment plant's capital costs go for sludge management. Although most available sludge disposal/utilization options can be implemented with minimal negative environmental impacts, consideration must be given to potential intermedia environmental impacts and economic and other impacts when designing and operating such systems. Innovative technologies for sludge management and disposal are also described. Projects and outputs of OWPO sludge management activities are listed; need for future research is indicated. The Appendices contain statistics, status of grants funding, criteria for disposal and utilization, program guidance on cost eligibility, and a listing of recent reports on municipal sludge management. (Wares-IPA)
W78-06290

COST ESTIMATES FOR CONSTRUCTION OF PUBLICLY-OWNED WASTEWATER TREATMENT FACILITIES. 1976 NEEDS SURVEY, (REPORT TO CONGRESS).
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 716, Price codes: A20 in paper copy, A01 in microfiche. Report No. EPA-430/9-76-010, (McD-48A), February 1977. 83 p, 45 tab, 4 append.

Descriptors: *Waste water treatment, *Treatment facilities, Economics, *Costs, Cost-benefit analysis, Pollution abatement, Water pollution, Surveys, *Estimated costs.

Cost estimates for construction of needed publicly-owned wastewater treatment facilities for eight categories in each of the United States and territories are presented. The survey estimates the overall remaining needs for the conveyance and treatment of municipal sewage and control of pollution from combined sewer overflows to be $96 billion, of which $52 billion are needed for new treatment plants and interceptors. The 1976 estimate is 37% lower than the 1974 needs survey estimate of $151 billion since the latest estimates reflect a specially formulated, consistent survey methodology and more information available from sources such as new facility plans, basin plans, and discharge permits. Additionally, new projects approved between the 1974 and 1976 surveys reduced the estimate by more than $8 billion. The 1976 estimate includes $18 billion for control of pollution from combined sewer overflows, which is less than half the estimate made in 1974; (that estimate included substantial costs for facilities

serving the purposes of urban drainage or flood control). An estimate of $54 billion more is given for the control of pollution from separate storm sewers as distinguished from other types of facilities. Appendices describe conduct of the 1976 survey, summary tables by states and territories, survey costs, and information on cost assessments and estimates. (Wares-IPA)
W78-06291

STATISTICAL SUMMARY, 1968 INVENTORY, MUNICIPAL WASTE FACILITIES IN THE UNITED STATES,
Federal Water Quality Administration, Washington, DC. Div. of Technical Support.
K. A. Jenkins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-245 732, Price codes: A03 in paper copy, A01 in microfiche. FWQA Publication No. CWT-6, 1970. 42 p, 1 fig, 29 tab, 6 ref.

Descriptors: *Sewage treatment, *Treatment facilities, Census, Sewage disposal, United States, Analysis, Waste water treatment.

A summary and an analysis of data on sewage treatment facilities in the United States and its territories are presented; data were collected between Jauary 1, 1968 and July 14, 1969, but are intended to reflect municipal sewage collection, treatment, and disposal facilities existing as of January 1, 1968. Certain data from four previous inventories (1940, 1945, 1957, and 1962) are included for comparison and to provide a measure of progress and trends. Analyses of the data and of trends in collection methods, treatment and disposal of the wastes are included. (Seip-IPA)
W78-06293

A MODEL FOR MULTI-PERIOD REGIONAL WASTEWATER PLANNING,
North Carolina Univ. at Chapel Hill.
C. H. Chiang.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-7,309. PhD Thesis, 1976, 176 p.

Descriptors: *Mathematical models, *Algorithms, *Planning, *Water management(Applied), Optimum development plans, Costs, Computer models, Sewerage, Treatment facilities, Waste water treatment.

A method for determining the location, timing, and scale of regional waste water treatment plants, sewers, and pumping stations with a heuristic algorithm composed of several subprograms is presented. The algorithm is capable of producing marginal cost analyese, examining tradeoffs between economics of scale in treatment and waste water conveyance, accounting for existing facilities, and considering plant capacity. Basically an iterative procedure, the algorithm can be used to provide fast, possible, least-cost solutions to several types of waste water planning problems. (Schulz-FIRL)
W78-06299

STATUS REPORT ON COMPLIANCE WITH THE CHLOR-ALKALI MERCURY REGULATIONS - 1975.
Department of the Environment, Ottawa (Ontario). Water Pollution Control Directorate.
Economic and Technical Review Report EPS 3-WP-77-12, September, 1977, in English and French, 17 p, 18 p, 5 append.

Descriptors: *Mercury, *Effluents, *Waste water disposal, *Industrial wastes, *Pollution, Discharge measurement, Chlorine, Flow measurement, Sampling, Control systems, Regulation, Monitoring, Water quality standards, *Canada, *Chlor-alkali industrial plants.

This report contains a review of the measures taken to curtail mercury losses to liquid effluents from chlor-alkali plants in Canada. Both mercury consumption and losses have been drastically reduced since 1970, when the significance of discharging inorganic mercury was first realised in Canada. Mercury consumed by the plants, per unit of production, has been reduced by approximately 50 percent. Mercury losses to liquid effluents have been reduced to less than 1 percent. Mercury purchases have also declined considerably in Canada. Plants records, and regulatory monitoring by both Federal and Provincial environmental control agencies, all confirm that these reductions are very significant. (WATDOC)
W78-06308

RUNOFF FROM A LOW-COST MANURE STORAGE FACILITY,
Vermont Univ., Burlington. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 5B.
W78-06314

RUNOFF FROM A PASTURED WATERSHED IN LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W78-06332

DRIP IRRIGATION TO REVEGETATE MINE WASTES IN AN ARID ENVIRONMENT,
ASARCO, Inc., Tucson, AZ.
For primary bibliographic entry see Field 3B.
W78-06339

DIRECT FILTRATION OF LAKE MICHIGAN WATER,
Townsend and Associates, Chicago, IL.
For primary bibliographic entry see Field 5F.
W78-06344

PROCEEDINGS, MISSISSIPPI WATER RESOURCES CONFERENCE, 1975.
Mississippi State Univ., Mississippi State. Water Resources Research Inst.
For primary bibliographic entry see Field 2J.
W78-06351

SOME COMMON ASPECTS OF PHYSICAL-CHEMICAL INDICES OF TOXIC SUBSTANCES AND THEIR PERMISSIBLE CONCENTRATIONS IN ATMOSPHERIC AIR, AIR OF WORKING AREAS AND WATER (IN RUSSIAN),
Nauchno-Issledovatelskii Inst. Gigieny Truda i Professionalnykh Zabolevanii, Leningrad (USSR).
E. I. Lyublina.
Gig Sanit 8, p 88-92, 1976.

Descriptors: *Organic compounds, *Lethal limit, *Water quality standards, *Air pollution, Water pollution control, Public health, Toxicity.

Direct linear correlatin was established between 252 volatile organic compounds and their volatility in relation to LC50, log permissible concentration (PC) in working area and log daily average PC in atmospheric air. For log PC in water, correlation was established between water solubility of substances and saturating concentrations. Daily effect of atmospheric air leads to a dynamic balance between the concentrations in the air and in the human body of all organic compounds. This requires special attention in standardizing PC of concentrations which saturate the air.--Copyright 1978, Biological Abstracts, Inc.
W78-06354

OPTIMAL ARTIFICIAL AERATION DESIGN IN POLLUTED STREAMS RECEIVING THERMAL DISCHARGE,
Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.
S. H. Lin, L. T. Fan, and C. L. Hwang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 558, Price codes: A03 in paper copy, A01 in microfiche. Kansas Water Resources Research Institute, Manhattan, Contribution Number 127, (1975). 32 p, 12 fig, 14 ref. OWRT B-030-KAN(10), 14-31-0001-3592.

Descriptors: Water quality, *Water pollution control, *Aeration, Thermal pollution, Design criteria, Dissolved oxygen, Cooling water, Water quality standards, *Optimal artificial aeration scheme, *Thermal discharge, *Continuous maximum principle, *Organic waste discharges, Optimal control policy, Minimum DO concentration, Non-zero artificial aeration.

The optimal artificial aeration scheme for a polluted stream which receives additional thermal discharge is studied. The continuous maximum principle is employed to find the optimal control policy which minimizes the system objective function and maintain an appropriate water quality in the stream. The system objective function which consists of the DO violation penalty from the desired value and the artificial aeration effort increases significantly with increasing amount of thermal discharge in comparison with the isothermal case. The system objective function also increases exponentially with increasing upstream BOD concentration. A design procedure is presented to find the optimal artificial aeration control policy which is able to maintain the water quality at a minimum legal requirement.
W78-06357

EFFICIENT AND EQUITABLE PRICING FOR WASTEWATER SYSTEMS: THE MADISON METROPOLITAN SEWERAGE DISTRICT,
Wisconsin Univ.- Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5D.
W78-06358

COST MINIMIZATION FOR COAL CONVERSION POLLUTION CONTROL: A MIXED INTEGER PROGRAMMING MODEL,
Utah Water Research Lab., Logan.
M. F. Torpy, A. B. Bishop, and R. Narayanan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 173, Price codes: A05 in paper copy, A01 in microfiche. Utah Water Research Laboratory, Water Resources Planning Series Report P-78-001, March 1978. 85 p, 40 tab, 58 fig, 2 append. OWRT A-032-UTAH(1), 14-34-0001-7094.

Descriptors: Energy development, Energy conversion, Water resources systems, Costs, Pollution control, Water quality, Water conservation, Coal, Model studies, *Mixed integer programming, Cost analysis.

A mixed integer program was structured to identify the least cost combinations of recycling and treatment alternatives that can be used to control the liquid, solid, and gas waste streams produced from a 750-megawatt coal fired steam electric power plant. The model compared the ability of methods of liquid stream recycle and waste discharge treatment to meet given air and water quality standards. The model was then used to study the effects on the optimal solution of changes in capital, operation and maintenance, and energy and water costs. In addition, the effects on optimum system design of changes in particulate and sulfur oxide emission standards and stream discharge standards were evaluated. Nonlinear cost functions for system components were structured with binary integer variables to define

the ordinate intercept and with continuous variables to define the slopes of total cost curve segments. The binary and continuous variables were associated with each other in pairs to approximate nonlinear total cost functions of alternative pollution control units. The optimal plant design was sensitive to increases in capital, operation and maintenance, and energy costs as well as air emission standard changes. The model identified the optimal treatment unit alternatives and their sizes when segments of the total costs and environmental standards were changed. The optimal solutions always identified water recycle, rather than stream discharge, as the optimal production strategy.
W78-06359

DEVELOPMENT AND IMPLEMENTATION OF A REGIONAL WATER PLANNING DATA MANAGEMENT SYSTEM,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W78-06360

MARINE POLLUTION: DIAGNOSIS AND TREATMENT, (MEERESVERSCHMUTZUNG: DIAGNOSE AND THERAPIE),
S. A. Gerlach.
1976.

Descriptors: *Trace elements, Marine pollution, *Mercury, *Lead, Water pollution control, Aquatic life, *Heavy metals, Legislation, Oil pollution, Sewage, *Waste disposal, Chlorinated hydrocarbons, Pesticides.

The pollution of water by domestic and industrial sewage and oil, the dumping of wastes in open water and their effect on aquatic life are described. Chapters on possible global marine pollution by Hg, Pb, trace elements, heavy metals, and chlorinated hydrocarbons are included. Legislation aimed at decreasing marine pollution is briefly discussed.--Copyright 1978, Biological Abstracts, Inc.
W78-06361

IMPACT OF FEDERAL AND STATE WATER QUALITY LAWS ON ALASKA NATIVE REGIONAL CORPORATIONS.
Alaska Univ., College. Inst. of Water Resources.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 158, Price codes: A02 in paper copy, A01 in microfiche. Termination Report, February, 1978. 9 p, 1 append. OWRT A-052-ALAS(1), 14-31-0001-5002.

Descriptors: *Legislation, *Water quality, *Alaska, Development, Standards, Nunam Kitlusisti, Federal Water Pollution Control Act, Section 208(Public Law 92-500), Alaska Native regional corporation.

An investigation of existing Federal and state water quality laws was conducted to determine impacts on development activities of Alaska Native regional corporations. The potential use of section 208 of Public Law 92-500, the 1972 amendments to the Federal Water Pollution Control Act, and other relevant planning laws was examined. Materials were compiled on Federal and state water quality legislation and regulations (with focus on the new requirements of P.L. 92-500); new and existing sources of pollution, nondegradation, and assimilative capacity were considered. The goal of listing and analyzing Federal and state statutory limitations on discharge into navigable waters was not achieved. Researchers worked with Nunam Kitlusisti (the environmental branch of the Association of Village Council Presidents), which is part of one of the 12 Alaska Native regional corporations. Investigators instigated involvement of the Native corporation in the 208 planning process for the development and implementation of best management practices for nonpoint source pollution in areas not designated as 208 planning regions. A published article (found in the appendix) resulted from the research and summarizes study results and Federal laws regulating water quality. The expense of water pollution control systems for new industries and the lack of government policy on nondegradation is emphasized with regard to Native corporations. The status of Nunam Kitlusisti's efforts to obtain designation as a 208 planning agency is addressed. (Seip-IPA)
W78-06366

VILLAGES AND SEQR,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
J. A. Stanturf, and Y. M. Perret.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 333, Price codes: A03 in paper copy, A01 in microfiche. Handbook, March, 1977. 43 p, 3 fig, 2 tab, 1 ref, 4 append. OWRT A-056-NY(4).

Descriptors: *Environmental effects, *New York, *Permits, Decision making, State governments, Water resources development, Local governments, Legislation, *State Environmental Quality Review Act(SEQR), Villages, Environmental Impact Statement, Flowcharts, Lansing(NY), Guidelines.

The requirements of the State Environmental Quality Review (SEQR) Act (New York) are discussed and the actions a village can take to meet these requirements are described. The SEQR process requires three phases: (1) An EIS by state-level agencies, (2) an EIS on direct actions of a village or other local government, and (3) an EIS at both state and local levels to include permits granted to private applicants. Villages were required to devise and adopt procedures covering direct actions by April 1, 1977. These procedures enabled a village to identify projects requiring an EIS, determine who will be responsible for preparing an EIS, and incorporate the information in the EIS into the decision-making process. Procedures are suggested for meeting these responsibilities, such as explaining the general SEQR process, suggesting steps a village can take to meet SEQR responsibilities, showing how to determine the need for an EIS, and examining the role of a village as lead agency and its relationship with other government agencies in the SEQR process. A fictional account of how one village uses SEQR is used to illustrate the process. Five examples from the village of Lansing, New York, illustrate ways SEQR will affect villages, i.e., overhead light control, access roads, zoning ordinances, and sewer interceptors and feeders. The appendices present guidelines for determining significant environmental effects, and the SEQR Act and SEQR Act amendments. (Wares-IPA)
W78-06367

INDUSTRIAL POINT SOURCES OF PETROLEUM: POLLUTION LOADS AND ECONOMIC PARAMETERS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 5B.
W78-06376

FERTILIZING POND WATER: CRITICAL REVIEW (IN SERBO-CROATIAN),
Poliopr. Fak., Zavod Poliopr. Zool., Zagreb, Yugosl.
For primary bibliographic entry see Field 5C.
W78-06406

VIRUS ADSORPTION BY FIVE SOILS,
Agricultural Research Service, Beltsville, MD. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5B.
W78-06422

1978 SEWERAGE PROJECT FORECAST.
Western Construction, Vol 53, No 2, p 32, February, 1978.

Descriptors: *Sewerage, *Legislation, *Federal government, *Financing, *Interceptor sewers, Construction, Sewers, Grants, Sanitary engineering, Waste water treatment, Municipal wastes.

Water project construction legislation, approved by the United States Congress, has allocated $24.5 billion to be appropriated over the next five years. According to the National Utility Contractors Association, the legislation will provide an economic boost to construction firms in 1978. The additional funding comes at the end of an $18 billion allocation established by the 1972 Clean Water Act. A study completed by the National Utility Contractors Association refuted the contention by the Environmental Protection Agency that collector systems are not a cost-effective approach to waste water management. The recent legislation mandates that more than 25% of the funds be used for the construction of collectors and interceptors, rehabilitation, or combined sewer separation. The appropriation is part of the 1977 Clean Water Act approved by Congress. (Lisk-FIRL)
W78-06423

THE BARCELONA CONVENTION AND ITS PROTOCOLS,
Ministry of Foreign Affairs, Rome (Italy).
A. S. Lagrange.
Ambio, Vol 6, No 6, p 328-332, 1977. 8 ref.

Descriptors: *Oceans, *International commissions, *Water policy, *Water pollution control, *Water pollution sources, Ships, Aircraft, Legal aspects, International law, Law of the sea, Permits, Waste water disposal.

The 1976 Barcelona Convention, in which 16 Mediterranean coastal countries participated, resulted in international agreements for controlling pollution in the Mediterranean Sea. Fifteen countries have signed agreements establishing the Convention as a framework for protection of the ocean from pollution, control of the dumping of pollutants by ships and aircraft, and regulation of pollution in the Mediterranean Sea by oil spills. Three categories of wastes were identified within the protocol regulating pollution by ships and aircraft. One category lists the various substances which are totally prohibited; the second details those pollutants which require a special permit from the appropriate authority before dumping; and the third category covers the general range of all other wastes and matter for which a general dumping permit is necessary. A list of totally prohibited pollutants, including acid and alkaline compounds, is currently under consideration for adoption. The second pollution abatement protocol adopted by the Convention establishes a regional data collection center and mandates international cooperation in controlling, monitoring, recovering, and identifying pollution caused by an emergency or accidental situations. No agreement could be reached among the participating countries on the control of land-based pollution sources. (Lisk-FIRL)
W78-06424

ENVIRONMENTAL POLLUTION CONTROL IN METROPOLITAN ATHENS,
Environmental Pollution Control Project, Athens (Greece).
A. Gilad.
Ambio, Vol 6, No 6, p 350-354, 1977. 6 fig, 1 tab.

Descriptors: *Pollutant identification, *Water pollution, *Air pollution, *Solid wastes, *Oceans, Landfills, Treatment facilities, Incineration, Industrial wastes, Water pollution control, Air pollution effects, Recycling, Waste water treatment, Municipal wastes.

Water, air, solid waste, and noise pollution controls under consideration for Athens, Greece, are reviewed. A Greek Environmental Pollution Control Project initiated in conjunction with the United Nations Development Program and the World Health Organization, was established in 1973 as an environmental data collection center and coordinator of pollution abatement policies. A liquid wastes disposal system is being developed based on analyses of municipal and industrial effluent data, water use, and the impact of effluent discharges on water quality. Bioindicators have also been traced in receiving waters to determine the long-term effects of effluent discharge. Noise level surveys were conducted in six areas of Athens to delineate noise sources. Traffic was found to be the major source of noise pollution; legislation is pending that will establish maximum noise levels. Disposal of solid wastes in sanitary landfills is considered the most economic alternative for pollution control. Studies were conducted on the disposal of industrial wastes and resource recovery of methane gas and scrap paper. The impact of air pollution on materials, archeological monuments, and public health was monitored; air pollution controls are under development. (Lisk-FIRL)
W78-06425

COMPUTERIZATION AND AUTOMATION OF WASTEWATER SYSTEMS,
S. J. Hadeed.
Journal Water Pollution Control Federation, Vol 50, p 5-7, January, 1978.

Descriptors: Computers, *Flowmeters, *Systems analysis, *Automation, *Data collections, Cost analysis, Treatment facilities, Data storage and retrieval, Monitoring, Control systems, Waste water treatment, Municipal wastes.

The advantages of automatic or computer control of municipal waste water treatment facilities are reviewed. Automation of sewage treatment plants is recommended as a means of reducing labor costs and human error. Large-scale facilities and industries have converted to automatic control to increase equipment life, reduce instrument size and maintenance requirements, and conserve chemical and energy consumption. Computerized operations are capable of collecting and reacting to data from flowmeters, thermocouples, pressure meters, thermometers, and other metering units. Plant efficiency can be computer controlled by comparing collected data with current instrument readings. Equipment malfunctions can be detected and even avoided by automatic monitoring of instruments and plant processes. The quality and quantity of the effluent during each treatment process is monitored by sampling units. The evaluation of computer operation in municipal waste treatment plants is based on the efficiency of the automatic processes and the cost factors involved in automation. An alternative for small treatment plants is the installation of a time-sharing terminal for data collection and analysis. (Lisk-FIRL)
W78-06427

OXYGEN INJECTION AT WORK'S INLET.
For primary bibliographic entry see Field 5D.
W78-06457

SEALING A SEWAGE LAGOON FOR HALF THE COST,
. Brown.
Engineering and Contract Record, Vol. 91, No. 1, 37, January, 1978.

Descriptors: *Bentonite, *Lagoons, *Sewage agoons, *Linings, *Sealants, Plastics, Seepage, Rubber, Protective coatings, Waste water treatment, Municipal wastes.

Polymer-treated bentonite has been used instead of conventional materials for sewage lagoon linings at the White River sewage treatment plant in Ontario, Canada. The polymer-treated bentonite Volclay SG 40, supplied by American Colloid Co of Lovell, Wyoming, swells to transform permeable, sandy soils into water-tight, sealed basins. The bentonite, when mixed with sand and water, doubles in size to form an impermeable seal, especially useful in swampy regions. A mixed blanket technique was used to apply the bentonite to the White River sewage lagoons. A 6.3 mm layer of the bentonite was applied to a section of the lagoon at a rate of 7.32 kg/cu meter. Two more layers, each 3 mm thick, were applied to the lagoon in opposing directions and the bentonite was raked into the sand to a depth of 50 mm and compacted. A 25 mm layer of SG 40 gel, a mixture of bentonite and water, was applied to the waste inlet at a depth of 609 mm to prevent erosion of the bentonite seal. One sewage lagoon required 227 tons of SG 40 using the mixed blanket technique. (Lisk-FIRL)
W78-06464

DEODORIZATION MEASURES FOR NIGHT SOIL TREATMENT PLANTS (SHINYO SHORI SHISETSU NO DASSHU TAISAKI NI TSUITE),
F. Toyoda, and M. Chugo.
Ebara infiruko joho, (Ebara-Infilco Engineering Review), No. 71, p 23-29, October, 1977. 6 fig, 7 tab, 2 ref.

Descriptors: *Deordorization, *Treatment facilities, *Odor, *Air pollution, *Gases, *Ozone, Adsorption, Incineration, Density, Waste water treatment, Sewage effluent, Municipal wastes.

Deodorization of sewage effluent gases with similar densities was evaluated for waste water treatment facilities using combined treatment processes. Deodorization techniques often employed are scrubbing, ozonation, adsorption, and incineration. Conventional deodorization methods treat gases for the different treatment processes together by one of the conventional methods. The combined treatment of gases was not considered adequately effective or economic. Odor-bearing gases produced during treatment in waste water facilities were collected and combined according to high, medium, or low density. These similar density gases were then deodorized by a combination of treatment methods applicable to the specific density characteristics of the gases. Although several types of equipment were required in the treatment plant, this method of deodorization was considered a more effective treatment technique. (Lisk-FIRL)
W78-06468

ENVIRONMENTAL MANAGEMENT IN A MEDITERRANEAN PORT CITY: HAIFA,
United Nations Environment Programs, Geneva (Switzerland). International Labor Office.
H. Z. Evan.
Ambio, Vol 6, No 6, p 346-349, 1977. 2 fig, 1 tab.

Descriptors: *Haifa(Israel), *Water quality control, *Air pollution, *Solid waste, *City planning, *Monitoring, Microclimatology, River basin commissions, Coasts, Landfills, Recycling, Industrial wastes, Oil wastes, Municipal wastes.

A two-year experimental environmental management project conducted in Haifa, Israel, was cosponsored by the Environmental Protection Service, the city of Haifa and the United Nations Environment Program. A municipal agency was established to monotor air quality, river and beach pollution, and solid waste disposal. The agency was also responsible for establishing industrial cooperation, urban planning studies, and information services to public and legislative bodies. Air quality management has focused on monitoring stations, emission inventory, microclimatic studies, and industrial stack emissions, especially during inversions. An autonomous River Authority has been proposed to prevent polution of the Kishon River with agricultural and industrial wastes. A 1,000 ton/day recycling facility has been proposed as a solution to the diminishing sanitary landfill areas. Reduction of coastal pollution by tanker oil and bilge water has been attempted by the provision of cleaning facilities and increased surveillance. Urban planning has concentrated on limiting population densities and separating residential and industrial areas. Legislation has been introduced for the dissemination of information to the public and for administrating guidelines. (Lisk-FIRL)
W78-06470

USING PLANTS FOR WASTEWATER TREATMENT,
California Univ., Berkeley. Sanitary Engineering Research Lab.
C. G. Golueke.
Compost Science, Vol. 18, No. 5, p 16-20, September-October, 1977. 1 tab, 7 ref.

Descriptors: Algae, *Floating plants, *Submerged plants, *Aquatic plants, *Waste water treatment, *Vascular tissues, Water hyacinth, Chlorella, Euglena, Bulrushes, Aquatic weeds, Nitrogen, Phosphorus, Harvesting of algae, Harvesting, Feeds, Municipal wastes.

Waste water treatment systems using algae, duckweed, and water hyacinths were evaluated for pollutant conversion or removal capabilities, ease of harvesting, and potential food or fertilizer source. The use of algae in waste water treatment requires a symbiotic relationship with bacteria which break down the complex organic compounds to nutrients usable by the algae. Harvesting of the algae is difficult because of the microscopic size and low specific gravity of algae cells. The algae provide a source of protein for animal feed. The vascular, floating duckweeds are capable of doubling in quantity over 3-7 days in a semitropical climate by absorption of nutrients. These lemnaceae are easily harvested, but wind can cause large accumulations of colonies that decay. Dewatering of the duckweed would be required before use as an animal feed and oxalic acid concentrations must be considered. Emergent vascular plants, such as reeds and bulrushes, ae grown in a bed containing sand and gravel upon which sewage effluent is applied. This method of treatment produces a clear, neutral effluent with low BOD concentrations and pathogenic bacteria counts but with residual phosphorus and nitrogen. Water hyacinths are capable of removing 80% of the nitrogen and 40% of the phosphorus, as well as amounts of potassium, calcium, magnesium, and sodium, from a sewage pond within a two day period. Vehicles from which harvesting operations are conducted are hindered by the masses of hyacinths in the water. The plants would have to be dewatered by 90-95% before use as an animal feed. (Lisk-FIRL)
W78-06483

ORANGE COUNTY AUGMENTS WATER SUPPLY WITH RECLAMATION SYSTEM.
For primary bibliographic entry see Field 5D.
W78-06487

SEWAGE ODOR CONTROL WORKS IN BELOIT, WISCONSIN,
Will Ross, Inc., Milwaukee, WS.
J. D. Bryson, C. A. Davis, and F. J. Zuicarelli.
Water and Sewage Works, Vol. 125, No. 1, p 82-83, January, 1978.

Descriptors: *Odor, *Neutralization, *Hydrogen sulfide, *Ammonia, *Gases, Air pollution, Chemical reactions, Digestion tanks, Aromatic compounds, Waste water treatment, Treatment facilities, Municipal wastes.

An electrical deodorizer at the Beloit, Wisconsin, sewage treatment plant neutralizes odors produced in the clarifiers by mixing the gases with a dry vapor containing modified and natural oils and Neutrox Gamma, an aromatic compound. The inflow of odorous air into the unit's chamber is controlled by an aperture which allows the proper mixture of air with the dry vapor for neutralization. The dry vapor containing the special neutralizing formula is contained in cartridges which inject the adequate amount of vapor for neutralizing odors. The neutralizing unit replaced a biodigestor tank which was ineffective in the winter months and expensive to maintain. The level of odor in the contaminated air is sampled in monitoring inlets; dry vapor treatment is controlled by the odor contamination levels in the samples. Hydrogen sulfide and ammonia are the primary odor causing gases produced in the treatment facility. The total cost of the odor neutralizing unit, including 48 cartridges, was $2,585. (Lisk-FIRL)
W78-06489

SEWAGE FARMING...WHY IT MAY BE IN YOUR FUTURE.
The American City and County, Vol 93, No 1, p 48-49, January, 1978.

Descriptors: *Return flow, *Infiltration, *Overland flow, *Irrigation, *Load distribution, Hydraulic properties, Biochemical oxygen demand, Phosphorus, Suspended solids, Slopes, Surface runoff, Induced infiltration, Irrigation practices, Permeability, Waste water treatment, Municipal wastes.

Land applications of treated sewage effluent by crop irrigation, rapid infiltration, and overland flow are evaluated and design loading rates are developed. The field size required for slow rate application by crop irrigation is dependent upon the hydraulic and nitrogen loadings. Hydaulic loading, the sum of all water uptake and loss rates, should not allow runoff. Rapid filtration applications are dependent upon and soil permeability and the percolation rate of waste water through the soil to the groundwater. Continuous infiltration of an area causes solids accumulation which governs the infiltration loadings. There is negligible crop uptake of water and nitrogen during rapid infiltration; nitrogen removal is controlled by nitrification and denitrification in the soil. Overland flow applications are limited when the slope of the area is more than 6%, the land area is less than 150 ft long in the direction of flow, or during cold periods when biological activity is low. Overland flow, in which waste water is treated by biological oxidation, the three systems but achieves high BOD and suspended solids removal rates. Pretreatment measures suggested for all three processes are: solids and organics removal, as well as disinfection, for slow irrigation; solids removal for rapid infiltration; and extractable phosphorus improvement for overland flow. (Lisk-FIRL)
W78-06494

LEAK DETECTOR.
Water and Waste Treatment, Vol. 20, No. 11, p 32, November, 1977.

Descriptors: *Chlorine, *Chlorination, *Disinfection, Equipment, *Quality control, Analytical techniques, Leakage, Water purification, Waste water treatment, Flowmeters, Flow measurements, Gases, Municipal wastes.

The English company of Fischer and Porter Ltd., Workington, Cumbria, has developed an automatic chlorination system and a device for the detection of chlorine gas leaks in waste water treatment facilities. The Chloralert Chlorine Leak Detector warns of chlorine gas in the surrounding atmosphere with an alarm light and activates external alarms through electrical contacts. The Chlorimatic chlorination system controls chlorine dosages applied to waste effluent and water supplies. The system, which supplies exact proportions of chlorine gas to varying waste water flow rates and qualities, is vacuum operated and solution fed. The Chlorimatic system, used in processes requiring up to 500 lb of chlorine gas/day, consists of a vacuum regulator, a flowmeter, an ejector, and an automatic control valve developed by Fischer and Porter Ltd. (Lisk-FIRL)
W78-06508

QUALITY CRITERIA FOR WATER, JULY 1976.
Environmental Protection Agency, Washington, D.C. Office of Water and Hazardous Materials.
(1977). 256 p, 23 tab.

Descriptors: *Water quality standards, *Water pollution effects, *Lethal limit, Pollutant identification, *Aquatic environment, Aquatic life, Recreation, *Public health, *Toxicity, *Pollutants, Chemicals, Industrial wastes, Domestic wastes, Waste identification, Trace elements.

This volume addresses the effects of those basic water constituents and pollutants that are considered most significant in the aquatic environment in the context of present knowledge and experience. The format for criteria presentation has been altered substantially from the previous volumes. It is believed that the alphabetical arrangement of the water quality constituents and the form in which the information is arranged will be of considerable help to the reader in using this volume. For each basic water constituent or pollutant there is a recommended criterion, an introduction, a rationale supporting the recommended criterion, and a list of the references cited in the development of the recommendation. The volume is to recommend criteria levels for a water quality that will provide the protection and propagation of fish and other aquatic life and for recreation in and on the water in accord with the 1983 goals of P. L. 92-500. Criteria also are presented for the domestic water supply use. Generally, these uses require water of the highest achievable quality, and water quality that supports these uses will also be suitable for agricultural and industrial uses. (See W74-12674 and W74-05417)
W78-06527

AN ASSESSMENT OF ESTUARINE AND NEARSHORE MARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point.
Applied Marine Science and Ocean Engineering.
For primary bibliographic entry see Field 2L.
W78-06528

OIL SPILLS, AND SPILLS OF HAZARDOUS SUBSTANCES.
Environmental Protection Agency, Washington, D.C. Div. of Oil and Hazardous Materials.
For primary bibliographic entry see Field 5B.
W78-06529

THE SEVERN ESTUARY AND THE BRISTOL CHANNEL, AN ASSESSMENT OF PRESENT KNOWLEDGE.
Bristorl Univ. (England).; and University Coll. of Swansea (Wales); and Institute of Coastal Oceanography and Tides Birkenhead (England); and Institute for Marine Environmental Research, Edinburgh (Scotland).
For primary bibliographic entry see Field 2L.
W78-06530

SHIPBOARD OIL IN WATER MONITOR.
Nucor Corp., Denville, NJ.
For primary bibliographic entry see Field 5A.
W78-06531

MODELING OF OIL EVAPORATION IN AN AQUEOUS ENVIRONMENT (RESEARCH ON THE EFFECTS OF CRUDE OIL TRANSFER AND UPSTREAM REFINERIES ON DELAWARE BAY),
Delaware Univ., Newark. Dept. of Civil Engineering; and Delaware Univ., Newark. Coll. of Marine Studies.
H. Wang, W. C. Yang, and C. P. Huang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 968, Price codes: A03 in paper copy, A01 in microfiche. Report No CMS-RANN-5-76, Ocean Engineering Report No 7, December 1976. 48 p, 14 fig, 3 tab, 12 ref. NSF-GI-41896.

Descriptors: *Oil spills, *Evaporation, *Air temperature, *Wind velocity, *Computer programs, *Oil pollution, Mathematical models, Delaware, Weathering, *Outer Continental Shelf, *Oil weathering, Delaware Bay, Wind speed, Pollutant transport, Transfer processes, Crude oil, Refineries.

The goal of the overall research program is to provide information on the input of oil transfer operations in Delaware Bay for decision makers. The work reported here consists of the computer modeling of oil weathering in the early stage of a spill. A numerical model is developed to predict changes in oil characteristics, specific gravity, residues by weight and residues by volume of oil on water through evaporation known to dominate the early stage of weathering. The major driving forces for evaporation being considered include air temperature, wind speed, and size of slick. Laboratory experiments were conducted using No. 2 fuel oil, Nigerian Crude, and Venezuelan Crude to calibrate the numerical model and to gain physical insight into the oil evaporation process. Based on the laboratory results, empirical relationships are proposed for determining the diffusion coefficient described in the first-order decay formula. Both numerical and laboratory results seemed to indicate that the effect of temperature on oil weathering is significant in the very early stage of weathering, but diminishes at a later time. The effect of wind speed is more uniform throughout the time duration being tested. (Sinha-OEIS)
W78-06533

BIOLOGICAL OIL SLICKS. PART I - LITERATURE EXAMINATION,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 5B.
W78-06536

LECTURES ON ESTUARINE CIRCULATIONS AND MASS DISTRIBUTIONS,
Johns Hopkins Univ., Baltimore, MD. Dept. of Earth and Planetary Sciences; and Johns Hopkins Univ., Baltimore, MD. Dept. of Mechanics and Materials Sciences.
For primary bibliographic entry see Field 2L.
W78-06538

OIL SPILL AND OIL POLLUTION REPORTS NOVEMBER 1976 - JANUARY 1977,
California Univ., Santa Barbara. Marine Science Inst.
P. Melvin, H. Ehrenspeck, and P. Nordin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 248, Price codes: A14 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Research and Development, Environmental Protection Technology Series No EPA-600/2-77-075, April 1977. 303 p, append. Grant No R803992.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Water pollution effects, *Bibliographies, Pollution abatement, Environmental effects, Estuarine environment, Patents, *Outer Continental Shelf, Coastal zone, Ecological effects.

Oil Spill and Oil Pollution Reports is a quarterly bulletin designed to review current scientific and technical publications and research projects in the field of oil pollution. Subject coverage includes all aspects of aquatic and terrestrial oil pollution. This issue contains summaries of research projects and published information selected from the scientific and technical literature during the period November, 1976 through January, 1977. The following sections are included in the report: reports, publications, and patents; current research projects; and current oil-related conferences. (Sinha-OEIS)
W78-06539

OIL SPILL AND OIL POLLUTION REPORTS AUGUST 1976 - OCTOBER 1976,
California Univ., Santa Barbara. Marine Science Inst.
P. Melvin, H. Ehrenspeck, and P. Nordin.
Available from the National Technical Information Service, Springfield, Va., as PB-267 266, Price codes: A14 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Research and Development, Environmental Protection Technology Series No. EPA-600/2-77-037, February 1977. 317 p, append. Grant No. R803992.

Descriptors: *Oil spills, *Oil pollution, Water pollution sources, *Water pollution effects, *Bibliographies, Pollution abatement, Environmental effects, Estuarine environment, Patents, *Outer Continental Shelf, Coastal zone, Ecological effects.

Oil Spill and Oil Pollution Reports is a quarterly bulletin designed to review current scientific and technical publications and research projects in the field of oil pollution. Subject coverage includes all aspects of aquatic and terrestrial oil pollution. This issue contains summaries of research projects and publications selected from the scientific and technical literature during the period August, 1976 through October, 1976. The following sections are included in the report: reports, publications, and patents; current research projects; and current oil-related conferences. (Sinha - OEIS)
W78-06540

OIL SPILL AND OIL POLLUTION REPORTS MAY 1976 - JULY 1976,
California Univ., Santa Barbara. Marine Science Inst.
P. Melvin, and H. Ehrenspeck.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 870, Price codes: A16 in paper copy, A01 in microfiche Environmental Protection Agency, Office of Research and Development, Environmental Protection Technology Series No. EPA-600/2-76-266, October 1976. 357 p, append. Grant No. R803992.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Water pollution effects, Bibliographies, Pollution abatement, Environmental effects, Estuarine environment, Patents, Outer Continental Shelf, Coastal zone, Ecological effects.

Oil Spill and Oil Pollution Reports is a quarterly bulletin designed to review current scientific and technical publications and research projects in the field of oil pollution. Subject coverage includes ass pects of aquatic and terrestial oil pollution. This issue contains summaries of research projects and documents selected from the scientific and technical literature during the period May, 1976 through July, 1976. The following sections are included in the report: reports, publications, and patents; current research projects; and current oil-related conferences. (Sinha - OEIS)
W78-06541

OIL SPILL AND OIL POLLUTION REPORTS MAY 1975 - JULY 1975,
California Univ., Santa Barbara. Marine Science Inst.
F. A. DeWitt, Jr., P. Melvin, and R. M. Ross.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 852, Price codes: A15 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Research and Development, Environmental Protection Technology Series No. EPA-600/2-76-129, July 1976. 329 p, append. Grant No R803063.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Water pollution effects, *Pollution abatement, Bibliographies, Environmental effects, Estuarine environment, Patents, *Outer Continental Shelf, Coastal zone, Ecological effects.

This report is one of a series on oil spills. It cites current events, literature, research patents, and other material relevant to oil pollution abatement and is published in an abstract format on a quarterly basis. As such, it servies as a reference document for those interested in oil spills and oil pollution control. These reports are part of the continuing program of the Oil & Hazardous Materials Spills Branch, IERL-CI, to assess the environmental impact of oil spills and to help in providing the methodologies and tools to prevent spills and to minimize their effects when they do occur. The sources of the bibliographic citations and summaries of articles presented are scientific, technical and abstract journals. A list of the periodicals reviewed is provided in the appendix. The summarized material is grouped according to subject and then arranged alphabetically by senior author within each subject division. (Sinha - OEIS)
W78-06545

PREDICTABILITY OF LNG VAPOR DISPERSION FROM CATASTROPHIC SPILLS ONTO WATER: AN ASSESSMENT,
Arkansas Univ., Fayetteville. Dept. of Chemical Engineering.
J. A. Havens.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 525, Price codes: A10 in paper copy, A01 in microfiche. Coast Guard Office of Merchant Marine Safety, Cargo and Hazardous Materials Division Report No. CG-M-09-77, April 1977. 113 p, 8 fig, 8 tab, 42 ref, 2 append.

Descriptors: *Mathematical models, *Natural gas, *Water pollution sources, Dispersion, Hazards, *Outer Continental Shelf, *Liquified natural gas, LNG spills, Vapor dispersion, Flammable gases, *Pollutant transport, Prediction models.

Mathematical models which have been used to predict the downwind travel of flammable gas mixtures in the event of a catastrophic spill of liquefied natural gas into water are reviewed. In the event of a catastrophic release it is considered highly likely that an immediate fire would ensue. However, in the event that ignition did not occur immediately, an LNG vapor cloud would form over and downwind of the spill site. Wide disagreement regarding the extent of travel (and the accompanying possible public exposure) of the flammable portion of such a cloud has contributed to an apparently growing concern regarding the risks asociated with LNG importation. The scope of this review was limited to the predictability of dispersion from a very large LNG spill on water. No consideration was given to site-specific factors such as topographical features and structures. Likewise, no consideration was given to specific applicability of weather conditions, since this would depend on the site involved as well as the traffic control measures which are imposed. (Sinha - OEIS)
W78-06546

PROCESSES, PROCEDURES AND METHODS FOR CONTROL OF POLLUTION FROM SALT WATER INTRUSION.
Environmental Protection Agency, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 457, Price codes: A05 in paper copy, A01 in microfiche. Draft Report, 1973. 76 p, 11 fig.

Descriptors: *Estuaries, *Water pollution control, *Water pollution sources, Tidal effects, Pollution abatement, Institutional constraints, Legislation, Legal aspects, *Outer Continental Shelf, *Salt water intrusion, Pollutant transport, Transfer processes.

This report deals with the causal factors and pollutant movement associated with upstream encroachment of sea water and its environmental consequences. Control methods and monitoring procedures are presented together with selected references to sources for more detailed information. Upstream migration of the sea water wedge changes the salinity of aquatic environments and may render fish and wildlife habitats unsuitable for native populations. Sea water encroachment can contaminate human and agricultural water supplies necessitating costly treatment or relocation of intake points. Upstream migration of sea water is generally the result of man's alteration of the hydraulic equilibrium that exists between the fresh water and sea water regimes. The most common causes of sea water encroachment in streams are dredging of navigation channels, construction of sea level chanals, and reduction of stream flow. Any attempt to control an activity involving the diversion and use of surface or ground waters, in order to prevent water pollution, will involve vested water rights and usually will be in conflict with these water rights. Legal and institutional spects are considered. (Sinha - OEIS)
W78-06547

STANDARDS OF ENVIRONMENTAL QUALITY FOR RECREATIONAL EVALUATION OF RIVERS,
Northwestern Univ., Evanston, IL. Technological Inst.
For primary bibliographic entry see Field 6B.
W78-06553

A MODEL FOR ESTABLISHING WATER QUALITY STANDARDS FOR RIVERS,
Bureau of Land Management, Anchorage, AL.
For primary bibliographic entry see Field 6B.
W78-06558

A BRANCH AND BOUND METHOD FOR USE IN PLANNING REGIONAL WASTEWATER TREATMENT SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-06565

ESTABLISHING LOCAL WATER QUALITY MANAGEMENT PRIORITIES,
Washington Univ., St. Louis, MO. Dept. of Technology and Human Affairs.
W. P. Darby, F. C. McMichael, and R. W. Dunlap.
Journal of Environmental Systems, Vol 7, No 3, p 257-277, 1977-78. 3 fig, 7 tab, 12 ref.

Descriptors: *Water quality, *Water management(Applied), *Urban watersheds, *Methodology, Evaluation, Discriminant analysis, Mathematical models, Land use, Planning, Water resources development, Regulation, Systems analysis.

A methodology which can be implemented by water resources regulatory authorities to establish local water quality management priorities for

urban watersheds is presented. The model utilizes an approach to management which does not require extensive field sampling and investigation, but rather makes use of readily-available data. Indirect indicators of watershed characteristics and land use planning are used to predict overall water quality conditions of the watersheds. The methodology is applied to Allegheny County, Pennsylvania, a region which can be divided into eighty-two separate, independent drainage areas. Indirect indicators are used here to forecast the overall water quality of those watersheds for which no direct measurements exist, to single out problematic watersheds for possible regulatory action, and to identify those watersheds which should receive an in-depth study to characterize water quality conditions. This methodology is currently used by Allegheny County Health Department to establish implementation priorities for the small urban streams in the region. (Bell-Cornell)
W78-06573

STEADY-STATE DISSOLVED OXYGEN MODEL FOR THE RIDEAU RIVER,
Ottawa Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-06574

IMPACT OF COMMUNITY PLANNING ON QUALITY OF LIFE IN THE NORTH,
Canada Department of National Health and Welfare, Edmonton (Alberta). Medical Services.
J. Grainge.
Canadian Journal of Civil Engineering, Vol 4, No 4, p 436-444, December 1977. 4 fig.

Descriptors: *Water resources development, *Long-term planning, *Community planning, *Scandinavia, Environmental control, Short-term planning, Sanitary engineering, Human population, Water supply, Sewerage, Arctice Ocean, Water distribution(Applied), Solid wastes, Constraints, *Canada, *Canadian North.

Long-range planning is required in order to avoid impending environmental disasters in most northern communities. Present short range planning should consider more closely the basic needs of the inhabitants. These needs include piped water and sewer systems, more careful avoidance of sewage pollution of drinking water and the immediate environment, better cross cultural integration, greater emphasis on recreational facilities, awareness of the need for energy savings, iess ice fogs, and relatively warm and sunny microclimates. The Scandinavians have been leaders in this field and offer many examples of advanced planning of northern communities in Lapland, Iceland, and West Greenland. We should study their approach towards the solution of our common problems. Through dialogue with them a clearer understanding and possibly better solutions to existing problems will be found. A basic necessity in making the studies is a better understanding of the nature of the North and of the people; we must learn to work with both nature and the people. It is now the time for long-range planning by considering climatic, environmental and cultural factors, and integrating them into a more harmonious system with the aim of a higher quality of life. (Bell-Cornell)
W78-06577

AN EVALUATION OF THE POTENTIAL FOR USING DRAINAGE CONTROL TO REDUCE NITRATE LOSS FROM AGRICULTURAL FIELDS TO SURFACE WATERS,
North Carolina State Univ. at Raleigh. Dept. of Soil Science.
J. W. Gilliam, R. W. Skaggs, and S. B. Weed.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 575, Price codes: A06 in paper copy, A01 in microfiche. Water Resources Research Institute of the University of North Carolina, Raleigh, UNC-WRRI Rpt. No 128, Jan 1978. 108 p, 23 fig, 4 tab, 32 ref, 2 append. OWRT A-083-NC(2). 14-34-0001-7070.

Descriptors: *Drainage control, *Nitrates, Nitrogen, Agricultural soils, *Soil water movement, Surface waters, Denitrification, Agricultural runoff, Soil drainage, Coastal plain soils, *North Carolina.

This study was an outgrowth of previous work which revealed that considerable denitrification occurred in poorly drained soils with high water tables. This resulted in less nitrate leaving fields in drainage waters than occurred in better drained soils. Two N.C. Coastal Plain sites were used: one in the poorly drained soils of the Tidewater area and the other in the moderately well drained soils of the Lower Coastal Plains. Flashboard riser type water control structures were installed in four main tile lines at each location. Each control structure was equipped with a weir and a stage recorder for computing total outflow of drainage water. A semi-proportional water sampler was installed at each weir to take samples for chemical analyses. The structures were very effective in controlling the loss of nitrate-nitrogen on the moderately well drained soils. The annual loss of nitrate-nitrogen under controlled conditions was 1-7 kg/ha as compared to the 25-40 kg/ha under uncontrolled conditions. This reduction is due entirely to prevention of water movement through the tile lines, however, and there is no indication that the water control resulted in the anticipated increased denitrification in the fields. Water table control on the poorly drained soils was much more successful. By controlling and maintaining the water table at higher levels, no significant difference in oxidation-reduction potential throughout the soil profile was observed. Also, there was no significant change in the nitrogen concentration in water leaving the fields in the drainage ditches under controlled and uncontrolled conditions. (Kiger-No Car St)
W78-06578

IMPACT OF POTENTIAL PHOSPHATE MINING ON THE HYDROLOGY OF OSCEOLA NATIONAL FOREST, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06590

WATER MANAGEMENT EFFECT OF THE PLZEN SULFITE PULP MILL SHUTDOWN (VODOHOSPODARSKY EFEKT LIKVIDACE SULFITOVE CELULOZKY V PLZNI),
Zapadoceske Papirny, Pilsen (Czechoslovakia).
J. Hroch.
Papir a Celuloza, Vol. 32, No. 7-8, p 211-212, 1977. 3 tab.

Descriptors: *Sulfite liquors, *Pulp wastes, *Water pollution effects, Wastes, Industrial wastes, Pulp and paper industry, Effluents, Water pollution sources, Foreign countries, Europe, Water quality, Dissolved oxygen, Biochemical oxygen demand, Chemical oxygen demand, Pollution abatement, Saturation, Czechoslovakia, Radbuza river(Czechoslovakia), Sulfite pulp mills.

In March 1975, the Plzen sulfite pulp mill was shut down, and the effect of this measure on the effluent-receiving waters was studied in 1976 after a new equilibrium was established. The mill is located on the Radbuza river with 355 and 364-day flows of 1.93 and 1.18 cu m/sec, respectively. River water above and below the mill was analyzed for 16 parameters before and after the shutdown. The comparison showed that a significant improvement in water quality resulted from the shutdown. For example, the dissolved oxygen level below the mill increased from 2.1 to 10.1 mg/liter and the saturation from 17 to 83%. At the same time the 5-day BOD decreased from 86.3 to 5.2 mg/liter and the COD from 115 to 9 mg/liter. (Trubacek-IPC)
W78-06630

USE OF WARM WATER AFTER COOLING COMPRESSORS AND CONDENSERS (ISPOL'ZOVANIE V PROIZVODSTVE TEPLOI VODY POSLE OKHLAZHDENIYA KOMPRESSOROV I KHOLODIL'NIKOV),
Solikamskii Tsellyulozno-Bumazhnyi Kombinat (USSR).
For primary bibliographic entry see Field 3C.
W78-06638

PEATLAND AND WATER IN THE NORTHERN LAKE STATES,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 4D.
W78-06639

GEOTHERMAL POWER SYSTEM,
For primary bibliographic entry see Field 8G.
W78-06659

WATER PURIFICATION METHODS,
ITT Corp., Nutley, NJ. (Assignee).
E. W. Sawyer, Jr.
U.S. Patent No. 4,054,515, 9 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 963, No 3, p 992, October 18, 1977.

Descriptors: *Patents, *Water treatment, *Water purification, *Water pollution treatment, *Pollutants, Adsorption, Clays, Clay minerals, Filtration, Toxins, Attapulgite, Sepiolite.

Treating water with certain minerals removes substances which do not respond to other methods of water purification. One method comprises the use of attapulgite clay powder in combination with alum for treating potable water. Substances such as pesticides, toxins, harmones, heavy metal cations and viruses are removed from water by adsorption upon the clay surface. When contacting is employed, the clay containing the adsorbed substances is subsequently removed by sedimentation or filtration. The clays can be regenerated by appropriate chemical or thermal techniques. (Sinha-OEIS)
W78-06662

OIL SKIMMING APPARATUS,
C. F. Propp.
U.S. Patent No. 4,054,525, 13 p, 15 fig, 12 ref; Official Gazette of the United States Patent Office, Vol 963, No 3, p 995-996, October 18, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water quality control, Water pollution treatment, Separation techniques, Floating, Skimming, Equipment.

An apparatus for removing oil from the surface of water has a sump in which a pump is provided for removing the oil and water mixture. The sump has a front inlet associated with a float and a connecting flexible apron directing the oil and water mixture from the float to the sump. The apron allows the float to move vertically and to pivot longitudinally and laterally so that the float can maintain a uniform feeding position independent of the main vessel. The float is placed in a front opening of the vessel for compactness and for directing oil into the inlet means. The apparatus is designed so that it will pick up debris with the oil and water mixture without plugging up. (Sinha-OEIS)
W78-06667

APPARATUS AND METHOD FOR REMOVING FINE PARTICLES FROM A LIQUID MEDIUM BY ULTRASONIC WAVES,
A. Porath-Furedi.

J.S. Patent No. 4,055,491, 5 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 63, No 4, p 1323, October 25, 1977.

Descriptors: *Patents, *Water treatment, Separation techniques, *Water quality control, Ultrasonics, Sound waves, Flocculation, Algae, Water quality.

An apparatus and method are described for using ultrasonic waves for removing microscopic particles from a liquid medium, such as algae from a polar or refuse pond. The described apparatus includes an ultrasonic generator propagating ultrasonic waves of over one megacycle per second through the liquid medium to cause the flocculation of the microscopic particles at spaced points. The ultrasonic waves are propagated in the horizontal direction and baffle plates are placed below the level of propagation. The baffles are oriented to provide a high resistance to the horizontal propagation and a low-resistance to the vertical settling of the flocculated particles. The ultrasonic generator is periodically energized to flocculate the particles, and then de-energized to permit the settling of the particles through the baffle plates where they are removed. (Sinha-OEIS)
W78-06672

OIL RECOVERY APPARATUS,
National Research Development Corp., London (England). (Assignee).
I. G. Teasdale.
U.S. Patent No. 4,056,472, 15 p, 8 fig, 16 ref; Official Gazette of the United States Patent Office, Vol 964, No 1, p 214, November 1 1977.

Descriptors: *Patents, *Oil spills, *Oil pollution, Water quality control, Water pollution treatment, Skimming, Floats, Weirs, Equipment, *Oil recovery.

The invention relates to a method and apparatus for concentrating a relatively large surface area thin film of oil into a relatively small surface area thick narrow layer of oil and subsequently recovery the oil layer. Oil is allowed to pass over the leading weir edge of an oil skimmer mounted transversely across a flotation platform. The leading weir edge is positioned in the region of the center of buoyancy of the flotation platform. Oil passing over the leading weir edge is sucked through a slotted flow equalizing baffle plate mounted within the oil skimmer and removed to a collection location or vessel. (Sinha-OEIS)
W78-06677

ESTIMATING AN EFFLUENT CHARGE: THE SERVE MINING CASE,
Minnesota Univ., Minneapolis. Dept. of Economics.
M. Peterson.
Land Economics, Vol. 5, No. 3, p 328-341, August 1977. 3 tab, 39 ref, 1 append.

Descriptors: *Effluents, *Reserve Mining Corporation, *Lake Superior, *Taconite, Water pollution effects, *Pollution taxes(Charges), Regulation, Judicial decisions, Mine wastes, Asbestos, Minnesota, Silver Bay(MN), Great Lakes, Water pollution sources, Water pollution control, Human disease, Economics, Costs, Social costs, Pollutants, Eutrophication, Public health.

Social costs incurred by the Reserve Mining Corporation's discharge of asbestos containing taconite tailings into Lake Superior at Silver Bay, Minnesota, are estimated to determine an equitable effluent charge. A 1974 court action attempted to force the company to alter its discharge procedures; this paper offers an alternative abatement strategy in which an effluent charge is imposed to cover annual social costs of the pollution. Revenues generated can be used to reduce pollution and treat cancer victims, as well as to constitute an incentive to Reserve to find discharge methods carrying lower social costs. Annual cost estimates include: (1) lake eutrophication ($3,837,000), (2) water filtration ($1,365,000), (3) health hazard ($532,000), (4) residual costs due to the permanence of the tailings in the lake ($584,000). A simple per-ton charge would be $.30 on the 20,888,000 tons of tailings discharged annually, or $6,318,000 per year. A more sophisticated levy would be $3.89/ton for coarse tailings (about 50% of total weight, but which account for only 6.4% of social costs and surface area) and $.55/ton for fine tailings (50% of the weight, 93.6% of social costs and surface area). Pollution of Lake Superior by the tailings appears to be causing rapid eutrophication, killing aquatic life, reducing asthetic beauty, and seriously damaging tourism. Contamination by asbestos-form fibers, a known carcinogen, may cause 274 deaths per year among North Shore residents. (Lynch-Wisconsin)
W78-06682

THE FRESH AIR--CLEAN WATER EXCHANGE,
H. F. Bormann, and G. E. Likens.
Natural History, Vol. 86, No. 9, p 63-64, 68, 70-71, November 1977.

Descriptors: *Forest watersheds, *Ecosystems, *Water pollution control, *Rainfall, *Water supply, Forests, Solar radiation, Pollution abatement, Air pollution, New Hampshire, Small watersheds, Precipitation(Atmospheric), Nutrients, Streams, Percolating water, Water pollution effects, Air pollution effects, Acidity, Pollutants, Urbanization, Forest soils, Air-water interfaces.

Studies of small New Hampshire forest watersheds (30-100 acres) show they provide very important pollutant-removal benefits to humans, all powered by solar energy; but forest vegetation and soils eventually come into equilibrium with pollution loads, lose their storage function, and the ecosystem may be damaged. Forests modify streamflow and erosion, filter air and water, release sediment-free water to underground and surface water supplies, and moderate temperature and humidity. Large quantities of nutrients move about freely between vegetation and soil, but little is lost in drainage water, and such losses are made up by rock weathering. A forest regulates the chemical quality of water percolating through it into streams or to groundwater. Nitrate present in increasing amounts in rainfall is mostly being held within the forest ecosystem. Because of increasing use of fossil fuels, rainfall in the northeastern United States is now largely a mixture of water and sulfuric and nitric acids. The forest ecosystem removes much of this acid from rainwater, so that stream water draining from the watersheds is 30 times less acid than rainwater. Natural soils remove heavy metals, some radioactive isotopes, and pesticides. Soil and forest vegetation also remove many particulate and gaseous pollutants from the air: vegetation is especially efficient in removing sulfur from the air, and forest soil absorbs large amounts of carbon monoxide. (Lynch-Wisconsin)
W78-06693

PREIMPOUNDMENT STUDY: CEDAR CREEK DRAINAGE BASIN: EVANS COUNTY WATERSHED: EVANS, TATTNALL, AND CANDLER COUNTIES, GEORGIA,
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5A.
W78-06695

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

ENERGY RELATED ACTIVITIES AND AN ASSESSMENT OF THE WATER RESOURCE MANAGEMENT ALTERNATIVES IN SOUTH LOUISIANA,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
For primary bibliographic entry see Field 6B.
W78-06201

OPTIMIZATION OF A REGIONAL WATER RESOURCE QUALITY MANAGEMENT SYSTEM,
California Univ., Berkeley.
For primary bibliographic entry see Field 5G.
W78-06234

A MODEL FOR MULTI-PERIOD REGIONAL WASTEWATER PLANNING,
North Carolina Univ. at Chapel Hill.
For primary bibliographic entry see Field 5G.
W78-06299

DEVELOPMENT AND IMPLEMENTATION OF A REGIONAL WATER PLANNING DATA MANAGEMENT SYSTEM,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
A. B. Whinston.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 174, Price codes: A10 in paper copy, A01 in microfiche. Technical Report No. 97, January 1978. 191 p, 39 fig, 86 ref. OWRT B-080-IND(9).

Descriptors: *Data processing, *Data storage and retrieval, *Decision making, Data collections, Computer models, Data transmission, Information exchange, *Planning, Information retrieval, Regional analysis, *Data management, *Water quality data, *GPLAN, CODASYL, Query processor.

The work is an extension to the Generalized Planning (GPLAN) System developed at Purdue University. The approach was to integrate techniques from the field of data base management with artificial intelligence techniques and concepts, culminating in an intelligent decision support system. The report commences with a survey of the emergency discipline of decision support systems. An example of a water quality mananagement application is given within the GPLAN framework. Several extensions and corrections for the CODASYL approach to data management are given. There is an investigation of problems encountered in the management of water quality data that is logically distributed. A generalized mapping language is proposed as a mechanism for information transferral within a distributed data base, and a general data structure for supporting the mapping function is illustrated. The presented method accommodates a variety of user views, is independent of whether the data base is geographically distributed or centralized, furnishes a straightforward security mechanism and provides a basis for treating the contingency of uninformed or non-programming users.
W78-06360

MATHEMATICAL MODELING AND ECONOMIC OPTIMIZATION OF WASTEWATER TREATMENT PLANTS,
Louvain Univ. (Belgium). Dept. of Engineering.
For primary bibliographic entry see Field 5D.
W78-06415

ECONOMIC EVALUATION OF ALTERNATIVE USES OF RIVERS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 6B.
W78-06552

SIMULATION MODELING AS A TOOL FOR MANAGING RIVER RECREATION,
Montana Univ., Missoula. School of Forestry.
For primary bibliographic entry see Field 6B.
W78-06555

A MARKOV-BASED LINEAR PROGRAMMING MODEL OF TRAVEL IN THE BOUNDARY WATERS CANOE AREA,
Northwestern Univ., Evanston, IL. Technological Inst.
For primary bibliographic entry see Field 6B.
W78-06556

A MODEL FOR ESTABLISHING WATER QUALITY STANDARDS FOR RIVERS,
Bureau of Land Management, Anchorage, AL.
For primary bibliographic entry see Field 6B.
W78-06558

OPTIMAL DESIGN OF WATER DISTRIBUTION NETWORKS,
Rome Univ. (Italy). Ist. di Aerodinamica.
For primary bibliographic entry see Field 4A.
W78-06562

MANAGING WILDERNESS TRAVEL: A MARKOV-BASED LINEAR PROGRAMMING MODEL,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
J. S. deBettencourt, G. L. Peterson, and P. K. Wang.
Environment and Planning A, Vol. 10, No. 1, p 71-79, 1978. 8 ref.

Descriptors: *Wilderness, *Management, *Markov processes, *Linear programming, *Mathematical models, *Watercraft travel, Canoeing, Constraints, Planning, Programs, Control, Optimization, Recreation, Quotas, Daily, Entry points, Traveler maximization, Model validity, Travel system, Analytical techniques, Equations, Systems analysis.

Overnight travel by watercraft in the Boundary Waters Canoe Area of Minnesota is described as a discrete parameter Markov chain. A simple normative model is constructed of the system as a steady state process in terms of constant daily entry rates and expected daily populations in interior zones. By means of linear programming and given constraints on entry rates and zone average daily populations, optimal entry quotas are determined for each of thirty-three entry points. The quotas thus derived have provided the basis for an actual control program implemented in 1976. Information pertaining to the validity of the application is presented and the use of the model in policy formation is described. (Bell-Cornell)
W78-06564

A BRANCH AND BOUND METHOD FOR USE IN PLANNING REGIONAL WASTEWATER TREATMENT SYSTEMS,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-06565

A STOCHASTIC MODEL OF THE OPERATION OF A STREAM-AQUIFER SYSTEM,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 4A.
W78-06566

STRUCTURAL FLOOD CONTROL PLANNING,
Bell Lab., Holmdel, NJ.
For primary bibliographic entry see Field 4A.
W78-06567

ON LEVEL CROSSINGS AND CYCLES IN DAM PROCESSES,
Utrecht Rijksuniversiteit (Netherlands). Mathematical Inst.
For primary bibliographic entry see Field 8B.
W78-06569

LAND DATA MANAGEMENT SYSTEM FOR RESOURCE PLANNING,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 4A.
W78-06570

ESTABLISHING LOCAL WATER QUALITY MANAGEMENT PRIORITIES,
Washington Univ., St. Louis, MO. Dept. of Technology and Human Affairs.
For primary bibliographic entry see Field 5G.
W78-06573

A SIMULATION MODEL FOR SCREENING A SYSTEM OF RESERVOIRS FOR ENVIRONMENTAL IMPACT,
MacLaren (James F.) Ltd., Willowdale (Ontario). Water Resources Group.
For primary bibliographic entry see Field 4A.
W78-06576

IMPACT OF COMMUNITY PLANNING ON QUALITY OF LIFE IN THE NORTH,
Canada Department of National Health and Welfare, Edmonton (Alberta). Medical Services.
For primary bibliographic entry see Field 5G.
W78-06577

6B. Evaluation Process

ENERGY RELATED ACTIVITIES AND AN ASSESSMENT OF THE WATER RESOURCE MANAGEMENT ALTERNATIVES IN SOUTH LOUISIANA,
Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
C. A. Whitehurst, and R. A. Kinney.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 868, Price codes: A09 in paper copy, A01 in microfiche. Completion Report, December 1976. 270 p, 53 fig, 33 tab, 12 ref, 8 append. OWRT C-6052(5204)(1). 14-31-0001-5204.

Descriptors: *Land use, Water resources, Management, *Alternative planning, *Louisiana, *Evaluation, Industries, *Oil and gas industry, *Barataria Basin(LA), *Model studies, *Regional analysis, Water quality, *Environmental effects, Drainage, Water pollution, Estuarine environment.

Results are presented of a study of water resource management problems which are related to oil and gas industrial activities in the upper regions of the Barataria Basin of South Louisiana. The project area is of major importance as a source for nutrients feeding the Barataria estuary, for its timber stand and because of agricultural usage. The study includes the utilization of assessment models of the region's environmental regimes and a measure of the expected impact of several historically significant energy-related activities on the water resources. The assessment model used in this study (SUITABILITY ANALYSIS) was a powerful tool in determining the state of the environment. Baseline data were generated including biological and botanical indices, distributions of soil classes, a water balance investigation, water quality measurements and a wildlife inventory. Land-use and water vector maps were prepared and estimates were made of the productivity of the region. The project region is one wherein land use is shared by natural vegetation and water but with areas of intense human activity. The influence of human activity is most obviously reflected in the water quality of the region and in the disruption of natural drainage which has resulted in the impoundment of natural areas and the enhancement of land-use changes. Recommendations were made for the establishment of a master land-use plan for the area in order to insure sensible (environmentally) land-use alterations. In the absence of such a plan, every effort should be made to control further disruption of the drainage system and discourage conversion of natural areas into agricultural lands.
W78-06201

PUERTO RICO'S WATER RESOURCES PROBLEMS AND RESEARCH NEEDS.
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.; and Department of Natural Resources, San Juan (Puerto Rico).
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 100, Price codes: A01 in paper copy, A01 in microfiche. Research Report, February, 1974. Proceedings of Conference and Planning Session, R. Vazquez, Ed. 88 p, 1 append. OWRT A-999-PR(2).

Descriptors: *Water resources, *Water resources development, *Puerto Rico, Soils, Crop production, Industries, Water quality, Water conservation, Water demand, Water supply, Environment, Environmental effects, Economics, Water control.

The proceedings of a conference and planning session to identify Puerto Rico's water resources problems and research needs are presented. Panel discussions were conducted on water for agriculture, water for development, water for industry, and on water and environmental quality R and D efforts. The agricultural discussion centered on water resource needs for sugar production and on Federal soil and water conservation programs. Economics, flood control, domestic water use problems and research needs, and Corps of Engineers water resources programs were discussed with regard to development. Concerning industrial development, water use problems and research needs for industry and water resource planning were treated. The panel on water and environmental quality discussed water quality problems and research needs, EPA water resources programs, USGS water resources research, and water resources in the Virgin Islands. (Wares-IPA)
W78-06206

ANALYSIS OF PRIORITY WATER RESOURCES PROBLEMS FOR THE SOUTHERN PLAINS REGION,
Arkansas Univ., Fayetteville. Water Resources Research Center.
R. E. Babcock, G. Carruthers, E. J. Dantin, M. T. Edmison, and W. L. Powers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 235, Price codes: A04 in paper copy, A01 in microfiche. Final Report, September, 1977. 46 p, 13 tab. OWRT B-214-TEX(1). 14-34-0001-7204.

Descriptors: *Water resources, *Research priorities, *Planning, *Arkansas, *Kansas, *Louisiana, *Oklahoma, *New Mexico, *Texas, Groundwater, Pollutant identification, Land subsidence, Recharge, Reservoirs, Water supply, Wells, Management, Southern plains US, Resource problem areas.

tate water resources research institutes in the outhern Plains River Basin Region of the U.S. Arkansas, Kansas, Louisiana, New Mexico, klahoma, and Texas) have identified their critical id serious water resources problems and search needs; funding is outlined through fiscal ear 1978. Problems in Arkansas were identified as oundwater quality/recharge, lake/reservoir uality degradation, urban land development im-cts, river management, economics and water e coefficients, and pollutant identification. In ansas, improving water use efficiency, water al-cation/management, and in-stream use and ater quality were stressed. Problems in Loui-na include contingency planning, deep well aste disposal, aquifer management, waste water eatment, aquifer heat storage, clay minerals, chates, subsidence, artificial recharge, and dionuclides. New Mexico problem areas include ecipitation management, groundwater, Indian ter rights, and economic development using ine water. Water quantity/quality, environmen- impact, and water planning/management are e focus in Oklahoma, and in Texas, flood plain nagement, subsidence from aquifer drawdown, oundwater depletion/recharge, irrigation effi-ncy, seasonal water supply deficiency, inter-sin transfer, groundwater quality protection, rface water pollution by brines, lake/reservoir ality degradation, fresh water inflow to ys/estuaries, regional management institutions, l energy cost and groundwater pumpage, quire major attention. (Wares-IPA)
78-06207

CING THE LONGTERM: AN INQUIRY INTO PORTUNITIES TO IMPROVE THE CLI-TE FOR RESEARCH WITH REFERENCE LIMNOLOGY IN CANADA,
heries and Marine Service, Winnipeg anitoba). Freshwater Inst.
r primary bibliographic entry see Field 6E.
8-06217

COME ESTIMATES AND REASONABLE TURNS IN ALASKA'S SALMON FISHERIES,
rnell Univ., Ithaca, NY. Law School.
. Owers.
nery Bulletin, Vol. 75, No. 3, p 483-492, 1977. 1 7 tab, 5 ref.

criptors: *Alaska, *Fisheries, *Salmon, come analysis, *Return(Monetary), mmercial fishing, Resource allocation, Sport ing, Limited entry, Permits, Regulation, Cost lysis, Nets, Trolling, Fish management, nomics, Equations, Profit.

nomic analysis of commercial salmon fishing Alaska indicates that while in certain purse e and drift gill net fisheries restricting or icing the number of operating units would raise ings to levels comparable with other sectors of Alaskan economy, such measures would be in-quate in other fisheries, particularly in the set nd power troll fisheries. In several areas sport ng is in direct competition with commercial eries, and resource allocation is a major blem. This paper examines a method for esti-ng the number of units that will provide a onable economic return in a fishery; three ria are developed for determining reasonable rn rate: (1) comparison with wages in other ors, (2) comparison with total annual incomes all sources and total incomes of workers in occupations, and (3) estimates by fishermen. show that in 1973, 60% of set gill netters, 44% urse seiners, and 15% of drift gill netters in ka registered a net financial loss. In that year age net return to each of the more than 6400 operators was about $1600. The first com-ensive limited-entry law in the United States passed by the Alaska legislature in 1973. Ta-present input data used to generate income ates by fishery, expected earnings at 5% per-eduction increments, and recommended per-evels. (Lynch-Wisconsin)

W78-06328

INTEGRATION OF WATER SUPPLY STRATEGIES IN A DESERT AREA,
California State Dept. of Water Resources, Sacramento. Div. of Planning.
J. L. Welsh.
In: Proceedings, United Nations Institute for Training and Research Conference on Alternative Strategies for Desert Development and Management, 31 May-10 June, 1977, Sacramento, California, Vol. 4, p. 1-7.

Descriptors: *Long-term planning, *California, Water resources development, Water management, Water allocation(Policy), *Water supply, Planning, Semiarid climates, Social needs, California water plan.

The need for a fully integrated, flexible and continually evolving water supply strategy and master plan is demonstrated. A brief summary of the California Water Plan is presented. The plan demonstrates that one broad master plan can accommodate and facilitate water development by several different governmental and private agencies. First published in 1957, the plan has demonstrated sufficient flexibility to accommodate the redirection of social goals and perceptions of resource limitations. It was pointed out that the plan may well serve as a guide to development in other arid and semi-arid parts of the world. (Castricone-Arizona)
W78-06342

THE REDISTRIBUTIONAL CONSEQUENCES OF PUBLIC RECREATION PROVISION AT THE POTHOLES RESERVOIR - COLUMBIA BASIN PROJECT, WASHINGTON,
Washington State Univ., Pullman. Dept. of Agricultural Economics.
K. C. Scott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 295, Price codes: A07 in paper copy, A01 in microfiche. Completion Report, June, 1975. 143 p, 6 fig, 45 tab, 73 ref, 2 append. OWRT A-066-WASH(1), 14-31-0001-5048.

Descriptors: *Recreation, *Recreation facilities, *Washington, Reservoirs, Economics, Public benefits, Public access, Surveys, Costs, Cost-benefit analysis, Water resources development, Income distribution, Geographical regions, Reservoir operation, Reservoir design, *Columbia River, *Potholes Reservoir(WA), Redistributional impacts, Use patterns, Recreation programs, Reservoir management.

The redistributional consequences of public recreation provision were ascertained at the Potholes Reservoir on the basis of income class, geographical area, age group, and family status of the beneficiaries and cost bearers. The reservoir, originally constructed for irrigation purposes, is a small storage unit within the Columbia Basin Project and is used extensively for recreation. Funds for recreational facilities and for annual operation and maintenance costs have been provided by State and local governments. Benefits identified were assigned to relevant socioeconomic classifications of recreationists based on the results of a recreation survey (2,650 recreational interviewees). Estimated public costs of providing and maintaining outdoor recreation opportunity there were obtained from administering Federal and State agencies. Finally, these public costs were assigned to income classes and to geographical areas and age groups according to the estimated tax incidence effects of the public sector in the state. Recreationists receiving positive redistributional impacts were the lower income classes ($0-7,500), the young (under 25), the elderly (over 55), and recreationists residing in geographical areas adjacent to the reservoir area. Redistributional impacts of public recreation in the study area appeared to conform to the stated policy of water resource development, namely, assisting residents (including elderly and poor) in a local area. The appendices contain the interview form and tables of survey results. (Wares-IPA)
W78-06349

DEVELOPMENT AND IMPLEMENTATION OF A REGIONAL WATER PLANNING DATA MANAGEMENT SYSTEM,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W78-06360

EDUCATION OF WATER RESOURCES PLANNERS AND MANAGERS FOR EFFECTIVE PUBLIC PARTICIPATION.
Clemson Univ., SC. Water Resources Research Inst.
Available from the National Technical Information Service, Springfield, VA, 22161 as PB-280 243, Price codes: A09 in paper copy, A01 in microfiche. Publication Report No. 71, February, 1978, 192 p, 75 ref. Albert, Harold E. (ed.). OWRT A-999-SC(7).

Descriptors: *Public participation, State governments, Industrial development, Administrative agencies, South Carolina, Corps of Engineers, *Interest groups, *Management, *Water resources development, *Social partcipitation, *Planning, Attitudes, *Social values, Bibliographies, *Education, Personnel, *Alternative planning, Lake Hartwell, Georgia.

Water resources development should provide measures and facilities which are responsive to the long-run needs and evolving preferences of the public. An important means of achieving this goal is effective participation in water resources planning and management. In order to achieve this, key representatives of the diverse interest groups and of the public must be sufficiently familiar with both the obvious and the subtle dimensions of public participation, and must be aware of objectives as well as alternative approaches to the process. Participants at this symposium included representatives from federal, state, and local government agencies, and from private interest groups. The conclusions reached by this panel were: (1) The public must be divided into publics and having the right publics involved in the planning stage is crucial to the development stage; (2) The right publics must be involved as early as the pre-planning stage, although all of the publics who eventually will be involved need not be at the same time; (3) There are a variety of techniques for public involvement and no single technique is adequate for all projects. A case study was analyzed by leading participants from both the public and private sector, and this substantiated the accuracy of the above conclusions. In addition to the symposium, an extensive bibliography was compiled and annotated, and is included.
W78-06363

PROJECTIONS OF ECONOMIC DEVELOPMENT ASSOCIATED WITH COAL-RELATED ACTIVITY IN MONTANA,
Montana State Univ., Missoula. Bureau of Business and Economic Research.
For primary bibliographic entry see Field 6D.
W78-06364

RESEARCH IN ACTION: TECHNOLOGY FOR IMPLEMENTING WATER RESEARCH RESULTS. PROCEEDINGS OF A CONFERENCE, DECEMBER 5 - 6, 1974, LINCOLN, NEBRASKA.
Nebraska Univ., Lincoln. Water Resources Center.
For primary bibliographic entry see Field 10D.
W78-06370

WATER REQUIREMENTS FOR FUTURE ENERGY DEVELOPMENT IN THE WEST: STATE PERSPECTIVES,
EG and G Idaho, Inc., Idaho Falls.
For primary bibliographic entry see Field 6D.
W78-06375

CATALOG OF WATER RESOURCES RESEARCH IN ILLINOIS.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 9A.
W78-06412

ECONOMIC EVALUATION OF ALTERNATIVE USES OF RIVERS,
Arizona Univ., Tucson. School of Renewable Natural Resources.
D. A. King.
In: Proceedings: River Recreation Management and Research Symposium, January 1977, Minneapolis, Minnesota. USDA Forest Service General Technical Report NC-28, North Central Forest Experiment Station, Forest Service, Department of Agriculture, St. Paul, Minn., p 60-66, 1977. 3 fig.

Descriptors: *Cost-benefit analysis, *Recreation, *Rivers, *Opportunity costs, Management, Decision criterion, Hotelling-Clawson-Knetch model, Amenity values, User benefits, Net social benefits, Benefit maximization, Measurement, Mathematical models, Systems analysis.

The benefit-cost analysis decision criterion and the concept of opportunity cost are reviewed. Outlined is how to measure recreational benefits using the Hotelling-Clawson-Knetsch model. Discussed also are data and research needs for using benefit-cost analysis as a tool for making recreational river management decisions. It is concluded that the state-of-the-knowledge regarding measurement of recreational user benefits is such that it is now possible to measure them with confidence. The total willingness-to-pay measure of value, the area under the demand curve for the environment, is the relevant measure, given maximization of net social benefits as the decision criterion. This measure of value is constrained by income and is, therefore, a lower bound value. (Bell-Cornell)
W78-06552

STANDARDS OF ENVIRONMENTAL QUALITY FOR RECREATIONAL EVALUATION OF RIVERS,
Northwestern Univ., Evanston, IL. Technological Inst.
J. S. deBettencourt, and G. L. Peterson.
In: Proceedings: River Recreation Management and Research Symposium, January 24-27, 1977, Minneapolis, Minnesota. USDA Forest Service General Technical Report NC-28, North Central Forest Experiment Station, Forest Service, Department of Agriculture, St. Paul, Minn. p 245-255. 8 fig.

Descriptors: *Standards, *Recreation, *Environmental control, *Rivers, *Evaluation, Analytical techniques, Water quality standards, Equations, Model studies, Systems analysis, Economics, Environmental effects, Wilderness areas, Urban areas.

Presented is a utility theory of behavior in the form of the rational model of choice, for evaluating recreational sites. Explored is the possibility of developing evaluative criteria and standards based on the individual and group threshold functions by which alternative sites are accepted or rejected. The experimental procedures used to develop the threshold functions are explained and illustrative results of pilot studies are presented. Focused upon are the environmental characteristics or attributes of recreational sites on rivers. Discriminant analysis, used under three different variable transformations--linear, quadric, and dummy variable--, is shown as a powerful tool for estimating the individual threshold function. The condition of the water is considered on a scale of polluted to clean, in wilderness as well as urban areas. Scale definitions include: water condition, degree of development, crowding/use, trash/litter, and skill level required. It is concluded that the formulation of user-based criteria and standards for evaluation of recreational facilities is an important part of the planning, design, and management of recreational environments. The techniques discussed show considerable promise if they can be adequately defined, developed, and validated. Potential applications and needs for further research are discussed. (Bell-Cornell)
W78-06553

A SURVEY AND ANALYSIS OF RECREATIONAL AND LIVESTOCK IMPACT ON THE RIPARIAN ZONE OF THE RIO GRANDE IN BIG BEND NATIONAL PARK,
Texas Agricultural Experiment Station, College Station.
R. B. Ditton, D. J. Schmidly, W. J. Boeer, and A. R. Graefe.
In: Proceedings: River Recreation Management and Research Symposium, January 1977, Minneapolis, Minnesota. USDA Forest Service General Technical Report NC-28, North Central Forest Experiment Station, Forest Service, Department of Agriculture, St. Paul, Minn., p 256-266, 1977. 4 fig, 3 tab.

Descriptors: *Recreation, *Rivers, *Livestock, *Impact analysis, *Rio Grande(Tex), *Riparian sites, Management, Visitors, User patterns, Cluster analysis, Principal components analysis, Water resources, *Big Bend National Park(Tex), Ecology, Biological conditions, Systems analysis, *Texas.

The Rio Grande of the Big Bend National Park (Texas) has experienced dramatic increases in recreational and water use. The National Park Service has thus found it necessary to secure information concerning the actual and potential impact on the river and on associated land area ecosystems from present levels of human usage. Visitor usage patterns, biological conditions, and selected parameters of recreational impact (including litter, trampling, tree cutting, and human waste) were measured over a 12-month period. Use and impact were shown to be strongly and positively correlated. However, recreational impact was not significantly related to biological health of the area. Cluster analysis was used to group areas into three categories based on degree of impact; only one of every four sites was indicated as heavily impacted. Principal components analysis identified human impact parameters as best discriminators between sites.
W78-06554

SIMULATION MODELING AS A TOOL FOR MANAGING RIVER RECREATION,
Montana Univ., Missoula. School of Forestry.
S. F. McCool, D. W. Lime, and D. H. Anderson.
In: Proceedings: River Recreation Management and Research Symposium, January 1977, Minneapolis, Minnesota. USDA Forest Service General Technical Report NC-28, North Central Forest Experiment Station, Forest Service, Department of Agriculture, St. Paul, Minn., p 304-311, 1977. 1 fig, 2 tab.

Descriptors: *Simulation analysis, *Rivers, *Recreation, Management, Use patterns, Prediction, Visitor use limits, Campgrounds, Travel time, Travel routes, Information output, Mathematical models, Linear function, Planning, Systems analysis, *Utah, *Colorado, *Green River(Colo Utah), *Yampa River(Colo).

Accelerating use of free-flowing rivers for recreational floating has led many managers to initiate interim visitor use limits. Ideally, managers should know beforehand how use patterns and level of solitude would be affected when use limits are implemented. The authors have modified the Wilderness Area Simulation Model, developed by Resources for the Future in cooperation with the USDA Forest Service, To predict patterns of river recreation use occurring under a variety of use conditions and have tested it on the Green and Yampa Rivers in Dinosaur National Monument for the week of June 23-29, 1975. The 'Base Case' simulation and actual patterns of use were compared to test the Simulator's validity and were found to be in close agreement. A variety of experiments, such as changing daily entry rates and opening and closing campgrounds, was simulated. (Bell-Cornell)
W78-06555

A MARKOV-BASED LINEAR PROGRAMMING MODEL OF TRAVEL IN THE BOUNDARY WATERS CANOE AREA,
Northwestern Univ., Evanston, IL. Technological Inst.
G. L. Peterson, J. S. deBettencourt, and P. K. Wang.
In: Proceedings: River Recreation Management and Research Symposium, January 24-27, 1977, Minneapolis, Minnesota. USDA Forest Service General Technical Report NC-28, North Central Forest Experiment Station, Forest Service, Department of Agriculture, St. Paul, Minn., p 342-350, 1977. 1 fig.

Descriptors: *Markov processes, *Linear programming, *Boundary waters, *Travel model, *Water travel, Canoes, Lakes, Systems analysis, Equations, Mathematical models, Probability, Management, Optimization, *Boundary Waters Canoe Area(Minn Canada), *Minnesota, *Canada.

Described and illustrated is a Markov-based linear programming method used for predicting and analyzing travel in the Boundary Waters Canoe Area (BWCA) in order that management can control the rate of entry of travellers into the area. The Markov framework allows for the development of two distinctly different modes of analysis; forward-seeking and backward-seeking models. In the former, the manager specifies judgmentally the entry rates for each entry point. In the latter, the manager is asked to specify carrying capacities for each of the interior zones--and upper and lower limits for each of the entry points. Subject to constraints, the linear programming algorithm is used to maximize the total number of groups entering the BWCA; given are opportunity costs for each of the constraints. The travel model is formulated in terms of three different kinds of zones or states that a camper might occupy: entry, interior, and exit zones. Discussed is the validity of underlying assumptions; considered are: noninformational probabilities; nonstationary probabilities and entry rates; the heterogeneous population of travellers; monitoring of change; improvement of operational characteristics; and basic research. (Bell-Cornell)
W78-06556

CAMPSITE CHOICE BEHAVIOR IN THE RIVER SETTING: A PILOT STUDY ON THE ROGUE RIVER, OREGON,
Victoria Univ. (British Columbia). Dept. of Geography.
R. E. Pfister.
In: Proceedings: River Recreation Management and Research Symposium, January 24-27, 1977, Minneapolis, Minnesota. USDA Forest Service General Technical Report NC-28, North Central Forest Experiment Station, Forest Service, Department of Agriculture, St. Paul, Minn., p 351-358, 1977. 2 fig, 6 tab.

Descriptors: *Wild rivers, *Oregon, *Campsites, Regression analysis, Mathematical models, River terraces, Decision making, Camping parties, Systems analysis, *Rouge River(Ore).

The relation of campsite choice to the natural characteristics of campsites was analyzed along the Wild and Scenic Rouge River in Oregon. Two regression models--for commercial and noncommercial camping parties--were formulated relating campsite choice to 13 site characteristics of river terraces. Of the 5 significant variables selected for each model, 3 were the same: size of the campsite, size of the tributary providing potable water to the location, and a rating of beach area available for landing a boat. Stepwise multiple linear regression analysis was employed to test if significant relations exist between Party-nights and sit characteristics of the river terraces with camping occurring. (Bell-Cornell)
W78-06557

A MODEL FOR ESTABLISHING WATER QUALITY STANDARDS FOR RIVERS,
Bureau of Land Management, Anchorage, AL.
L. R. Waller, and D. R. McCurdy.
In: Proceedings: River Recreation Management and Research Symposium, January 24-27, 1977, Minneapolis, Minnesota. USDA Forest Service General Technical Report NC-28, North Central Forest Experiment Station, Forest Service, Department of Agriculture, St. Paul, Minn., p 380-385, 1977. 7 tab.

Descriptors: *Water quality standards, *Standards, *Rivers, Mathematical models, Costs, Recreation, Supply, Management, Decision making, Systems analysis.

An approach is presented for setting water quality standards for a river based on the following functional relation: R = f (Q, CQ, S, RC), where R = recreation activities (in number of units), Q = water quality level, CQ = cost of achieving or maintaining a specific water quality level, S = recreational supply of the resource, and RC = recreational consumption. The basic assumption is that the recreational use of a river is the most demanding of a high water quality compared to the other uses of the river. Types of decisions for which the model can be used as a basis are given; the usefulness of the model is discussed via two hypthetical situations. (Bell-Cornell)
W78-06558

MANAGING WILDERNESS TRAVEL: A MARKOV-BASED LINEAR PROGRAMMING MODEL,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W78-06564

QUANTITATIVE ASSESSMENT OF NATURAL VALUES IN BENEFIT-COST ANALYSIS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
R. Walker, and S. Bayley.
Journal of Environmental Systems, Vol 7, No 2, p 131-147, 1977-78. 1 fig, 3 tab, 19 ref.

Descriptors: *Ecosystems, *Cost-benefit analysis, Environmental effects, *Assessment, Economics, *Natural values, Flood plains, Highway effects, Methodology, Energy flows, Florida, Discount rates, Cost-benefit ratio, Water flow.

Two methods are presented of quantifying the contribution of natural ecosystems to man's economy in benefit-cost analysis. The economic approach uses dollar costs to approximate the more tangible natural system contributions. The energetic approach uses energy flows of the natural ecosystems to quantify the contributions. Sample calculations of each approach are made of the impact of a highway on a floodplain. It is found possible to integrate natural system value into an economic benefit-cost framework. Thus, for transportation planning, there is no longer a reason to disregard this type of externality in benefit-cost analysis. (Bell-Cornell)
W78-06572

EXTERNALITIES AND PROPERTY RIGHTS IN THE FISHERIES: COMMENT,
Environment and Land Use Committee, Victoria (British Columbia). Secretariat.
V. W. Loose, and G. C. Robinson.
Land Economics, Vol. 53, No. 4, p 488-491, November 1977. 6 ref.

Descriptors: *Fisheries, *Oysters, *Externalities, *Proprietary power, Northeast U.S., Model studies, Economics, Property rights, Legal aspects, Optimization, Employment.

A critique is given of a previous article by Agnello and Donnelley which presented a model of the U.S. east coast oyster fishery. The earlier article argued that inputs are not optimally allocated in the U.S. oyster industry and that the industry is particularly well-suited for analyzing effects of alternative property rights structures on resource allocation, since there is a mix of free-access and private beds. The model predicted that the average product of labor on the free-access beds is less than that on the privately held beds, and an empirical test was formulated which, it was claimed, supports the hypothesis. It was argued that the social optimum would be served by changing tenure from free-access to private holdings, and that this would not decrease employment; the 'grounds quality externality' mitigates the negative employment impact. Loose and Robinson offer two criticisms: (1) There is no evidence that a 'grounds quality externality' exists, and such effects as are discussed are simply the 'ownership externality' described by Bator. (2) The empirical evidence also supports the alternative hypothesis that the average product of labor free-access beds is less than on private beds simply because free-access beds are of innately lower quality. A critique is offered of Agnello and Donnelley's empirical evidence. (See also W78-06681) (Lynch-Wisconsin)
W78-06680

'EXTERNALITIES AND PROPERTY RIGHTS IN THE FISHERIES': A REPLY,
Delaware Univ., Newark. Dept. of Economics.
R. J. Agnello, and L. P. Donnelley.
Land Economics, Vol. 53, No. 4, p 492-495, November 1977. 7 ref.

Descriptors: *Fisheries, *Oysters, *Externalities, *Proprietary power, Northeast U.S., Model studies, Economics, Property rights, Legal aspects, Optimization, Employment.

Agnello and Donnelley reply to major criticisms by Loose and Robinson on their earlier article in which a model of the U.S east coast oyster fishery was presented. The original article argued that a 'grounds quality externality' mitigates the negative employment impact of a recommended change of oyster beds tenure from free-access to private holdings. Agnello and Donnelley argue that the average product of labor on the free-access beds is less than on privately owned beds; this supported, say the authors, by empirical evidence they supply. The critics questioned the existence of the 'grounds quality externality', and maintained that the empirical data also support the alternative hypothesis that the average product of labor on free-access beds is less because they are of innately lower quality. In this reply, the original authors assert that the criticisms do not affect the validity of the original results. They hold that 'grounds quality externality' is an example of Bator's dynamic ownership externality, and that such a distinction is useful. While Loose and Robinson maintain the oyster beds of innately higher productivity are leased, the private grounds in fact are barren or do not measure up to criteria for successful oyster growth. (See also W78-06680) (Lynch-Wisconsin)
W78-06681

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COSTS OF RADIUM REMOVAL FROM POTABLE WATER SUPPLIES,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5D.
W78-06280

NEW PROCEDURE HELPS ENGINEERS SATISFY COST-CONSCIOUS CLIENTS,
Wisconsin Univ.-Madison. Dept. of Engineering.
W. R. Baker.
Water and Sewage Works, Vol. 124, No. 10, p 62-64, October 1977. 2 fig, 2 tab.

Descriptors: Life cycle costing, *Lost earnings, *Alternative costs, *Cost-effectiveness, Equipment, Engineering, Economics, Present worth, Interest rates, Mathematical models, Economic analysis, Compound amount factor, Planning, Engineering economics, Capital investments analysis.

Life cycle costing computes total ownership costs of an engineering system and combines initial purchase price with all future costs. Its basis is the lost earnings concept, which accounts for interest lost due to money being used to buy equipment rather than investing in an interest-yielding account. Life cycle costing, also referred to as engineering economics, analysis of capital investments, or the time value of money, is an important tool for comparing alternate construction and purchasing options. It computes the total and true costs of possession of an item over the ownership time span. These costs include: (1) purchase price; (2) construction; (3) operation and maintenance; (4) mortgage payments; (5) salvage, trade-in, or sale value at the end of the item's useful life; and (6) lost interest earnings on the purchase amount. Equivalence, another basic concept of life cycle costing, means that today's dollar is not euqal to a future dollar because of interest accruals and their growth effect over time. Present worth, or the current worth of a futrue sum, including compound interest, is equivalent to discounting in the investment field. Life cycle costs can be computed with a mathematical model, the compound amount factor (CAF). A sample problem is given employing life cycle costing. (Lynch-Wisconsin)
W78-06324

DETERMINING THE ECONOMICS OF FILTER CAPPING,
For primary bibliographic entry see Field 5D.
W78-06325

TECHNOLOGICAL ECONOMICS APPLIED TO WASTE RECOVERY AND TREATMENT PROCESSES,
Aston Univ., Birmingham (England). Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5D.
W78-06327

EFFICIENT AND EQUITABLE PRICING FOR WASTEWATER SYSTEMS: THE MADISON METROPOLITAN SEWERAGE DISTRICT,
Wisconsin Univ.- Madison. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 5D.
W78-06358

COST MINIMIZATION FOR COAL CONVERSION POLLUTION CONTROL: A MIXED INTEGER PROGRAMMING MODEL,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5G.
W78-06359

OPTIMIZATION IN DESIGN OF PUMPING SYSTEMS,
Weston (Roy F.) Inc., West Chester, PA.
For primary bibliographic entry see Field 8C.
W78-06439

AN EXAMPLE OF EXCESS URBAN WATER CONSUMPTION,
Calgary Univ. (Alberta). Dept. of Civil Engineering.
For primary bibliographic entry see Field 3D.
W78-06575

OZONATION OF MAKE-UPWATER FOR SALMONIC FISH REARING FACILITIES,
Idaho Univ., Moscow. Dept. of Bacteriology and Biochemistry.
For primary bibliographic entry see Field 5D.
W78-06579

ESTIMATING AN EFFLUENT CHARGE: THE RESERVE MINING CASE,
Minnesota Univ., Minneapolis. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-06682

6D. Water Demand

PROJECTIONS OF ECONOMIC DEVELOPMENT ASSOCIATED WITH COAL-RELATED ACTIVITY IN MONTANA,
Montana State Univ., Missoula. Bureau of Business and Economic Research.
P. E. Polzin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 249, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, January, 1974. 33 p, 1 fig, 7 tab, 5 ref. OWRT C-5258(No. 4217)(1).

Descriptors: *Montana, *Economic prediction, *Coals, Industries, *Forecasting, Water demand, *Industrial development.

Projected economic impacts of three possible levels of coal-related developments in Montana are presented. Actual mining and energy facilities are projected as being located only in Big Horn, Rosebud, and Powder River Counties; however, Custer, Treasure, Musselshell, and Yellowstone Counties were also included in the projection analysis because the seven counties together include the local trade centers for the development area and thus constitute a meaninful economic region. The overall economic characteristics of the impact area did not change in the coal-related activity projected in the first scenario, wherein the additional five to six thousand jobs forecast could easily be accommodated by the natural increase in the local labor force. Developments projected in scenario II suggest major economic changes in the impact area after 1980 continuing to 2000. After 1980, almost 10,000 permanent new jobs would be added, with significant net immigration, lower unemployment, and a greater than average per capita income. Aggregate economic growth is expected to continue at a lower rate until 2000. Economic impact of scenario III is also most notable between 1980 and 1985, but with significant economic growth projected to begin earlier. Between 1980 and 1985, about 20,000 new jobs would be introduced and incomes would rise to 106% of the national average, with expansion continuing to 2000 at a slower pace. (Wares-IPA)
W78-06364

WATER REQUIREMENTS FOR FUTURE ENERGY DEVELOPMENT IN THE WEST: STATE PERSPECTIVES,
EG and G Idaho, Inc., Idaho Falls.
W. D. Gertsch, J. Sathaye, R. Ritschard, and S. Parker.
Available from the National Technical Information Service, Springfield, VA 22161 as LA-6688-MS, Price codes: A04 in paper copy, A01 in microfiche. Informal Report, LA-6688-MS, (UC-11 and UC-95c), August 1977. 57 p, 17 fig, 32 tab, 46 ref. ERDA W-7405-ENG 36.

Descriptors: *Water requirements, *Energy, *United States, Water, Regional development, Natural resources, Coals, Energy transfer, Future planning(Projected), Planning, *Energy development, *Western water resources, Regional energy assessment program, Economic development program.

The survey was prepared for the Water Resources Council and presented a summary of state views on the sufficiency of western water resources for energy development in the West. Possible impacts and problems associated with the commitment of water to energy use also were identified. The project was undertaken during September and October 1976. Drafts of each state summary were sent to the Council's western regional study directors in November, and this volume comprised the entire work. It covered only part of the participation by the Los Alamos Scientific Laboratory and the Energy Research and Development Administration in the Council's 1975 National Assessment. (Roberts-ISWS)
W78-06375

6E. Water Law and Institutions

FACING THE LONGTERM: AN INQUIRY INTO OPPORTUNITIES TO IMPROVE THE CLIMATE FOR RESEARCH WITH REFERENCE TO LIMNOLOGY IN CANADA,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
J. R. Vallentyne.
Journal of the Fisheries Research Board of Canada, Vol 35, No 3, p 350-369, March 1978. 2 tab, 23 ref, 1 append.

Descriptors: *Research and development, *Planning, *Contracts, *Limnology, *Canada, Project planning, Administration, Management, Projects, Long-term planning, Budgeting, Governments, Institutions, Laboratories, Research priorities, Research climates.

Deterioration of the climate for research was the main concern expressed in individual interviews with 125 freshwater scientists. The principal problem cited in the Department of Fisheries and the Environment (DFE) was disruptions to the continuity and time frame essential to research; in universities, declining support for 'basic' research; and in both, a perceived lack of attention on the part of governments and the public to measures for the resolution of problems in the long-term. These perceptions were analyzed in terms of changing attitudes to environment, research, and science policy from 1957 to 1976. Specific suggestions to improve the climate for research in DFE were: implementation of a policy on research; 3-5 year continuity in funding; standardized evaluation of programs; periodic evaluation of committees; filling research manager positions with scientists on a temporary basis; and mechanisms to ensure adequate representation of national-international research (long term) interests. In universities there is a need for a shift in accent from individual to cooperative work, including graduate theses. A strategy needs to be developed within the research community to facilitate communication with the public and senior managers on long-term issues. Without an increase in the forces causing senior managers to be more responsive to the long-term, the climate for research will remain as a perennial problem. This is because managers are conditioned by their role to think and act 'short' in space and time, whereas scientists are conditioned by their role to think and act 'long' in space and time. Development of an independent 'scientific auditing' function, possibly coupled with existing financial auditing functions, is needed to improve the credibility of governments and industries in regard to resource interests that are 'long' in space and time. (Sims-ISWS)
W78-06217

FIFTH INTERNATIONAL SYMPOSIUM ON FRESH WATER FROM THE SEA,
Office of Naval Research, London (England).
For primary bibliographic entry see Field 3A.
W78-06301

INTEGRATION OF WATER SUPPLY STRATEGIES IN A DESERT AREA,
California State Dept. of Water Resources, Sacramento. Div. of Planning.
For primary bibliographic entry see Field 6B.
W78-06342

IMPACT OF FEDERAL AND STATE WATER QUALITY LAWS ON ALASKA NATIVE REGIONAL CORPORATIONS.
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5G.
W78-06366

VILLAGES AND SEQR,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 5G.
W78-06367

THE BARCELONA CONVENTION AND ITS PROTOCOLS,
Ministry of Foreign Affairs, Rome (Italy).
For primary bibliographic entry see Field 5G.
W78-06424

SAFETY OF DAMS, A REVIEW OF THE PROGRAM OF THE U. S. BUREAU OF RECLAMATION FOR THE SAFETY OF EXISTING DAMS.
National Research Council, Washington, D.C. Committee on the Safety of Dams.
For primary bibliographic entry see Field 8B.
W78-06522

ESTIMATING AN EFFLUENT CHARGE: THE RESERVE MINING CASE,
Minnesota Univ., Minneapolis. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-06682

6F. Nonstructural Alternatives

SUITE OF MATHEMATICAL FLOOD PLAIN MODELS,
University of the Witwatersrand, Johannesburg (South Africa). Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-06563

6G. Ecologic Impact Of Water Development

PUERTO RICO'S WATER RESOURCES PROBLEMS AND RESEARCH NEEDS.
Puerto Rico Univ., Mayaguez. Water Resources Research Inst.; and Department of Natural Resources, San Juan (Puerto Rico).
For primary bibliographic entry see Field 6B.
W78-06206

DRAFT ENVIRONMENTAL IMPACT STATEMENT - CHEMICAL WASTE INCINERATOR SHIP PROJECT (VOLUME 1 OF 2 - ENVIRONMENTAL ANALYSIS AND APPENDICES I, II, AND III, U.S. ENVIRONMENTAL PROTECTION AGENCY: DISPOSAL OF ORGANOCHLORINE WASTES BY INCINERATION AT SEA).
Maritime Administration, Washington, D.C.
For primary bibliographic entry see Field 5E.
W78-06265

DRAFT ENVIRONMENTAL IMPACT STATEMENT - CHEMICAL WASTE INCINERATOR SHIP PROJECT (VOLUME 2 OF 2 - APPENDIX IV, U.S. ENVIRONMENTAL PROTECTION AGENCY: DISPOSAL OF ORGANOCHLORINE WASTES BY INCINERATION AT SEA).
Maritime Administration, Washington, D.C.
For primary bibliographic entry see Field 5E.
W78-06266

CLIMATIC AND ECOLOGICAL ASPECTS OF DESERTIFICATION,
New South Wales Univ. (Australia). School of Geography.
For primary bibliographic entry see Field 2B.
W78-06338

FISHERIES PROBLEMS ASSOCIATED WITH THE DEVELOPMENT OF THE LOWER COLORADO RIVER,
S. J. Nicola.
In: Proceedings, United Nations Institute for Training and Research Conference on Alternative Strategies for Desert Development and Management, 31 May-10 June, 1977. Sacramento, California, Vol. 3, p 1-14. 3 fig, 2 tab, 4 ref.

Descriptors: *Fish management, *Colorado River, *Environmental effects, *Fish conservation, Ecology, Fisheries, Water management, Water resources development, River basin development, Water sports, Fresh water fish.

The main purpose was to review the history of the development of the lower Colorado River and describe the effects of development on the natural environment. Strong emphasis is placed on the effect of development on native fishes. An explanation as to how government agencies, including the California Department of Fish and Game, have dealt with the problems of fishery resource management in this changing environment is reviewed with an eye toward the possibility of restoring native fishes, as well as the continual management of existing sport fisheries. A table listing native and introduced fishes of the Lower Colorado is included. (Castricone-Arizona)
W78-06341

IMPACT OF FEDERAL AND STATE WATER QUALITY LAWS ON ALASKA NATIVE REGIONAL CORPORATIONS.
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 5G.
W78-06366

VILLAGES AND SEQR,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 5G.
W78-06367

A REVIEW OF THE CORPS OF ENGINEERS' DRAFT ENVIRONMENTAL IMPACT ON THE FIRE ISLAND INLET TO MONTAUK POINT, NEW YORK, BEACH EROSION CONTROL AND HURRICANE PROTECTION PROJECT,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 4D.
W78-06368

ENVIRONMENTAL MANAGEMENT IN A MEDITERRANEAN PORT CITY: HAIFA,
United Nations Environment Programs, Geneva (Switzerland). International Labor Office.
For primary bibliographic entry see Field 5G.
W78-06470

AN ASSESSMENT OF ESTUARINE AND NEARSHORE MARINE ENVIRONMENTS,
Virginia Inst. of Marine Science, Gloucester Point. Applied Marine Science and Ocean Engineering.
For primary bibliographic entry see Field 2L.
W78-06528

THE INTERTIDAL FAUNA OF SANDY BEACHES. A SURVEY OF THE SCOTTISH COAST,
Aberdeen (Scotland). Marine Lab.
For primary bibliographic entry see Field 2L.
W78-06535

POLLUTANT TRANSFER TO THE MARINE ENVIRONMENT.
Rhode Island Univ., Kingston; and Texas Univ. at Austin. Port Aransas. Marine Science Inst.
For primary bibliographic entry see Field 5B.
W78-06549

STANDARDS OF ENVIRONMENTAL QUALITY FOR RECREATIONAL EVALUATION OF RIVERS,
Northwestern Univ., Evanston, IL. Technological Inst.
For primary bibliographic entry see Field 6B.
W78-06553

QUANTITATIVE ASSESSMENT OF NATURAL VALUES IN BENEFIT-COST ANALYSIS,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 6B.
W78-06572

A SIMULATION MODEL FOR SCREENING A SYSTEM OF RESERVOIRS FOR ENVIRONMENTAL IMPACT,
MacLaren (James F.) Ltd., Willowdale (Ontario). Water Resources Group.
For primary bibliographic entry see Field 4A.
W78-06576

IMPACT OF COMMUNITY PLANNING ON QUALITY OF LIFE IN THE NORTH,
Canada Department of National Health and Welfare, Edmonton (Alberta). Medical Services.
For primary bibliographic entry see Field 5G.
W78-06577

7. RESOURCES DATA

7B. Data Acquisition

MICROWAVE INTERFERENCE DETECTION OF SUBSURFACE WATER,
Drexel Univ., Philadelphia, PA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-06225

THE USE OF REMOTE SENSING TECHNIQUES FOR DETECTION AND IDENTIFICATION OF POLLUTANT DISCHARGES,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Mobility and Environmental Systems Lab.
For primary bibliographic entry see Field 5A.
W78-06230

SATELLITE IMAGES OF LAKE ERIE ICE: JANUARY-MARCH 1975,
National Environmental Satellite Service, Washington, DC.
For primary bibliographic entry see Field 2C.
W78-06231

AOIPS WATER RESOURCES DATA MANAGEMENT SYSTEM,
Earth Satellite Corp., Washington, DC.
For primary bibliographic entry see Field 7C.
W78-06239

SOIL, WATER, AND VEGETATION CONDITIONS IN SOUTH TEXAS,
Agricultural Research Service, Weslaco, TX.
C. L. Wiegand.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-22630, Price codes: A02 in paper copy, A01 in microfiche. Quarterly Progress Report, April 1976. 21 p, 2 fig, 7 tab, 10 ref, 1 append. NASA S-53876-AG.

Descriptors: *Remote sensing, *Vegetation, *Crops, *Land use, *Texas, Satellites(Artificial), Classification, Citrus fruits, Ranges, Grain sorghum, Soils, Agriculture, Data processing, Analytical techniques, LANDSAT.

Software development for a computer-aided crop and soil survey system is nearing completion. The system was modified and tested by periodically classifying the crops and land uses in a 390,000 hectare county of diverse agricultural enterprises. Computer-aided variety classification accuracies using LANDSAT-1 MSS data for a 600 hectare citrus farm were 83% for Redblush grapefruit and 91% for oranges. These accuracies indicate that there is good potential for computer-aided inventories of grapefruit and orange citrus orchards with LANDSAT-type MSS data. The standard errors of estimate for the calibration of computer compatible tape coordinate system (pixel and record) to earth coordinate system (longitude and latitude) for 6 LANDSAT scenes ranged from 0.72 to 1.50 pixels and from 0.58 to 1.75 records. The regression coefficients appear to be good enough to locate closely ground sites of interest, even for scenes in which clouds obliterate most of the 30 reference landmarks. (Sims-ISWS)
W78-06240

GROUND WATER RECHARGE TO THE AQUIFERS OF NORTHERN SAN LUIS VALLEY, COLORADO: A REMOTE SENSING INVESTIGATION,
Colorado School of Mines, Golden, Dept. of Geology.
For primary bibliographic entry see Field 2F.
W78-06242

VISUAL SURF OBSERVATIONS/MARINELAND EXPERIMENT,
Coastal Engineering Research Center, Belvoir, VA.
For primary bibliographic entry see Field 2L.
W78-06252

DEVELOPMENT AND EVALUATION OF AN EXPERIMENTAL FRAZIL ICE MEASUREMENT INSTRUMENT,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2C.
W78-06313

TWO COMPLEMENTARY ULTRASONIC SYSTEMS.
For primary bibliographic entry see Field 5A.
W78-06510

VERSATILE WASTEWATER FLOWMETER,
For primary bibliographic entry see Field 5D.
W78-06511

FUNDAMENTAL ANALYSIS OF THE LINEAR MULTIPLE REGRESSION TECHNIQUE FOR QUANTIFICATION OF WATER QUALITY PARAMETERS FROM REMOTE SENSING DATA,
Old Dominion Univ., Norfolk, VA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-06550

MICROWAVE RADIOMETRIC SENSING OF SURFACE TEMPERATURE AND WIND SPEED FROM SEASAT,
Radiometric Technology, Inc., Wakefield, MA.
For primary bibliographic entry see Field 2L.
W78-06551

MOISTURE DETECTION APPARATUS,
For primary bibliographic entry see Field 3F.
W78-06668

7C. Evaluation, Processing and Publication

VALIDATION AND IMPLEMENTATION OF A SIMPLIFIED STREAMFLOW SIMULATOR,
Nebraska Univ., Lincoln. Dept. of Computer Science.
For primary bibliographic entry see Field 2E.
W78-06205

OPTIMAL OPERATION OF A FLOOD CONTROL RESERVOIR,
Iowa State Univ., Ames. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W78-06208

INPUT DATA FORMATS FOR ALLUVIAL CHANNEL EXPERIMENTS,
Colorado State Univ., Fort Collins. Engineering Research Center.
For primary bibliographic entry see Field 8B.
W78-06235

AOIPS WATER RESOURCES DATA MANAGEMENT SYSTEM,
Earth Satellite Corp., Washington, DC.
E. S. Merritt, R. L. Shotwell, M. C. Place, and N. J. Belknap.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-14567, Price codes: A23 in paper copy, A01 in microfiche. Final Report, September 1976. 335 p, 19 fig, 9 tab, 10 ref, 2 append. NASA NAS5-22894.

Descriptors: *Remote sensing, *Utah, *Idaho, *Wyoming, *Data processing, Hydrology, Computers, *Computer programs, *Watersheds(Basins), Rainfall, Runoff, Snow cover, Snow melt, Mathematical models, Computer models, Satellites(Artificial), Water resources, LANDSAT data, *Bear River watershed(Utah-Ida-Wyo).

A geocoded data management system applicable for hydrological applications was designed for implementation on the AOIPS hardware at Goddard Space Flight Center. The emphasis throughout was on demonstrating the utility of the Atmospheric and Oceanographic Information Processing System (AOIPS) for hydrological applications. Within that context, the geocoded hydrology data management system was designed to take advantage of the interactive capability of the AOIPS hardware. Portions of the Water Resource Data Management System which best demonstrate the interactive natue of the hydrology data management system were implemented on the AOIPS. A hydrological case study was prepared using all data supplied by Goddard Space Flight Center for the Bear River watershed located in northwest Utah, southeast Idaho, and western Wyoming. (Sims-ISWS)
W78-06239

SOIL, WATER, AND VEGETATION CONDITIONS IN SOUTH TEXAS,
Agricultural Research Service, Weslaco, TX.
For primary bibliographic entry see Field 7B.
W78-06240

HISTORICAL STREAMFLOW SUMMARY, MANITOBA, TO 1976.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
(1977), 187 p. in English and French.

Descriptors: *Streamflow, Water resources, *Hydrologic data, *Data collections, Networks, *Surface waters, Publications, Surveys, *Canada, *Manitoba, Historical data, Hydrometric data, Stream discharge(1976).

This report contains a summary of monthly and annual mean discharges and annual extremes of discharge for rivers in Manitoba. The data cover that collected by the Water Survey of Canada up to 1976. The location of the station, drainage area, and whether the flow is natural or regulated are noted. Besides the monthly and annual means, maximum instantaneous discharges, the extreme for the period of record, and the annual total discharge are provided for most stations. (WATDOC)
W78-06310

HISTORICAL STREAMFLOW SUMMARY, SASKATCHEWAN, TO 1976.
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
(1977), 299 p. in English and French.

Descriptors: *Steamflow, Water resources, *Hydrologic data, *Data collections, Networks, *Surface water, Publications, Surveys, *Canada, *Saskatchewan, Historical data, Hydrometric data, Stream discharge(1976).

This report contains a summary of monthly and annual mean discharges and annual extremes of discharge for rivers in Saskatchewan. The data cover that collected by the Water Survey of Canada up to 1976. The location of the station, drainage area, and whether the flow is natural or regulated are noted. Besides the monthly and annual means, maximum instantaneous discharges, the extreme for the period of record, and the annual total discharge are provided for most stations. (WATDOC)
W78-06311

MAGNITUDE AND FREQUENCY OF FLOODS IN SOUTHERN ONTARIO,
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.
For primary bibliographic entry see Field 2E.
W78-06312

DEVELOPMENT AND IMPLEMENTATION OF A REGIONAL WATER PLANNING DATA MANAGEMENT SYSTEM,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
For primary bibliographic entry see Field 6A.
W78-06360

GREATEST KNOWN AREAL STORM RAINFALL DEPTHS FOR THE CONTIGUOUS UNITED STATES,
NOAA National Weather Service, Silver Spring, MD. Office of Hydrology
A. P. Shipe, and J. T. Riedel
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 871, Price codes: A09 in paper copy, A01 in microfiche. Report NOAA-TM-NWS-HYDRO-33, December 1976. 178 p, 1 fig, 5 tab, 8 ref.

Descriptors: *Rainfall, *Depth-area-duration analysis, *Excessive precipitation, *United States, Precipitation(Atmospheric), Precipitation intensity, Rain, Distribution patterns, Probable maximum precipitation, Rain gages, Rainfall disposition, Storms, Precipitation excess, Climatology, Meteorology, *Data collections.

The greatest known areal storm rainfall depths for the contiguous United States were presented for the winter, spring, summer, and fall seasons. The depths were for 100, 200, 1,000, 5,000 and 10,000 sq mi (259, 518, 2590, 12,950, 25,900 sq km) for 6, 12, 24, and 48 hours. The rainfall values were given on maps and identified on adjacent tables. (Sims-ISWS)
W78-06380

THE DYNAMICS OF STRATIFICATION AND OF STRATIFIED FLOW IN LARGE LAKES.
International Joint Commission-United States and Canada, Windsor (Ontario). Standing Committee on the Scientific Basis for Water Quality Criteria.
For primary bibliographic entry see Field 2H.
W78-06388

SOME OBSERVATIONS OF STRATIFIED FLOW IN LARGE, THERMALLY STRATIFIED LAKES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W78-06389

SOME OBSERVATIONS ON FREELY PROPAGATING INTERNAL WAVES IN LAKE ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2H.
W78-06390

METHODS FOR REFINING SAMPLE ESTIMATES OF THE PARAMETERS OF HYDROLOGIC SERIES,
For primary bibliographic entry see Field 2E.
W78-06403

COMPUTERIZATION AND AUTOMATION OF WASTEWATER SYSTEMS,
For primary bibliographic entry see Field 5G.
W78-06427

WHITHER AUTOMATIC CONTROL IN THE SEWAGE TREATMENT FIELD,
Kent Instruments Ltd., Luton (England).
For primary bibliographic entry see Field 5D.
W78-06448

TREATMENT PLANT AND PIPELINE FLOW CONTROLLED BY MINICOMPUTER SYSTEM.
For primary bibliographic entry see Field 5D.
W78-06450

DUTCH TREAT SEWAGE BY COMPUTER SYSTEM.
For primary bibliographic entry see Field 5D.
W78-06454

AUTOMATION OF WASTE WATER TREATMENT PLANTS--PART 1--DATA COLLECTION AND USE,
Anglian Water Authority, Norwich (England). Norwich Sewage Div.
For primary bibliographic entry see Field 5D.
W78-06472

APPLICATION OF COMPUTER MODELING FOR CAPACITY STAGING OF DENVER, COLO., WATER-TREATMENT FACILITIES,
Colorado School of Mines, Golden. Dept. of Basic Engineering.
For primary bibliographic entry see Field 5F.
W78-06559

CALIBRATION OF HYDROLOGICAL MODEL USING OPTIMIZATION TECHNIQUE,
Severn-Trent Water Authority, Birmingham (England).
For primary bibliographic entry see Field 2A.
W78-06561

LAND DATA MANAGEMENT SYSTEM FOR RESOURCE PLANNING,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 4A.
W78-06570

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1976 TO SPRING 1977,
Geological Survey, Tucson, AZ. Water Resources Div.
H. M. Babcock.
Water-Resources Investigations 77-106 (open-file report), September 1977. 2 sheets, 23 ref.

Descriptors: *Groundwater resources, *Arizona, *Pumping, *Irrigation, *Water level fluctuations, *Maps, Aquifers, Water yield, Water wells, Water levels, Projections, Water demand, Water utilization.

Two small-scale maps of Arizona show (1) pumpage of ground water by areas and (2) the status of the ground-water inventory in the State. The main map, which is at a scale of 1:500,000, shows potential well production, depth of water in selected wells in spring 1977, and change in water level in selected wells from 1972 to 1977. The brief text that accompanies the maps summarizes the current ground-water conditions in the State. The withdrawal of ground water was about 5.5 million acre-feet in Arizona in 1976 of which about 4.7 million acre-feet was used for the irrigation. The Salt River Valley and the lower Santa Cruz basin are the largest agricultural areas in the State. For 1972-76, ground-water withdrawal in the two areas was about 8.2 to 4.9 million acre-feet, respectively, and, in general, water levels are declining. Other areas in which ground-water withdrawals have caused large water-level declines are the Willcox, San Simon, upper Santa Cruz, Avra Valley, Gila Bend, Harquahala Plains, and McMullen Valley areas. (Woodard-USGS)
W78-06583

SALTWATER INTRUSION IN THE SHALLOW AQUIFER IN PALM BEACH AND MARTIN COUNTIES, FLORIDA,
Geological Survey, Tallahassee, FL. Water Resources Div.
V. B. Scott, L. F. Land, and H. G. Rodis.
Water-Resources Investigations 76-135 (open-file report), 1977. 1 sheet, 2 fig, 10 ref.

Descriptors: *Saline water intrusion, *Aquifers, *Florida, *Coasts, *Pumping, Drawdown, Water supply, Water demand, Saline water-freshwater interfaces, *Maps, Aquifer characteristics, Martin County(Fla), *Palm Beach County(Fla).

Urban growth has been rapid in recent years in Palm Beach and Martin Counties, Fla. The withdrawal of large quantities of fresh ground water in the vicinity of the coast has reduced or locally reversed the natural seaward hydraulic gradient and, in places, allowed saltwater to advance landward in the aquifer, displacing freshwater. Maps show the position of the saltwater front in eight urban areas adjacent to the coast. The saltwater front, as shown on the profiles, is based on a chloride concentration of 250 mg/liter which is recommended as a limit for water that is considered potable. The chloride concentration of native freshwater almost always is less than 50 mg/liter in the coastal aquifer. (Woodard-USGS)
W78-06584

MAP SHOWING GROUND-WATER CONDITIONS IN THE LOWER VERDE RIVER AREA, MARICOPA, YAVAPAI, AND GILA COUNTIES, ARIZONA-1976,
Geological Survey, Tucson, AZ. Water Resources Div.
P. P. Ross.
Water-Resources Investigations 77-113 (open-file report), October 1977. 1 sheet, 5 ref.

Descriptors: *Groundwater resources, *Arizona, *Water levels, *Water quality, *Maps, Aquifers, Water wells, Water table, Chemical analysis, *Lower Verde River area(Ariz), Maricopa County, Yavapai County, Gila County.

Arizona is divided into 67 ground-water areas, and individual areas are selected for intensive data collection once every 6 years. The data collected in the lower Verde River area are given on a map that shows altitude of the water level, depth of water, well depth, chemical quality of the water, and irrigated area. Scale 1:125,000. (Woodard-USGS)
W78-06585

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1976.
Geological Survey, Salt Lake City, UT. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-277 927, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report UT-76-1, August 1977. 617 p, 7 fig.

Descriptors: *Utah, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for Utah consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality of ground water. This report contains discharge records for 240 gaging stations; stage and contents for 21 lakes and reservoirs; water quality for 42 hydrologic stations, 123 partial-record stations and 387 wells; and water levels for 152 observation wells. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Utah. (Woodard-USGS)
W78-06594

WATER RESOURCES DATA FOR MINNESOTA, WATER YEAR 1975.
Geological Survey, St. Paul, MN. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 952, Price codes: A22 in paper copy, A01 in microfiche. Water-Data Report MN-75-1, August 1976. 513 p, 4 tab, 26 ref.

Descriptors: *Minnesota, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1975 water year for Minnesota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 127 gaging stations; stage only records for 1 gaging station; stage and contents for 9 lakes and reservoirs; water quality for 40 gaging stations, 14 partial-record flow stations, 25 lakes, and 60 wells; and water levels for 25 observation wells. Also included are 149 crest-stage partial-record stations and 157 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Minnesota. (Woodard-USGS)
W78-06595

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 1. ARKANSAS RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 785, Price codes: A22 in paper copy, A01 in microfiche. Water-Data Report OK-76-1, August 1977. 513 p, 6 fig.

Descriptors: *Oklahoma, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Arkansas River basin(Okla).

Water resources data for the 1976 water year for Oklahoma consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes or reservoirs; and water levels and water quality or ground water. Volumes 1 and 2 of this report contain discharge records for 122 gaging stations, stage and contents for 22 lakes or reservoirs, and water quality for 95 gaging stations and 3 lakes. Also included are 44 crest-stage partial-record stations and 1 low-flow partial-record station. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Oklahoma. This volume (Volume 2) includes the Arkansas River basin. (Woodard-USGS)
W78-06596

WATER RESOURCES DATA FOR OKLAHOMA, WATER YEAR 1976--VOLUME 2. RED RIVER BASIN.
Geological Survey, Oklahoma City, OK. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 786, Price codes: A10 in paper copy, A01 in microfiche. Water-Data Report OK-76-2, August 1977. 216 p, 6 fig.

Descriptors: Oklahoma, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sedi-

ment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Red River basin(Okla).

Water resources data for the 1976 water year for Oklahoma consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of reservoirs; and water levels and water quality of ground water. Volume 1 and 2 of this report contain discharge records for 122 gaging stations, stage and contents for 22 lakes or reservoirs, and water quality for 95 gaging stations and 3 lakes. Also included are 44 crest-stage partial-record stations and 1 low-flow partial-record station. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Oklahoma. This volume (Volume 2) includes the Red River basin. (Woodard-USGS)
W78-06597

GROUND-WATER DATA FOR MICHIGAN, 1976,
Geological Survey, Lansing, MI. Water Resources Div.
G. C. Huffman.
Michigan Geological Survey Department of Natural Resources, Lansing, 1977. 56 p, 6 fig, 2 tab, 108 ref.

Descriptors: *Groundwater resources, *Well data, *Water levels, *Water users, *Michigan, Pumping, Water yield, Hydrographs, Water level fluctuations, Observation wells, Groundwater recharge, Precipitation(Atmospheric).

This report summarizes data on ground-water levels in 167 observation wells in Michigan, and provides information on well locations, depths, elevations, and aquifers. Tabulated data include extremes of water levels for the year 1976 and for the period of record. Also tabulated is the pumpage of most major ground-water users in the State. Levels were generally above average in most areas through spring of 1976, but declined to near or below average by the end of the year. During the year, water levels reached record highs in 32 wells and dropped to record lows in 20 wells. (Woodard-USGS)
W78-06598

DIGITAL COMPUTER SIMULATION MODEL OF THE ENGLISHTOWN AQUIFER IN THE NORTHERN COASTAL PLAIN OF NEW JERSEY,
Geological Survey, Trenton, NJ. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06601

HYDROLOGIC DATA FOR LITTLE ELM CREEK TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
R. M. Slade, Jr., and J. M. Taylor.
Open-file report 77-83, May 1977. 108 p, 2 fig, 4 tab.

Descriptors: *Hydrologic data, *Storm runoff, *Small watersheds, *Retaining walls, *Texas, Rainfall, Runoff, Streamflow, Water storage, *Little Elm Creek, *Trinity River basin(Tex).

This report contains rainfall, runoff, and storage data collected during the 1975 water year for a 75.5 sq mi area above the stream-gaging station Little Elm Creek near Aubrey, Texas. Floodflows from 35.7 sq mi of the area are regulated by 16 flood-water-retarding structures constructed by the Soil Conservation Service. Six storm periods were selected for detailed computations and analyses. Water-quality data is given for Little Elm Creek. (Woodard-USGS)
W78-06604

HYDROLOGIC DATA FOR MOUNTAIN CREEK, TRINITY RIVER BASIN, TEXAS, 1975,
Geological Survey, Austin, TX. Water Resources Div.
H. D. Buckner.
Open-file report 77-72, May 1977. 19 p, 1 fig.

Descriptors: *Hydrologic data, *Streamflow, *Reservoir storage, *Water quality, *Small watersheds, Texas, Inflow, Discharge(Water), Rainfall, *Mountain Creek, *Trinity River basin(Tex).

Mountain Creek drains the northeast corner of Johnson County, the northwest corner of Ellis County, the southeast corner of Tarrant County, and part of the southwest corner of Dallas County, Tex. The basin is 30 miles long and averages 10 miles in width. The total drainage area at the mouth is 304 sq mi. Basin outflow for the 1975 water year was 146,400 acre-feet which is 68,880 acre-feet above the 15-year (1960-75) average of 77,520 acre-feet. Storage in Mountain Creek Lake showed a net loss of 150 acre-feet during the water year. Rainfall over the study area for the 1975 water year was about 39 inches, which is about 5 inches above the 15-year mean for the area. (Woodard-USGS)
W78-06605

STATUS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX)--SEPTEMBER 1977,
Geological Survey, Reston, VA. Water Resources Div.
M. D. Edwards.
Open-file report 78-154, 1978. 26 p, 1 fig, 4 tab, 4 ref, 2 append.

Descriptors: *Data storage and retrieval, *Water resources, *Bibliographies, *Information retrieval, *Management, Information exchange, Indexing, Systems analysis, Computer programs, *National Water Data Exchange.

Major progress in the implementation of the National Water Data Exchange (Nawdex) took place during Fiscal Year 1977--beginning October 1, 1976 and ending September 30, 1977. This report describes the status of the program at the end of this period. Program advancement is reported in the areas of administration, membership, Local Assistance Center facilities, development of the Water Data Sources Directory and the Master Water Data Index data bases, development of systems related to these data bases, and the coordination of services available through member organizations. (Woodard-USGS)
W78-06607

COPEPOD 2: A MARKOV-TYPE MODEL FOR COPEPOD POPULATION DYNAMICS,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 5C.
W78-06696

8. ENGINEERING WORKS

8A. Structures

A REVIEW OF THE CORPS OF ENGINEERS' DRAFT ENVIRONMENTAL IMPACT ON THE FIRE ISLAND INLET TO MONTAUK POINT, NEW YORK, BEACH EROSION CONTROL AND HURRICANE PROTECTION PROJECT,
Cornell Univ., Ithaca, NY. Center for Environmental Research.
For primary bibliographic entry see Field 4D.
W78-06368

ENGINEERING CONDITION SURVEY AND STRUCTURAL INVESTIGATION OF MONTGOMERY LOCKS AND DAM, OHIO RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
C. E. Pace, and J. T. Peatross, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 655, Price codes: A10 in paper copy, A01 in microfiche. Miscellaneous Paper C-77-2, March 1977. 202 p, 58 fig, 6 tab, 3 ref, 1 append.

Descriptors: *Ohio River, *Pennsylvania, *Stress analysis, *Structural stability, *Non-destructive tests, *Concrete structures, *Deterioration, Dams, Locks, Hydraulic structures, Concrete testing, Safety factors.

Results are presented of an engineering condition survey and a structural analysis of Montgomery Locks and Dams, Ohio River. There is general spalling, leaching, and cracking of the concrete surfaces. The crack survey implied that a majority of the cracking in the lock walls is caused by barge impact. The longitudinal crack parallel to the lock in the middle wall of Montgomery Lock was hypothesized to be caused by barge impact; therefore, this can be a source of deterioration which increases with lock use. The soniscope study indicated that the cracking along the center of the middle wall does not worsen with depth. Maintenance of the surface cracks and spalled areas is essential. In relation to present-day criteria, almost all of the monoliths on the land wall are inadequate in their resistance to overturning and base pressures. In general, the monoliths in middle and river walls are inadequate in their resistance to overturning. The miter sills are inadequate for sliding if the locks are dewatered. Since corrective action is needed, a feasibility study should be made to determine what action is necessary which will provide the most economical and adequate lock usage over a period of 30 to 50 years. (Adams-ISWS)
W78-06378

A DYNAMIC STUDY OF WATERWORKS PIPING UNDER EARTHQUAKE SHOCKS, (IN JAPANESE),
H. Otsuki, Y. Nakamichi, and K. Kawasaki.
Journal of Japan Water Works Association, No 517, p 2-18, October, 1977. 30 fig, 6 tab, 28 ref.

Descriptors: *Conduits, *Hydraulic structures, *Seismic studies, *Earthquake engineering, *Conveyance structures, Seismic design, Seismic waves, Shear stress, Stress analysis, Shear.

The impact of earthquake tremors on various types of underground pipe conduits for water transport was examined within the context of theoretical pipe dynamics. Subsurface conduits extend along the ground surface and are encased in sand and soil. The seismic force of an earthquake acting on basement causes shearing as surface waves move over the superficial base. The resulting ground deformation causes similar deformation and stress in the conduit body. The stress resulting from the seismic force and ground deformation is distributed over various parts of the pipe. The earthquake tremor causes the ground to vibrate, initiating a parallel vibration of the underground conduit. This sympathetic response to the seismic vibration of the ground occurs in all underground conduits. (Lisk-FIRL)
W78-06697

8B. Hydraulics

ALGEBRAIC SOLUTION OF THE KORTON-IZZARD TURBULENT OVERLAND FLOW MODEL OF THE RISING HYDROGRAPH,
Ahmadu Bello Univ., Zaria (Nigeria). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06215

RIVER-INDUCED CURRENTS IN A FJORD LAKE,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2A.
W78-06219

WAVE REFLECTION AND TRANSMISSION AT PERMEABLE BREAKWATERS,
Massachusetts Inst., of Tech. Cambridge. Dept. of Civil Engineering.
C. K. Sollitt, and R. H. Cross, III.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A029 000, Price codes: A09 in paper copy, A01 in microfiche. Technical Paper No. 76-8, July 1976. 172 p, 44 fig, 4 tab, 32 ref, 7 append. DACW72-68-C-0032.

Descriptors: *Breakwaters, *Coastal structures, *Waves(Water), Laboratory tests, Theoretical analysis, Turbulent flow, Porous media, Fluid mechanics, Permeability, Reflectance, Equations, Mathematical studies, *Permeable breakwaters, *Wave reflection, *Wave transmission, Reflection coefficients, Transmission coefficients, Rubble-mound breakwaters.

Observations of rubble-mound breakwaters interacting with surface waves in laboratory models and in field applications demonstrated that significant wave energy is transmitted through structures commonly regarded as being impervious. The objective of the investigation was the development of a theoretical analysis to account for this phenomenon. Three breakwater configurations were considered: (1) crib-style breakwaters with vertical walls and homogeneous fill; (2) conventional trapezoidal shaped breakwaters with layered fill; and (3) pile-array breakwaters composed of vertical piles placed in symmetric patterns. Waves were assumed to arrive at normal incidence. The unsteady equations of motion for flow in the voids of an arbitrary porous structure were linearized using a technique which approximates the known turbulent damping condition inside the structure. Linear wave theory was assumed to apply outside the structure, and the excitation was provided by a monochromatic incident wave. A semi-empirical method was used to approximate the effect of wave breaking. An experimental program was conducted to verify the analytical models. Theory and experiment yield the following general conclusions; (1) the transmission coefficient decreases with decreasing wavelength, breakwater porosity and permeability, and increasing wave height and breakwater width; and (2) the reflection coefficient decreases with increasing wavelength, breakwater porosity and permeability, and decreasing breakwater width. (Adams-ISWS)
W78-06229

INPUT DATA FORMATS FOR ALLUVIAL CHANNEL EXPERIMENTS,
Colorado State Univ., Fort Collins. Engineering Research Center.
K. Mahmood, T. Masood, and G. L. Eyster.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 230, Price codes: A10 in paper copy, A01 in microfiche. Report No. CER75-76KM-TM-GLE39, May 1976. 208 p.

Descriptors: *Data storage and retrieval, *Alluvial channels, Documentation, Hydrology, Sediment transport, Computers, Channels, Foreign countries, Foreign research, *Computer programs, *India, *Pakistan, *Experimental data.

Various experiments covering hydraulic, morphologic, and sediment characteristics of alluvial channels are being conducted on the Link Canals of Pakistan. Data from these experiments are to be punched on cards for use on digital computers. The formats have been designed with enough flexibility to cater for any variation that may occur within the scope of the experiment. (Lee-ISWS)
W78-06235

HYDROGRAPH SYNTHESIS USING LANDSAT REMOTE SENSING AND THE SCS MODELS,
Maryland Univ., College Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06236

POTAMOLOGY INVESTIGATION, RELATIONSHIP BETWEEN CALCULATED HYDRAULIC PARAMETERS AND PHYSICAL FEATURES OF THE CHANNEL.
Water and Environment Consultants, Inc., Fort Collins, CO.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 719, Price codes: A03 in paper copy, A01 in microfiche. Prepared by Army Engineer District, Omaha, Nebraska, April 1976. 26 p, 10 fig, 5 tab, append. Army DACW45-75-D-0003.

Descriptors: *Missouri River, *Channel morphology, *Rivers, Channels, Channel improvement, Erosion, Sediments, Flow, Streamflow, River flow, Flow control, Hydraulics, River training, Discharge(Water), Water levels, Degradation(Stream), Control structures, Dams, Flow resistance, Sand bars, Potamology.

The data gathered in the 1971 Hydrographic Survey of the Missouri River by the Army Corps of Engineers, Omaha District, Were studied to determine the relationships between the physical features (i.e., area, control structures, and bend geometry) to the hydraulic parameters (i.e., average velocity, shear velocity, and resistance of flow). Recommendations concerning data collection were presented. The results of the analysis showed that resistance to flow is directly proportional to flow area and the hydraulic radius, whereas it is indirectly proportional to the velocity. The effects of the bend geometry (radius of curvature, length of bend, and central angle of bend) on the resistance to flow seem to be masked out by effects of the major sand bars, by training works constructed along the reaches, and by changes in the bed roughness. A steady increase in the size of bed material is present for the whole reach studies, indicating possible changes in the resistance to flow. Also, potential points or problem areas in terms of navigation depth and local aggradation can be found through inspection of the six plates prepared for the data. (Sims-ISWS)
W78-06237

POTAMOLOGY INVESTIGATION, A STUDY OF THE SHIFT IN THE STAGE-DISCHARGE RELATIONSHIP OF THE MISSOURI RIVER AT SIOUX CITY, IOWA.
Water and Environment Consultants, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 4A.
W78-06238

IMPLICATIONS OF SUBMERGENCE FOR COASTAL ENGINEERS,
Coastal Engineering Research Center, Fort Belvoir, VA.
E. B. Hands.
Army Coastal Engineering Research Center Reprint 78-7, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 149-166, 7 fig, 2 tab, 51 ref.

Descriptors: *Submergence, *Sea level, *Subsidence, *Shore protection, Erosion, Flooding, Water resources, Outer Continental Shelf, Pollutant transport, Eustatic changes.

Submergence affects most US shorelines, and has created serious problems in many localities by increasing flooding, accelerating erosion, altering surface drainage, and causing structural damage. The purpose of this paper is to present selected examples illustrating the problems engineers face in areas of coastal submergence and to discuss in general how sea-level changes affect long term shore processes. (Sinha-OEIS)
W78-06244

SEDIMENT HANDLING AND BEACH FILL DESIGN,
Coastal Engineering Research Center, Fort Belvoir, VA.
R. D. Hobson.
Army Coastal Engineering Research Center Reprint 78-10, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 167-180, 4 fig, 2 tab, 10 ref.

Descriptors: *Shore protection, *Beaches, *Dredging, Gravels, Sands, Water resources, New York, North Carolina, Design, *Beach fill, Pollutant transport, Transfer processes, Beach nourishment.

Offshore sand and gravel deposits constitute an extensive mineral resource whose importance and economic value increase steadily as onshore and lagoonal sources become unavailable. One major use of these marine deposits is for beach nourishment where the amount of initial fill material needed and the expected periodic renourishment requirements are usually estimated using fill factor and renourishment beach fill models. Two cases are examined where adequate data are available to quantify some effects of dredging and handling on sediment texture. Both cases studied indicate that the winnowing of fine sediments during handling operations produces fill sands that are generally coarser and better sorted than bottom sediments, and that these changes tend to improve the predicted performance of fill sediments. Volumetric losses are fairly high for the examples presented and such losses deserve consideration when estimating the overfill and renourishment elements of project design. (Sinha-OEIS)
W78-06245

EVALUATION OF A CONCRETE BUILDING BLOCK REVETMENT,
Coastal Engineering Research Center, Fort Belvoir, VA.
For primary bibliographic entry see Field 8F.
W78-06248

DESIGNING FOR BANK EROSION CONTROL WITH VEGETATION,
Coastal Engineering Research Center, Fort Belvoir, VA.
P. L. Knutson.
Army Coastal Engineering Research Center Reprint 78-2, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 716-733, 7 fig, 3 tab, 24 ref.

Descriptors: *Bank erosion, *Stabilization, *Marsh plants, *Design criteria, Estuaries, Erosion, Shore protection, Water resources, Outer Continental Shelf, Pollutant transport.

Marsh plants are effective in stabilizing eroding banks in sheltered coastal areas. Exceptional results have been achieved in a variety of intertidal environments at a fraction of the cost required for comparable structural protection. Techniques are available for the efficient propagation of several marsh plants for use in bank stabilization. This paper provides design criteria for determining site suitability; selecting plant materials and planting methods; and estimating labor requirements on a project by project basis. (Sinha-OEIS)
W78-06249

SEDIMENTS IMPOUNDED BY AN OFFSHORE BREAKWATER,
Coastal Engineering Research Center, Fort Belvior, VA.
For primary bibliographic entry see Field 2L.
W78-06251

DISPERSION OF BUOYANT WASTE WATER DISCHARGED FROM OUTFALL DIFFUSERS OF FINITE LENGTH,
California Inst. of Tech., Pasadena.
For primary bibliographic entry see Field 5B.
W78-06269

BUOYANCY EFFECTS IN THERMALLY STRATIFIED OPEN-CHANNEL FLOW,
Iowa Univ., Iowa City. Dept. of Mechanics and Hydraulics.
G-J. Hwang.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 156, Price codes: A10 in paper copy, A01 in microfiche. Doctoral Thesis, July, 1975. 201 p, 30 fig, 1 tab, 28 ref, 3 append. OWRT C-3140(No. 3692)(3).

Descriptors: *Flow characteristics, *Flow profiles, *Approximation method, *Buoyancy, Equations, Effluents, Channel flow, Temperature, Velocity, Turbulent boundary layers, *Water flow behavior, Perturbations, Thermal discharge.

Expansion of successive approximations was used to investigate the detailed flow behavior from the injection of a heated effluent flow without excess momentum at the surface of a cooler ambient open channel flow. A perturbation procedure solved numerically the convective-diffusion equation and the equations of motion by the modified Hartree-Womersley method. Simulated experimental entrance conditions for the zero order density and the first order velocity perturbations were utilized; controlled flume experiments were conducted to obtain data for comparison with and verification of the numerical results. Significant buoyancy effects for a thermally stratified open-channel flow were: (1) slight change in the Von-Karman constant; (2) existence of a multilayered flow structure upstream with alternating negative and positive velocity perturbations in successive layers, and further downstream, a two-layered flow structure with positive upper and negative bottom region velocity perturbations; (3) modification of the longitudinal velocity profile from a logarithmic to a logarithmic-linear law with empirical coefficients and the Monin-Obukhov length as a scaling parameter; and (4) a small vertical velocity component with entrainment of warm fluid from below the water surface. Findings were supported more qualitatively than quantitatively. Perturbation was judged useful for certain types of practical thermal discharge problems; modified numerical procedure was a convenient and economical method. Appendices contain calculations on the effluent thickness and boundary value problem and the computer program. (Wares-IPA)
W78-06371

HYDRAULIC FRACTURING OF DRILLED WATER WELLS IN CRYSTALLINE ROCKS OF NEW HAMPSHIRE,
New Hampshire Dept. of Resources and Economic Development, Concord. State Geologists Office.
For primary bibliographic entry see Field 4B.
W78-06372

ENGINEERING CONDITION SURVEY AND STRUCTURAL INVESTIGATION OF MONTGOMERY LOCKS AND DAM, OHIO RIVER,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
For primary bibliographic entry see Field 8A.
W78-06378

URBANIZATION: HYDROLOGIC-HYDRAULIC-DAMAGE EFFECTS,
Southeastern Wisconsin Regional Planning Commission, Waukesha.
For primary bibliographic entry see Field 4C.
W78-06385

NOTE ON LABORATORY MODELING OF SEASONAL THERMOCLINE,
Delaware Univ., Newark, Coll. of Marine Studies.
For primary bibliographic entry see Field 2H.
W78-06398

CALCULATION OF FLOW RESTRICTION LENGTHS FOR RAIN OVERFLOW AND BASINS (BERECHNUNG DER DROSSELSTRECKE VON REGENUEBERLAEUFEN UND REGENBECKEN),
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).
W. Munz.
Gas-Wasser-Abwasser, Vol 57, No 12, p 869-875, 1977. 10 fig, 4 tab, 8 ref.

Descriptors: *Conduits, *Pipelines, *Storm water, *Overflow, *Hydraulic models, Culverts, Surface drainage, Attenuation, Channel flow, Pipe flow, Treatment facilities, Waste water treatment, Municipal wastes.

A hydraulic study of the flow of water through a pipe culvert toward a treatment plant is applied to the limitation of storm water overflow conditions in a rain basin. The relationship of the inlet level to the culvert is calculated according to the difference in water flow heights before and after the culvert inlet. Positioning of the weir is dependent upon the upstream flow velocity in the incoming sewer. The height should allow an incoming velocity high enough to prevent sedimentation in the pipe. By simulating these flow conditions, unfavorable oscillations in the pipe can be avoided and proper flow established. By restricting these flow conditions in the culvert, self-priming action in the culvert may be controlled. (Lisk-FIRL)
W78-06428

OPTIMIZATION IN DESIGN OF PUMPING SYSTEMS,
Weston (Roy F.) Inc., West Chester, PA.
For primary bibliographic entry see Field 8C.
W78-06439

MODIFYING MANNING'S EQUATION FOR FLOW RATE ESTIMATES,
K. J. Lanfear, and J. J. Coll.
Water and Sewage Works, Vol 125, No 3, p 68-69, March, 1978. 3 fig, 2 tab.

Descriptors: *Manning's equation, *Flow rate, *Sewerage, *Pipelines, *Mathematical models, Depth, Slopes, Velocity, On-site investigations, Flow measurement, Municipal wastes.

A modification of Manning's equation is developed to reduce the error of flow calculation in municipal sewage pipes and manholes and to eliminate the need for measuring slope. Estimation of the Manning's coefficient can lead to a 15% error in the calculated flow rates. The measurement of slope in old, deteriorated, or defective pipes is not always accurate enough to provide accurate flow data. Manning's equation also does not take into account the variation of the Manning's equation involves determining the function of slope with a single flow measurement. The slope function is calculated according to measured values of velocity, area, hydraulic radius, pipe diameter, and depth of flow. Flow rates in several manholes are measured with velocity meter used in conjunction with depth of flow, the modified Manning's equations, and the conventional Manning's equation. Flow rates calculated by the modified Manning's equation agreed with measured values obtained in three manhole tests. Flow rates calculated according to the conventional Manning's equation agreed with the measured flow rate in only one instance, overestimating or underestimating flow rate in the other two tests. (Lisk-FIRL)
W78-06475

SAFETY OF DAMS, A REVIEW OF THE PROGRAM OF THE U. S. BUREAU OF RECLAMATION FOR THE SAFETY OF EXISTING DAMS.
National Research Council, Washington, D.C. Committee on the Safety of Dams.
National Academy of Sciences, Washington, D.C., 1977. 70 p, 22 ref, append.

Descriptors: *Dam safety, Dams, Dam failure, Dam design, Earth dams, Safety factors, Safety, Bureau of reclamation, Instrumentation, Earthquake engineering, Seismographs, Landslides, Hazards, Model studies, Inundation maps, Seismic design, Earthquake estimation, Risk analysis.

The NRC Committee on the Safety of Dams made specific recommendations to the Bureau of Reclamation: Establish an independent dam safety office, responsible directly to the Commissioner of Reclamation, to discharge the single function of dam and reservoir safety in the public interest. Ensure that adequate funds and manpower are provided to accomplish all essential elements of dam safety within established time frames. Extend the recently adopted policy to use independent consultants on all future designs for major dams to encompass engineering evaluation for safety of existing dams. Provide field instrumentation to monitor the behavior of dam structures and to assist in evaluating safety for all major dams. Locate strong motion seismographs at all major damsites in earthquake zones 3 and 4. Increase the scope of and participation in the examinations under the Review of Maintenance Program in order to obtain a comprehensive technical assessment of project features. Establish a landslide surveillance program by identifying all significant active, inactive and potential landslides at every reservoir. Improve hydrological methodologies such as application of mathematical watershed models, spillway design flood methodology and state-of-the-art methods to develop inundation maps. Make a more complete geologic and seismologic analysis for existing dams in order to estimate maximum credible earthquakes in regions of high to moderate seismicity or from active faults. Establish a more effective and comprehensive emergency preparedness program. Consider Engineering and Research Center organizational changes to strengthen the role and responsibility of engineering geologists and geotechnical engineers. Give consideration to the preparation and implementation of a probabilistic or risk analysis program for the purpose of ranking major dams in accordance with the hazard potential and probability of a failure or partial failure of the structure.
W78-06522

BEACH NOURISHMENT TECHNIQUES. REPORT 2: A MEANS OF PREDICTING LITTORAL SEDIMENT TRANSPORT SEAWARD OF THE BREAKER ZONE,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Hydraulics Lab.
For primary bibliographic entry see Field 2L.
W78-06534

OPTIMAL DESIGN OF WATER DISTRIBUTION NETWORKS,
Rome Univ. (Italy). Ist. di Aerodinamica.
For primary bibliographic entry see Field 4A.
W78-06562

STRUCTURAL FLOOD CONTROL PLANNING,
Bell Lab., Holmdel, NJ.
For primary bibliographic entry see Field 4A.
W78-06567

ON LEVEL CROSSINGS AND CYCLES IN DAM PROCESSES,
Utrecht Rijksuniversiteit (Netherlands). Mathematical Inst.
J. W. Cohen, and M. Rubinovitch.
Mathematics of Operations Research, Vol. 2, No. 4, p 297-310, November 1977. 1 fig, 14 ref.

Descriptors: *Dams, *Stochastic processes, *Optimization, Markov processes, Costs, Revenue maximization, Repetitive cycles, Behavior, Equations, Mathematical models, Operations research.

The classical dam with input according to a process with stationary, independent increments and output at unit rate is considered. The stochastic properties of level crossings, i.e., up- and downcrossings, of a fixed level $x > 0$ are studied. It is shown that successive downcrossings of any such level constitute a renewal process with a.s. strictly positive lifetimes. This property allows the content process to be described as a regenerative process. In fact, several types of imbedded renewal processes may be defined and various cycles in the content process may be identified. The numbrer of downcrossings of a fixed level in each such cycle as well as other functionals are studied. In particular, some new properties of the zero set of the dam process are obtained. This study has arisen from questions in cost optimization problems of dams and a simple example is discussed to illustrate the use of the results in this context. (Bell-Cornell)
W78-06569

FLOOD MANAGEMENT FOR SMALL URBAN STREAMS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 4A.
W78-06571

PROBLEMS ASSOCIATED WITH MAINTENANCE OF CHANNEL CAPACITY BELOW FEDERAL RESERVOIRS IN KANSAS,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 2E.
W78-06580

8C. Hydraulic Machinery

FACTORS INFLUENCING OXYGEN INPUT IN AERATORS WITH VERTICAL SHAFT (AZ OXIGENBEVITELT BEFOLYOASOLO TENYEZOK A FUEGGOLEGES-TENGELYU FELUELETI LEVEGOZTETOKNEL),
M. Karoly.
Tatabanyai Szenbanyak Muszaki-Kozgazdasagi Koezlemenyei, Vol. 17, No. 1-2, p 12-16, 1977. 3 fig, 1 tab.

Descriptors: *Aeration, *Design criteria, *Oxygenation, *Equipment, *Operation and maintenance, *Dissolved oxygen, Aerobic conditions, Dimensions, Hydrualic design, Waste water treatment.

Design parameters of vertical shaft aerators and aerating basins which influence oxyen input were investigated. The oxygen input increases with the second power of the aerator diameter and with the second or third power of the circumferential speed; the efficiency is not influenced significantly by circumferential speeds in the range of 3.5-6.0 m/sec. Up to a certain level, oxygen input increases nearly linearly with the depth of immersion of the aerator. Although the oxygen input is intrinsically higher in rectangular basins then in circular ones, it can be increased in circular basins to yield an oxygen input of 1.7-1.9 kg/kWh by means of baffles which prevent or reduce the rotation of water around the aerator. For rectangular aeration basins, the specific oxygen input increases with a decrease in basin volume and is lower in rectangular shallow basins than it is in deeper basins of equal volume. Oxygen input is highest for rectangular basins having side length to water depth ratios in the range of 3-4:1. (Takacs-FIRL)
W78-06419

HYDRAULIC INVESTIGATION OF THE OPERATION OF DIFFERENT DESIGNS OF SECONDARY SETTLERS (IDRAVLICHESKOE ISSLEDOVANIE RABOT'L VTORICHNJIKH OTSTOINIKOV RAZLICH'IKH KONSTRUKCII),
I. V. Skirdov, and S. I. Kol'tsova.
Vodosnabzhenie i Sanitarnaia Tekhnika, No. 9, p 7-11, 1977. 4 fig, 6 ref.

Descriptors: *Separation techniques, *Sludge treatment, *Settling basins, *Design criteria, *Sedimentation rates, Equipment, Design criteria, Flow control, Operation and maintenance, Hydraulic design, Biological treatment, Sewage treatment, Waste water treatment.

Hydraulic characteristics of secondary vertical and radial settlers used in biological waste water treatment were examined. The performance of radial and vertical settlers was controlled by currents due to the difference in density between water and sludge. The currents generally limited to space utilization factor to less than 40%. Rotary distributors installed at the bottom of the settler were capable of increasing the space utilization factor to approximately 80-90%. The rotary distributors also increased the hydraulic load to a maximum of 2.2 cu m/sq m/hr, or nearly twice as high as that achieved in conventional radial settlers. (Takacs-FIRL)
W78-06420

CITY STORM SEWERS DUG IN CLOSE QUARTERS.
Highway and Heavy Construction, Vol 121, No 2, p 87, February, 1978.

Descriptors: *Hydraulic backhoe, *Storm drains, *Subsurface drainage, Equipment, *Sewers, *Conduits, Alluvium, Rock excavation, Earthworks, Trenches, Sewerage, Waste water disposal, Municipal wastes.

A hydraulic backhoe was utilized in a storm sewer construction project which required excavation in the proximity of buildings, trees and other objects. The RH 12 backhoe, equipped with a 48-inch bucket, was employed to excavate 4-5 ft wide trenches at depths ranging 3-16 ft for the installation of storm sewers and underdrains in Nanticoke, Pennsylvania. The hydraulic backhoe was required to dig through alluvial deposits, hard rock, pavement, concrete, and asphalt for the laying of 12-36 inch reinforced concrete storm conduits. Blasting of hard rock was occasionally necessary before excavation by the RH 12 hydraulic backhoe. The excavation time logged by the backhoe for several thousand feet of storm drain installation amounted to 450 hrs. The project also included the construction of sidewalks, driveway aprons, concrete curbs and gutters, asphalt paving, and landscaping. (Lisk-FIRL)
W78-06429

NEW PORTOBELLO OUTFALL.
For primary bibliographic entry see Field 5D.
W78-06436

PIPEFREEZING A SEWER.
Water Services, Vol 81, No 982, p 778, December, 1977.

Descriptors: *Pipelines, *Conduits, *Pumping plants, *Culverts, *Freezing, Nitrogen, Conveyance structures, Drains, Sewerage, Hydraulic structures, Waste water disposal, Municipal wastes.

Liquid nitrogen was used by BCB Pipefreezing Services Ltd of Croydon, England, to freeze a section of a sewer main that had to be rerouted. The 250 mm diameter pipeline, which carries sewage from the town of Brookend to a pumping station, was rerouted for the installation of a 4 by 8 ft concrete culvert at the same depth as that of the sewage main. A section of the pipe, constructed of spun cast iron, was isolated with insulated freezing jackets into which liquid nitrogen was injected. Freezing of the pipeline eliminated the necessity of draining the several mile long sewage main and shutting down the pumping station while the pipe was rerouted. Once the main was adequately frozen, the section of pipe was removed and the modifications were completed. (Lisk-FIRL)
W78-06437

OPTIMIZATION IN DESIGN OF PUMPING SYSTEMS,
Weston (Roy F.) Inc., West Chester, PA.
A. K. Deb.
Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol 104, No EE1, p 127-136, February, 1978. 2 fig, 1 tab, 6 ref, 1 append.

Descriptors: *Pipes, *Pumping plants, *Cost analysis, *Optimization, *Capital costs, Operation and maintenance, Optimum development plans, Inflation(Economic), Mathematical models, Demand, Project planning, Waste water treatment, Municipal wastes.

A mathematical model for pipe diameter optimization in a pumping system incorporated capital costs, inflation factors, operation and maintenance expenses, and energy costs. Parameters considered for optimum pumping system planning included demand rate, installation timing, locality of use, salvage value, equipment life, head loss, viscosity, and liquid density. Energy requirements were higher for small diameter pipes which caused large friction heads and required larger pumps. Large diameter pipes reduced energy costs but increased pipeline cost factors. The capital cost of a pipeline system was expressed as a function of pipe diameter or as a function of flow and total head. For systems where population growth and resulting increased demands on a pumping system could be anticipated, a formula was presented for selecting the optimum year for pumping system expansion on the basis of an inflation factor, a demand factor, and the length of the planning period. (Lisk-FIRL)
W78-06439

STANDBY POWER.
Water Services, Vol 81, No 982, p 770, December, 1977.

Descriptors: *Pumping plants, *Generators, *Electrical power, *Electrical power failures, *Flooding, Electric power production, Standby power, Electrical equipment, Electrical power demand, Pumps, Sewerage, Waste water treatment, Municipal wastes.

Standby power generators, produced by Auto Diesels Braby Ltd of Uxbridge, Middlesex, England, supply backup power during electrical failures to pumping stations within England's Regional Water Authorities. The compact generators, both installed and mobile, provide power outputs of 20-480 kilovolts-ampere. The units can be set for either manual or automatic control, the latter especially important in unmanned pumping stations where power failure could mean immediate flooding. The automatically controlled generators supply power to the pumping station withing 20 sec of the main power failure. In pumping stations where power loss does not pose an immediate threat of flooding, mobile generators are transported to the pumping site. The Mobile Units provide the highest expected initial current required at the serviced pumping stations; the installed standby generators are programmed to provide the specific starting current required by the individual pumping station. The static generator is hooked into the main distribution switchboard at the station; the mobile generator is equipped with a control panel mounted on its own trailer. (Lisk-FIRL)
W78-06440

SHIELDHALL SEWAGE PURIFICATION WORKS--SPECIFICATION FOR AND SELECTION OF MECHANICAL EQUIPMENT AND PUMPS,
Strain and Robertson (Consulting Engineers, Glasgow (Scotland).
For primary bibliographic entry see Field 5D.
W78-06462

BELT PRESS BEATS SLUDGE DEWATERING PROBLEMS.
For primary bibliographic entry see Field 5D.
W78-06463

BASIC SEWAGE TREATMENT FOR SMALL COMMUNITIES.
For primary bibliographic entry see Field 5D.
W78-06486

TRUCK-TANKERS CLEAN SEPTIC TANKS IN RURAL AREAS,
For primary bibliographic entry see Field 5D.
W78-06488

8D. Soil Mechanics

EFFECTS OF WATER ON SLOPE STABILITY,
Kentucky Bureau of Highways, Lexington. Div. of Research.
T. C. Hopkins, D. L. Allen, and R. C. Deen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 860, Price codes: A03 in paper copy, A01 in microfiche. Research Report No. 435, Prepared for Federal Highway Administration, Washington, D.C., October 1975. 41 p, 27 fig, 1 tab, 60 ref. KYHPR-68-48; HPR-1(9).

Descriptors: *Slope stability, *Shear strength, *Embankments, *Safety factors, *Failure(Mechanics), Soil mechanics, Design criteria, Erosion, Monitoring, Clays, Effective stress, Pore pressure, Seepage, Atterberg limits, Soil moisture meters, Critical state, Total stress analysis.

A brief state-of-the-art review of the effects of water on slope stability and the techniques for analysis was presented. The derivations and effects of seepage forces and rapid drawdown on effective stress also were presented. Various conditions of external loading produce changes in effective stress. These changes were discussed, and limiting conditions which should be analyzed were mentioned. Limitations of total stress analyses were discussed in detail. It appears that, for soils having a liquidity index of 0.36 or greater (normally consolidated), the undrained shear strength gives factors of safety close to the actual factor of safety. For soils with a liquidity index less than 0.36 (overconsolidated), the undrained shear strength gives factors of safety that are too high; but the strength parameters can be corrected by the empirical relationship presented herein. Data also showed that the difference between vane and calculated shear strength increased as the plasticity index and or the liquid limit increased. An empirical relationship for correcting vane shear strength was presented. A discussion was presented of effective stress analysis, including differences between peak and residual phi angles for normally consolidated and overconsolidated soils. The residual phi angle decreased log arithmically with increasing clay fraction. The 'critical' state of a clay also was defined. Shear strength parameters of a clay tested in that state correspond to the theoretical strength of an overconsolidated clay which has undergone a process of softening. Water may cause unstable conditions in earth slopes due to changes in geometry. Erosion of the toe or the slope can induce damaging stress. Piping through heaving or erosion of subsurface layers can cause damage. Construction of side-hill embankments can cause damming, resulting in a rise in the water table. Methods of water detection also were summarized. A discussion of ways to monitor water pressures, including the types and operations of piezometers, was given. Finally, suggested guidelines for the design of earth slopes were included. (Adams-ISWS)
W78-06377

BURIED FLEXIBLE PIPE PERFORMANCE IN THE PROXIMITY OF NEW EXCAVATIONS,
Uni-Bell Plastic Pipe Association, Dallas, TX.
For primary bibliographic entry see Field 8G.
W78-06474

8F. Concrete

EVALUATION OF A CONCRETE BUILDING BLOCK REVETMENT,
Coastal Engineering Research Center, Fort Belvoir, VA.
M. L. Giles.
Army Coastal Engineering Research Center Reprint 78-5, Reprinted from: 'Coastal Sediments '77', 5th Symposium of Waterway, Port, Coastal, and Ocean Division, ASCE, held at Charleston, SC, 2-4 November 1977. p 686-695, 9 fig, 4 ref.

Descriptors: *Beach erosion, *Shore protection, *Concrete structures, Erosion, Resources development, Revetments, Environmental conditions.

The results of a two-dimensional laboratory evaluation of a beach revetment plan that uses common concrete building blocks as the revetment armor unit is presented. Common concrete building blocks were evaluated to aid the owner of property situated along a sheltered coast. The revetment was evaluated to determine: (1) the maximum breaking wave height for which the revetment is effective, (2) the nature and cause of revetment failures, (3) the extent of toe scour for various wave conditions, (4) filter requirements, (5) effect of wave overtopping of the revetment, and (6) the ease of installation under simulated field conditions. Results of this two-dimensional prototype scale evaluation indicate that the plan as tested could be installed easily by a homeowner and would effectively protect a beach from 0.90 meter high breaking waves. (Sinha-OEIS)
W78-06248

PIPELINE FLOATED ACROSS RIVER.
Water and Wastes Engineering, Vol 15, No 1, p 32, January, 1978.

Descriptors: *Conduits, *Sewerage, *Construction joints, *Pipes, *Bridges, Concrete pipes, Pipelines, Trenches, Underwater, Virginia, Sheet piling, Steel piles, Piles(Foundations), Cranes, Floating, Waste water treatment, Treatment facilities, Municipal wastes.

A prestressed concrete sewer main, connecting the York County, Virginia, treatment facility with a large southern treatment plant, was settled into position in Virginia's Poquoson River. The sewer line, with a diameter of 42 inches, is part of a sewer force main encompassing over 30,000 ft of 42 and 30 inch pipes. The main was constructed with movable ball joints, allowing flexible conformity of up to 15 degrees to the river bed. As the pipe sections were joined, they were floated across the river by a cable from the opposite shore. A wooden pile bridge was constructed parallel to the line to provide a support structure for seven cranes which aided in the installation. Filling in of the trench, excavated on the river bottom for the sewer main, was prevented in a marshy portion of the shore by steel sheet pilings. Once the pipe was floated across the river, it was settled by pumping of water through the line. (Lisk-FIRL)
W78-06434

DIRTY 'OLE MAN RIVER' GETTING CLEANED UP.
Water and Wastes Engineering, Vol 15, No 1, p 44, January, 1978.

Descriptors: *Sewerage, *Conduits, *Interceptor sewers, *Pumping plants, *Mississippi River, Hydraulic structures, Conveyance structures, Treatment facilities, Waste water treatment, Municipal wastes.

A $2.8 million interceptor sewer and pumping station for the President's Island section of Memphis, Tennessee, has a maximum daily flow capacity of 21 million gallons of municipal and industrial wastes. The interceptor sewer consists of four miles of gravity sewer line and two miles of force main, 2000 linear feet of which was submerged into place in a channel of the Mississippi River. The larger concrete gravity sewer lines, with diameters ranging 12-42 inches, were lined with coal tar epoxy to prevent hydrochloric acid corrosion. The force main lines, with diameters of 4-30 inches, are supplemented by four lift stations in areas of deep pipe excavation. The President's Island pumping station is equipped with two variable speed and two constant speed pumps with capacities of 4,900 gal/min. The pumping station wet wells are designed to transform stress into compression, reducing the need for thick walls. The pumping station will ultimately discharge the effluent into a waste water treatment facility in Memphis. (Lisk-FIRL)
W78-06435

8G. Materials

UTILIZATION OF BRACKISH WATER IN COAL GASIFICATION,
New Mexico State Univ., University Park. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 3E.
W78-06204

DREDGE DISPOSAL STUDY, SAN FRANCISCO BAY AND ESTUARY. APPENDIX M--DREDGING TECHNOLOGY.
JBF Scientific Corp., Wilmington, MA.
For primary bibliographic entry see Field 5E.
W78-06259

NEW SHALLOW SEWER BEATS HIGH COST OF DEEP GRAVITY SYSTEM,
N. Hancock.
Engineering and Contract Record, Vol 91, No 1, p 20-21, January, 1978. 1 fig.

Descriptors: *Sewerage, *Thermal insulation, *Plastics, *Pipes, *Gravity, Manholes, Plastic pipes, Pumping plants, Pumps, Waste water treatment, Permafrost, Water table, Municipal wastes.

A shallow depth sewage system which includes polyethylene pipes and grinder pumps has been installed in the Canadian Toronto Islands. Special construction techniques were required because of the area's high water table, flat terrain, and permafrost. Polyethylene pipe sections, up to 300 feet in length, were joined with a butt fuser machine and insulated with 2 inches of water repellant styrofoam. The pipes were buried beneath three feet of covering to guard against frost. The manholes were also insulated with 2 inches of styrofoam; chamber valves and piping were wrapped with styrofoam half-shells and polyethylene tape. The 28,000 feet of pipe serves the year-round system and the summer recreational facilities. The system contains 30 pumping stations with 125 gal/min centrifugal grinder pumps serving the larger usage areas. Three pumps, one 75 hp for summer use, one 10 hp for winter months, and one backup pump, are employed in the system. Sewage is eventually discharged into the Toronto interceptor sewer. (Lisk-FIRL)
W78-06430

UPDATING AND COMPLETING SEWER RECORDS COULD COST LESS THAN YOU THINK.
Surveyor, Vol 151, No 4465, p C1, January, 1978. 1 fig.

Descriptors: *Conduits, *Sewerage, *Manholes, *Outlets, *Outfall sewers, Surveys, Mapping, Data collections, Electrical equipment, Sewers, Pipelines, Waste disposal, Municipal wastes.

A survey of all manholes, sewer lines, and outfalls in the London Borough of Waltham Forest in England was completed within two years at a substantial savings. The first phase of the project involved visual inspection of all manholes, conduits, and outfalls in the three divisions of the borough. The second phase of the survey required a study of existing sewer records which outlined some of the routes of old sewer lines not located along public highways. Each manhole was examined for pipe size, depths, and structural defects; precise locations of sewer lines were identified with electroprobe equipment. The electroprobe survey detailed the location of old sewer lines constructed on curves or sharp bends. A total of 10,786 manholes, 372 lampholes, and 213 outfalls were investigated in the survey. The final cost of the project, which was estimated at 50,000 pounds sterling, was 29,000 pounds sterling after the collation of the survey data. (Lisk-FIRL)
W78-06432

MEASURING PRESSURE SURGES IN PIPELINES.
Water and Waste Treatment, Vol 20, No 10, p 26, October, 1977. 2 fig.

Descriptors: *Pipelines, *Pressure measuring instruments, *Water pressure, *Measurement, *Sewerage, Head loss, Flow, Pressure, Surges, Waste water disposal, Municipal wastes.

Transducers (CEL) of Reading, England, has developed a bonded strain gauge pressure transducer for the measurement of pressure surges in pipelines. The Water Research Center in Medmenham, Bucks, England, used the transducer to measure pipeline surges in an attempt to prevent pressure-related pipeline damages. The DataSense 1000, capable of optimizing pump switching timing or measuring static or dynamic pressures in pipes, was modified from 0-500 lbs/sq in to 0-1.5 lbs/sq in and 0-375 lbs/sq in. The transducer was used in conjunction with a portable pressure indicator and a chart recorder. An isolating valve with an integral bleed value was positioned in the pipeline to be tested. Air trapped in the pipeline was released by the bleed valve which was then shut. The isolating valve was then opened and the pressure was measured. Positioning of the transducer is dependent upon the type of pipeline being measured. (Lisk-FIRL)
W78-06433

A TOUGH CONTENDER FOR PIPEWORK. SIMPLE AS ABS,
J. Maitland.
Process Engineering, p 107, 109, 111, October, 1977. 2 fig, 2 tab.

Descriptors: *Acrylonitrile butadiene styrene, *Plastic pipes, *Conduits, *Heat resistance, *Corrosion, *Pipes, Iron, Copper, Steel pipes, Radiation, Industrial wastes, Solvents, Ductility.

Acrylonitrile butadiene styrene (ABS) plastic is replacing lead, copper, cast iron, and steel as the preferred material for drain, waste, and vent pipes. The ABS plastic has superior heat resistance and greater ductility at low temperatures than polyvinyl chloride pipes. The absence of noxious combustion products is an additional advantage of ABS pipes. Industrial uses of ABS material include the transport of chemicals, slurries, effluents, and compressed air, as well as mine and quarry applications. Food and water supplies can be transported through this material because of its nontoxicity. A newer use of ABS is for pipe casings; installations to a depth of 600 ft have been achieved. ABS offers light weight, a high modulus, abuse resistance, heat resistance, and suitability for potable water. The quality of ABS is dependent upon the processing and the use of high molecular weight ABS resin. ABS pipes, with solvent welded or rubber joints, are resistant to low levels of radiation in nuclear power stations. (Lisk-FIRL)
W78-06438

BURIED FLEXIBLE PIPE PERFORMANCE IN THE PROXIMITY OF NEW EXCAVATIONS,
Uni-Bell Plastic Pipe Association, Dallas, TX.
W. D. Nesbeitt.
Public Works, Vol 109, No 3, p 80-81, March, 1978. 2 fig.

Descriptors: *Pipes, *Flexibility, *Soil stability, *Sewerage, *Excavations, Trenches, Soil properties, Soil pressure, Soil strench, Hydraulic structures, Pipelines, Waste water treatment, Analytical techniques, Municipal wastes.

Precautions for excavating in the vicinity of buried flexible pipe are reviewed and equations for calculating critical trench depth and safe separation distance are presented. The safe separation distance is a function of pipe diameter, depth of soil cover over the pipe, and the critical trench depth in a vertical excavation. The minimum safe separation for a highly flexible pipe is equal to the least amount of horizontal soil cover required between the pipe and the open trench to prevent shift or collapse of the trench wall. The critical trench depth is calculated with estimated values for soil cohesion, unit weight of the soil, and the friction angle of the trench wall soil. When the minimum safe horizontal separation is not established, a soil wedge may form by deterioration of the flexible pipe support, pushing into the open trench. The effect of soil failure upon the flexible pipe is related to the weight of the soil wedge, the stiffness of the pipe ring, and the failure arc of the soil shear plane. Pipe flexibility is considered a monor factor in estimating the response of buried pipe to adjacent excavation. (Lisk-FIRL)
W78-06474

THE DEVELOPMENT, MANUFACTURE AND APPLICATIONS OF GLASS REINFORCED PLASTIC PIPES,
L. T. Cooper.
Anti-Corrosion Methods and Materials, Vol 25, No 2, p 3, 5, 7, 10, February, 1968. 1 tab, 6 ref.

Descriptors: *Glass-reinforced plastics, *Pipes, *Plastic pipes, *Corrosion control, *Pressure conduits, *Steel pipes, Linings, Drainage systems, Conveyance structures, Chemical wastes, Flow, Waste water treatment, Sewerage.

The development, manufacture, applications, and costs of glass-reinforced plastic pipes are reviewed. The longitudinal and circumferential strengths of pipes are reinforced with biaxial or helical winding of resin-impregnated glass fiber. In the Redland Pipes Ltd plant in Parkstone, England, a biaxial winding machine is employed for pipes with diameters of 300-2,000 mm, and a combined helical and biaxial machine for pipes having diameters of 300-4,800 mm. Glass reinforced plastic pipe has a strength to weight ratio seven times that of steel; it is light weight, corrosion resistant, abrasion resistant, and non-toxic and not resistant to flow. The ability of glass-reinforced plastic pipe to withstand heavy loads and corrosives makes it suitable for sewage and drainage installations. The plastic pipes are capable of resisting the high and low internal pressures experienced in rising mains and pressure pipelines; its resistance to tainting, toxins, and microbial growth makes it suitable for potable water conveyance. The cost of glass-reinforced plastic pipe is less than that of polypropylene, chloride, and stainless steel pipe. Plastic pipe is cost competitive with mild steel pipes in the larger diameter ranges. (Lisk-FIRL)
W78-06476

DEEP SHAFT SYSTEM USES GRP.
For primary bibliographic entry see Field 5D.
W78-06481

COMPUTER CONTROLS PIPELINE FLOW.
Water and Waste Treatment, Vol 20, No 12, p 34-35, December, 1977. 1 fig.

Descriptors: *Analog computers, *Digital computers, *Pipelines, *Treatment facilities, *Automatic control, Telemetry, Monitoring, Flood control, Flood routing, Waste water treatment, Municipal wastes.

The Eindhoven sewage treatment plant in the Netherlands, designed to treat effluent from a maximum potential population of 750,000 and an expanding industry, is controlled by a Philips P800 minicomputer with telemetry links. The computer system also monitors and controls the flow in the 46 km long pipeline through which sewage is transported to the treatment facility. A P855 computer collects and displays data in the central control room on measurements of levels, flows, motor currents, and operating hours. Computer control of the six sewage pumps located between the coarse screens and the grit remover has maximized pump efficiency by operating the pumps in sequential order according to the monitored effluent levels in the three supply channels. The computer operates the sewage transport pipeline as a buffer reservoir by incorporating monitored pipeline data into a simulated model of the line. Flow data relayed to the computer by the telemetry system allows the balance of water levels in the pipeline for optimal buffer capacity, and prevents or controls overflows. Control stations and a pumping station along the pipeline route are also under computer control. (Lisk-FIRL)
W78-06513

SAFETY OF DAMS, A REVIEW OF THE PROGRAM OF THE U. S. BUREAU OF RECLAMATION FOR THE SAFETY OF EXISTING DAMS.
National Research Council, Washington, D.C. Committee on the Safety of Dams.
For primary bibliographic entry see Field 8B.
W78-06522

CLEANING APPARATUS FOR SEWER PIPES AND THE LIKE,
T. E. Jones.
United States Patent 4,073,302. Issued February 15, 1978. Official Gazette of the United Patent Office, Vol. 967, No. 2, p 473, February, 1978. 1 fig.

Descriptors: *Pipes, *Cleaning, *Conduits, *Scour, *Patents, *Design data, Pressure, Equipment, Sewers, Waste water treatment, Waste water disposal, Municipal wastes.

An apparatus for cleaning the interiors of sewage pipes and other conduits with compressed cleaning fluid has been patented. The cleaning apparatus consists of a tubular body containing a cylindrical bore with a nozzle at one end and an inlet conduit on the other. The conduit is connected to a supply of pressurized cleaning fluid which is sprayed into the pipes through the nozzle at the other end of the bore. The nozzle is divided into two chambers, the first having a larger diameter than the second. A wall separates the second chamber from the first chamber, equipped with a number of jets through which the cleaning fluid is discharged under pressure. The entire apparatus is mounted on two sets of hubs, each containing three legs. The legs have rotating wheels and pivotal skids which engage with the interior of the pipes. The skids may be rotated perpendicular to the tubular body of the apparatus. (Lisk-FIRL)
W78-06568

GEOTHERMAL POWER SYSTEM,
J. S. Swearingen.
U.S. Patent No 4,054,175, 10 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 963, no 3, p 880, October 18, 1977.

Descriptors: *Patents, *Geothermal studies, *Thermal properties, *Scaling, Heat transfer, Heat exchangers.

An object of the invention is to provide a system of extracting heat from hot unrefined water by passing the hot unrefined water directly through conventional heat exchange apparatus. Scaling and other solid build-up of impurities from the water is prevented in the hot water well casing and water transport equipment as well as in the heat exchange equipment. The agents for beneficially treating the water are derived directly from the source of hot unrefined water. The improvement involves adding to the hot unrefined water prior to its contact with the heat exchange surface, an agent capable of increasing the formation of non-scale-forming species of the scale-forming impurities whereby scaling and other solid build-up on the heat exchange surface, particularly upon cooling of the water, is minimized. Non-scale-forming species are those which remain in solution or suspension in the unrefined water as it is passed through the heat exchange apparatus without forming scale and/or those which are harmlessly precipitated, e.g. solid non-scale particles which are small enough to remain in suspension in the moving water and be carried out of the heat exchange apparatus. (Sinha-OEIS)
W78-06659

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

ANNUAL REPORT 1973 - 1974.
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 9D.
W78-06350

ANNUAL REPORT FISCAL YEAR 1976, TO THE OFFICE OF WATER RESEARCH AND TECHNOLOGY.
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 9D.
W78-06355

ANNUAL REPORT OF THE IOWA STATE WATER RESOURCES RESEARCH INSTITUTE FOR FY 1976.
Iowa State Water Resources Research Inst. Ames.
For primary bibliographic entry see Field 9D.
W78-06365

CATALOG OF WATER RESOURCES RESEARCH IN ILLINOIS.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 561, Price codes: A06 in paper copy, A01 in microfiche. Special Report No. 7, July 1977, 106 p.

Descriptors: *Water resources research, *Research and development, *Illinois, Water research institute, State agencies, Government agencies, *Research projects, Research facilities.

One of the responsibilities of the Water Resources Center is to collect and compile information on water resources research projects being conducted by institutions and agencies in Illinois. That information, needed to avoid duplication of research efforts, is published in this catalog to improve communication among research units and to help inform users of research information in Illinois. The research projects are listed by investigating agency. Most of the projects were considered active as of June 1977. A subject index is presented in the appendix. Researchers and users of research results who have a need for more information about specific projects should direct their inquires to the principal investigator at the agency or institution listed.
W78-06412

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT 1973 - 1974.
Hawaii Univ., Honolulu. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 621, Price codes: A05 in paper copy, A01 in microfiche. 1975. 76 p, 6 fig. OWRT A-999-HI(12).

Descriptors: *Water resources, *Water resources development, *Hawaii, Research and development, Water supply, Groundwater, Waste disposal, Forecasting, Surface waters, Water pollution, Information exchange.

Research issues of special relevance to Hawaii (water supply drawing from natural groundwater sources, drought, flooding, and domestic discharges of waste waters into coastal and surface waters, surface water ownership, and water resources forecasting) are reviewed, and research relating to these and other areas is described. Research allotment projects carried on during 1973 and 1974 treated watershed pollution, water demand, radiation well logging, water infiltration analysis, water resources, sedimentation, groundwater pollution, fog precipitation, analysis of time patterns of water use, sewage treatment, and volcanic contamination of rainwater. Matching grant projects described were concerned with rainfall space/time variations, urban hydrology and water resources, water distribution optimization, and water problem analysis. Non-OWRR projects described included those concerned with coastal water quality, sewage effluent recycling, sewage monitoring and analysis, water pollution, water resources, and water quality information storage and retrieval. Publications and personnel are listed. (Wares-IPA)
W78-06350

ANNUAL REPORT FISCAL YEAR 1976, TO THE OFFICE OF WATER RESEARCH AND TECHNOLOGY.
Utah Center for Water Resources Research, Logan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 362, Price codes: A05 in paper copy, A01 in microfiche. Annual Report, August, 1976. 87 p, 8 fig, 7 tab, 2 append. OWRT A-999-UTAH(4), 14-34-0001-6046.

Descriptors: *Water resources development, *Utah, *Water Resources Institute, *Research and development, Water quality control, Water quality standards, Water pollution treatment, Projects, *Annual report, *Fiscal year 1976.

Annual status reports are presented for 10 annual allotment projects (Title I), 10 matching grant projects (Title I), and 5 Title II projects. Project accomplishments, publications, and status; the application of research results; work remaining; and projected accomplishments are described. The status of training and education programs is reported. The introduction cites long-range goals, priorities, and problems and organizational changes. (Seip-IPA)
W78-06355

ANNUAL REPORT OF THE IOWA STATE WATER RESOURCES RESEARCH INSTITUTE FOR FY 1976.
Iowa State Water Resources Research Inst. Ames.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 617, Price codes: A08 in paper copy, A01 in microfiche. Annual Report, July, 1976. 163 p, 2 tab, 1 append. OWRT A-999-IA(14).

Descriptors: *Water resources development, *Iowa, *Water Resources Institute, *Research and development, Waste water treatment, Projects, *Annual report, *Fiscal year 1976, *Iowa State Water Resources Research Institute, Project status report.

Status reports are presented for 12 annual allotment projects and 10 matching grant projects. Project accomplishments, publications, applications of research results, outlines of remaining work and anticipated accomplishments are described. Five new annual allotment projects and 2 new matching grant projects for the transition quarter and FY 1977 are also described. The director's statement cites drought as the major problem facing water resource management efforts; long-range goals and problems and the status of the training and education programs are delineated in the director's report. Publications, completion reports, theses and dissertations are listed. (Seip-IPA)
W78-06365

CATALOG OF WATER RESOURCES RESEARCH IN ILLINOIS.
Illinois Univ. at Urbana-Champaign. Water Resources Center.
For primary bibliographic entry see Field 9A.
W78-06412

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

BIBLIOGRAPHY ON COLD REGIONS SCIENCE AND TECHNOLOGY, VOLUME XXVIII, PT. 1.
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-06232

ANNUAL REPORT 1973 - 1974.
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 9D.
W78-06350

ANNUAL REPORT FISCAL YEAR 1976, TO THE OFFICE OF WATER RESEARCH AND TECHNOLOGY.
Utah Center for Water Resources Research, Logan.
For primary bibliographic entry see Field 9D.
W78-06355

ANNUAL REPORT OF THE IOWA STATE WATER RESOURCES RESEARCH INSTITUTE FOR FY 1976.
Iowa State Water Resources Research Inst. Ames.
For primary bibliographic entry see Field 9D.
W78-06365

A PLAN TO IMPROVE THE WATER RESOURCES SCIENTIFIC INFORMATION CENTER PROGRAM,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 10D.
W78-06373

MATHEMATICAL MODELING AND ECONOMIC OPTIMIZATION OF WASTEWATER TREATMENT PLANTS,
Louvain Univ. (Belgium). Dept. of Engineering.
For primary bibliographic entry see Field 5D.
W78-06415

BIOLOGICAL OIL SLICKS. PART I - LITERATURE EXAMINATION,
Naval Research Lab., Washington, D.C.
For primary bibliographic entry see Field 5B.
W78-06536

STATUS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX)--SEPTEMBER 1977,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06607

10D. Specialized Information Center Services

RESEARCH IN ACTION: TECHNOLOGY FOR IMPLEMENTING WATER RESEARCH RESULTS. PROCEEDINGS OF A CONFERENCE, DECEMBER 5 - 6, 1974, LINCOLN, NEBRASKA.
Nebraska Univ., Lincoln. Water Resources Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 337, Price codes: A05 in paper copy, A01 in microfiche. (1975). 82 p, 2 fig, 3 tab, 8 ref, 1 append. OWRT A-999-NEB(17).

Descriptors: *Conferences, *Water resources, *Water quality, *Research and development, Nebraska, *Technology, Communication, Planning, Information exchange, Lincoln(NB), *Technology transfer.

A conference concerning the implementation of water research results explored practical techniques for expediting the transfer of such information. Although a significant portion of water research results can be applied in practical situations, there is often a significant time delay between the accomplishment of the research and its first important application; the lack of systematic feedback from practical applications of water research was also noted. Some specific characteristics of the human communication problem regarding application of such research were identified as differences between problem-oriented research and water resources problem solving and the large volume of scientific and technical literature which is unstructured in terms of problem applications. Other aspects of research results implementation discussed were State and Federal water planning, the University's role in utilization, and the Research Applied to National Needs (RANN) program. Panel discussions were held on the need for effective research translation, and workshops were conducted on how to achieve action from research. The appendix lists conference participants. (Wares-IPA)
W78-06370

A PLAN TO IMPROVE THE WATER RESOURCES SCIENTIFIC INFORMATION CENTER PROGRAM,
Massachusetts Univ., Amherst. Water Resources Research Center.
B. B. Berger, J. J. Knightly, L. W. Weinberger, and C. A. Wogrin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 272, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, April 1976, 53 p. OWRT X-152(No. 5264)(1).

Descriptors: *Information exchange, *Information retrieval, *Scientific information center, Data storage and retrieval, Communication, *Documentation, Abstracting, Indexing, *Bibliographies, *Reviews, Data collections, *Information dissemination.

The WRSIC system can be improved by the following: (1) improve coverage, (2) improve user awareness, (3) improve accessibility, (4) improve quality of services, and (5) strengthen user support. It was determined that these objectives could be met by describing three specific investigations, and a supplemental study which, when completed, should provide a useful basis for guiding WRSIC's future development. The investigations focus on: (1) adequacy of coverage of the system; (2) assessment of attitudes and values of potential users; and (3) a study of optimized user access to the system. The supplemental study focuses on the quality of information provided by WRSIC.
W78-06373

STATUS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX)--SEPTEMBER 1977,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 07C.
W78-06607

10F. Preparation Of Reviews

MATHEMATICAL MODELING AND ECONOMIC OPTIMIZATION OF WASTEWATER TREATMENT PLANTS,
Louvain Univ. (Belgium). Dept. of Engineering.
For primary bibliographic entry see Field 05D.
W78-06415

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SELECTED WATER RESOURCES ABSTRACTS

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AUGUST 1, 1978

W78-06701 -- W78-07200

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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01 NATURE OF WATER
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02 WATER CYCLE
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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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08 ENGINEERING WORKS
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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

APPARENT ANOMALY IN FREEZING OF ORDINARY WATER,
Cold Regions Research and Engineering Lab., Hanover, NH.
G. K. Swinzow.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A039 177, Price codes: A03 in paper copy, A01 in microfiche. CRREL 76-20, June 1976. 29 p, 20 fig, 2 tab, 9 ref. 4A061101A91D.

Descriptors: *Freezing, *Ice, *Crystals, *Ice-water interfaces, *Crystallization, Analytical techniques, Crystal growth, Nucleation, Temperature, Physical properties, Thermocline, Supercooling, Water temperature, Dissolved solids, Water cooling, *Thermal anomaly.

Under ordinary conditions the freezing of water begins with supercooling and ice nucleation and proceeds at 0C at the ice/water interface until ice formation stops. The presence of solutes, high pressure, or disperal in fine pores causes the water to freeze at temperatures below 0C (the so-called freezing point depression). Whenever freezing begins, it proceeds at a constant temperature, or at a temperature which becomes progressively lower. A temperature rise during ice formation was considered here to be an anomaly. Under all equal circumstances, the conditions under which an anomalous freezing temperature is observable appear to be very special. This report described 2 different experiments displaying the anomalous rise of temperature after nucleation and during ice formation. In one case, the water was dispersed in the fine pores of fine powders; in the other case, pure water was frozen in a transparent insulated cell. Photographic observations were made, relations of ice surface to water volume were measured. (Henley-ISWS)
W78-06882

MEASUREMENT OF ABSORPTION COEFFICIENTS OF WATER IN THE VISIBLE SPECTRAL REGION (PHASE I & II),
Missouri Univ., Kansas City.
R. C. Waring, M. R. Querry, P. G. Cary, and R. Jordan.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 590, Price codes: A07 in paper copy, A01 in microfiche. Missouri Water Resources Research Center, Rolla, Completion Report, January 27, 1978. 132 p, 3 append. OWRT A-091-MO(3), 14-34-0001-7053 and 7054.

Descriptors: *Attenuation coefficients, Measurement, *Absorption coefficients, Wave lengths, Electromagnetic radiation, *Split laser beam method, Lasers, *Deionized filtered water, Methodology, Analytical techniques, Distilled water, Sea water.

The attenuation coefficient of deionized filtered water was measured in the wave-length regions 418-640 nm and 660-695 nm. A tunable dye laser provided a source of quasiomonochromatic electromagnetic radiation. The data were collected by use of a split laser beam, a reference and sample cell, detector, dual channel boxcar integrator, A-D converter and 9820 Hewlett-Packard calculator. Rayleigh scattering coefficients for local density fluctuations within the liquid were computed in the region 418-640 nm subtracted from the attenuation coefficient, thus providing the sum of the absorption coefficient and the scattering coefficients caused by microscopic particles suspended in the liquid. Values obtained for attenuation coefficients were compared with attenuation coefficients or absorption coefficients from previous investigations of ocean water, deionized filtered water, and distilled water. Specific comparisons of attenuation coefficient data obtained by adiabatic laser calorimetry. Attenuation coefficients in the region 660-695 nm are presented graphically.
W78-07052

1B. Aqueous Solutions and Suspensions

THE KINETICS OF CALCITE DISSOLUTION IN C02-WATER SYSTEMS AT 5 DEG TO 60 DEG C AND 0.0 TO 1.0 ATM C02,
Geological Survey, Reston, VA. Water Resources Div.; and University of East Anglia, Norwich (England).
L. N. Plummer, T. M. L. Wigley, and D. L. Parkhurst.
American Journal of Science, Vol 278, p 179-216, February 1978. 13 fig, 6 tab, 36 ref.

Descriptors: *Calcite, *Solutes, *Mixing, *Kinetics, *Aqueous solutions, Mechanical properties, Chemical reactions, Temperature, Model studies, Evaluation, *Dissolution kinetics, Activation energy, Reaction mechanisms.

The results are presented of experimental dissolution studies in the pure calcite-water system using both the 'pH-stat' and 'free drift' methods (Morse, 1974). The data were obtained over a wide range of fluid composition varying bulk fluid pH from 2.0 to 7.0 and bulk fluid PC02 from near 0.0 to 1.0 atm. Temperature was varied from approximately 5 to 60 deg C. A mechanistic model is developed that describes the observations and has application to the dissolution of calcite in pure calcite-water systems. (Woodard-USGS)
W78-06936

MEASUREMENT OF ABSORPTION COEFFICIENTS OF WATER IN THE VISIBLE SPECTRAL REGION (PHASE I & II),
Missouri Univ., Kansas City.
For primary bibliographic entry see Field 1A.
W78-07052

2. WATER CYCLE

2A. General

RAINFALL SIMULATION FOR ENVIRONMENTAL APPLICATION,
Oak Ridge National Lab., TN. Environmental Sciences Div.
For primary bibliographic entry see Field 2B.
W78-06726

AN HOURLY PRECIPITATION MODEL FOR RALSTON CREEK,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
R. N. Eli, II, and T. E. Croley, II.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 310, Price codes: A09 in paper copy, A01 in microfiche. IIHR Report No. 192, August 1976. 185 p, 108 fig, 34 tab, 55 ref, 6 append. OWRT A-053-IA(5) and B-055-IA(2).

Descriptors: *Precipitation(Atmospheric), *Watersheds(Basins), *Iowa, *Model studies, Mathematical models, Rainfall, Storms, Floods, Stochastic processes, Monte Carlo method, Climatology, Meteorology, *Ralston Creek(Iowa).

A compilation and an analysis of the Iowa City Ralston Creek hourly precipitation record were made prior to the development of a stochastic data generation precipitation model intended for use in urban flooding hazard studies. The model was to be used to estimate the return periods of extreme storm events by means of extensive data generation. An unbroken historical record of 33 years of point hourly precipitation accumulations was constructed from a high density recording gage network within the watershed. A stochastic precipitation model, using statistical values computed from the historical data, was proposed for the time ocurrence and intensity of storm events. The model was constructed for each of 6 divisions of the year to represent the seasonal non-stationarity observed in the historical data. The resulting data generation model is highly efficient, allowing 33 years of hourly data to be generated in less than 30 seconds on the IBM 360 computer at the University of Iowa. Tests of historical versus generated data indicate that a very precise modeling of storm events is possible with respect to their rate of occurrence and their duration and intensity. Physical considerations support the possibility of model application to other geographical areas. (Sims-ISWS)
W78-06732

SOME STATISTICAL RELATIONSHIPS BETWEEN RAINFALL AND RUNOFF,
New Mexico Inst. of Mining and Technology, Socorro.
V. P. Singh, and Y. K. Birsoy.
Journal of Hydrology, Vol 34, No 3/4, p 251-268, August 1977. 9 fig, 12 ref. OWRT B-054-NMEX(1).

Descriptors: *Rainfall, *Runoff, *Rainfall-runoff relationships, *Model studies, Mathematical models, Distribution patterns, Precipitation(Atmospheric), Streamflow, Annual, Discharge(Water), Statistics, Statistical models, Hydrology.

Relationships were developed between statistical parameters of annual rainfall and parameters of annual runoff. The transformation of rainfall into runoff was characterized by a single linear reservoir. The relationships were compared with those available in the literature and which can be utilized to describe the statistical distribution of runoff, given the distribution of rainfall. It was shown that, for large carryover, the distribution of rainfall. It was shown that, for large carryover, the distribution of runoff always tends to be normal regardless of the distribution of rainfall. (See also W77-11986, W77-11985 and W77-09339) (Sims-ISWS)
W78-06735

UTILIZING CLIMATIC DATA TO APPRAISE POTENTIAL WATER YIELDS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W78-06850

COMPARISON OF ANNUAL STREAMFLOW MODELS,
Washington Univ., Seattle. Department of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06851

U. S. PROGRAMS IN RESEARCH DRAINAGE BASINS--AN INTERIM ASSESSMENT.
National Research Council, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 589, Price codes: A04 in paper copy, A01 in microfiche. Final Report, 1977. 64 p, 14 ref, 2 append. NSF-C310, T.O. 153.

Descriptors: *Demonstration watersheds, *International Hydrological Decade, *United States, *Research and development, Hydrology,

Watersheds(Basins), Model studies, Programs, Research priorities, Hydrologic systems, Information exchange, Publication, Water resources, Hydrologic aspects.

This report described and summarized the United States International Hydrological Decade (IHD) program in research drainage basins. The United States has a large number of basins that have been instrumented to satisfy many scientific objectives, ranging from basic water budget studies to studies of the hydrologic effects of land-use and land-treatment practices. The basis U.S. contribution to the IHD in this area was the selection of 60 research basins whose results were assured to be available for international distribution. The Work Group that prepared this final report remains convinced that research drainage basins, regardless of shortcomings in their use in many instances, remain the best means for determining hydrological relationships, for testing theoretical and empirical hypotheses, and for monitoring changes in the earth's environments. Recommendatios were made for future work. (Humphreys-ISWS)
W78-06873

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS,
Ecosystems International, Inc., Gambrille, Md.
P. A. Castruccio, H. L. Loats, Jr., and T. R. Fowler.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-18633, Price codes: A09 in paper copy, A01 in microfiche. Final Report - NAS8-30539, ECO-76: C-2-1, Gambrille, Md., January 1976. 56 fig, 24 tab, 95 ref, append.

Descriptors: *Remote sensing, *Hydrologic data, *Hydrology, *Mathematical models, *LANDSAT imagery, Planning, Driver phenomena, Peak rate model, Rainfall, Runoff, Sensitivity, Routing module, Watersheds(Basins), Systems analysis, Equations.

The launch of LANDSAT has provided water resources managers and hydrologists with broad prospects for efficient acquisition of essentially real-time data. The reduction of satellite data to practical, operational information requires a clear, easily applicable methodology for converting these data into quantitative hydrologic parameters. Summarized is the development of a model specifically structured to take full advantage of the capabilities of LANDSAT, e.g., its frequent recurrence and consequent ability to determine seasonal variations in a watershed's conditions. The effort was structured along two major routes: (1) the development of a hydrologic planning model specifically based upon remotely sensed inputs, including its test and verification from existing records: and (2) the application of LANDSAT data to supplying the model's quantitative parameters and coefficients. This first phase of the effort focused on the definition of the 'drivers'--those hydrologic processes to which peak runoff is most sensitive--upon the synthesis of a simple yet effective mod3el for the estimation of long-recurrence outflows. Next, this report describes in detail the study's second phase, which includes the development of a routing model for use in sensitivity analyses and a quantitative investigation of the accuracy and completeness of the hydrologic information which can be extracted from remotely-sensed imagery. (Bell-Cornell)
W78-07013

ON SOME MULTI-SITE MULTI-SEASON STREAMFLOW GENERATION MODELS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
J. Kindler, and W. Zuberek.
Research Memorandum RM-76-76, International Institute for Applied Systems Analysis, Laxenburg, Austria, December 1976. 94 p, 11 fig, 19 ref, append.

Descriptors: *Streamflow, *Simulation analysis, *Model studies, *Computer models, *Computer programs, Parametric hydrology, Disaggregation models, Evaluation, Monthly, Seasonal, Systems analysis, Equations.

The relative performance of some multi-site, multi-season models is compared with respect to their adequacy for simulating monthly streamflow sequences. The three models brought under examination are the extended version of the multivariate model proposed by Matalas (1967), the model formulated by Young and Pisano (1968), and the disaggregation model of Valencia and Schaake (1972). Computer implementation of these models has been accomplished in the form of the Multi-site Multi-season Streamflow Generation Package (MMSGP). Evaluation and comparison of the models has been carried out in terms of statistical flow parameters only. Some of these parameters are not explicitly built into the model structure. To conclude, some general comments concerning applicability of each model are presented. (Bell-Cornell)
W78-07014

THE ANALYSIS OF MULTIVARIATE TIME SERIES WITH A VIEW TO APPLICATIONS IN HYDROLOGY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
J. Ledolter.
Research Memorandum RM-77-11, February 1977. 33 p, 21 ref, append.

Descriptors: *Stochastic processes, *Hydrology, *Model studies, *Streamflow, Estimating, Watersheds(Basins), Simulation analysis, Autocovariance, *Multivariate time series, Equations, Systems analysis, *Time series analysis.

Discussed herein are stochastic models for vector processes, in particular the class of multivariate autoregressive moving average models. Special cases of this class have been discussed in the literature on multi-site streamflow generation and it is shown how these can be brought into a general famework. An iterative model building procedure, consisting of model specification--estimation--diagnostic checking is stressed. Results on model specification are given and it is shown how partial autocovariance matrices can be used to check whether or not multivariate autoregressive models provide adequate representation for (standardized) streamflow sequences. Furthermore, estimation of parameters in multivariate autoregressive moving average models is discussed and it is pointed out that moment estimators can be inefficient when moving average parameters are present. An approximate maximum likelihood estimation procedure is suggested. The paper concludes with a summary of important practical implications for hydrologists. (Bell-Cornell)
W78-07016

WATER RESOURCES AND NEGENTROPY,
National Research Center for Disaster Prevention, Tokyo (Japan).
M. Sugawara.
In: Mathematical Models in Hydrology, Volume 2. Proceedings of the Warsaw Symposium, Poland, July 1971. International Association of Hydrological Sciences Publication No. 101, p 876-878, 1974.

Descriptors: *Water resources, *Negentropy, *Water quality, Biological use, Desalination, Sea water, Statistical meaning, Information, Microorganisms.

In almost all cases of water use, it is not water itself but its negentropy (for example, its coolness and purity) which is consumed. From the point of view of negentropy, we can understand the substantial meaning water resources. In statistical mechanics, entropy is the measure of randomness and the negentropy is the measure of order. Therefore, water resources in a random state is poor in negentropy and consequently has small utility. The idea of entropy is also useful in information. Moreover, it is suggestive for problems of water resources. (See also W77-06708) (Bell-Cornell)
W78-07054

DECONVOLUTION AND AUTOMATIC IDENTIFICATION OF PARAMETERS IN HYDROLOGY,
Ecole Nationale Superieure des Mines de Paris (France)
Y. Emsellem, G. de Marsily, D. Poitrinal, and M. Ratsimiebo
In: Mathematical Models in Hydrology, Volume 2. Proceedings of the Warsaw Symposium, Poland, July 1971. International Association of Hydrological Sciences Publication No. 101, p 709-735, 1974. 24 fig, 35 ref.

Descriptors: *Parametric hydrology, *Unit response analysis, *Deconvolution, Hydrographs, Storms, Methodology, Rivers, Pollutants, Radioactivity, Algorithms, Systems analysis.

Unit response analysis and its possible uses in hydrology is introduced. This is already well known as the unit hydrograph used in storm analysis. Classical methods for computing the unit response of a system which sometimes lack stability and a new algorithm which does not are presented. Examples of deconvolution and its generalization to other problems of identification are given. (See also W77-06708) (Bell-Cornell)
W78-07055

A SIMPLIFIED HYDROMETEOROLOGIC MODEL AND SOME REGIONAL APPLICATIONS,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
G. Girard, J. P. Fortin, and R. Charbonneau.
In: Mathematical Models in Hydrology, Volume 2. Proceedings of the Warsaw Symposium, Poland, July 1971. International Association of Hydrological Sciences Publication No. 101, p 703-708, 1974. 4 fig, 7 ref.

Descriptors: *Reservoirs, *Computer models, *Parametric hydrology, Streamflow, Regional analysis, Evapotranspiration, Equations, Evaluation, Systems analysis.

The orignality of this distributed parameter mathematical model lies in the extreme simplicity of its vertical structure, in its very easy application to all basins (large or small and regardless of their geographical location), and also in the short time required for its execution on digital electronic computers. The model, called SIM, is presented along with results from its application to basins of widely differing areas subject to quite different climates. Conscious of the imperfections of the model and of the crude hypotheses underlying it, the authors nevertheless point out the potential usefulness of SIM to hydrologists interested in developing conceptual models, as a means of approximating the complex reality of the water cycle in the ground. (See also W77-06708) (Bell-Cornell)
W78-07056

FORMULATION AND ANALYSIS OF SOME DIMENSIONAL CRITERIA OF OPTIMIZATION,
Quebec Univ., Montreal.
For primary bibliographic entry see Field 2E.
W78-07057

USE OF A PIECEWISE LINEAR MODEL WITH SPATIAL STRUCTURE AND INPUT FOR EVALUATING AGRICULTURAL TO URBAN HYDROLOGIC IMPACT,
Agricultural Research Service, Athens, GA. Southwest Watershed Research Center.

W. C. Mills, W. M. Snyder, T. K. Woody, R. B. Slack, and J. D. Dean.
In: Proceedings of the National Symposium on Urban Hydrology, Hydraulics, and Sediment Control, July 1976. UKY Bu111, College of Engineering, University of Kentucky, Lexington, December 1976, p 215-223. 9 fig, 16 ref.

Descriptors: *Watersheds(Basins), *Linear model, *Hydrologic impact, *Land use, *Simulation analysis, Evaluation, Urban hydrology, Agriculture, Rainfall, Runoff, Grid system, Flow routing, Reservoirs, Equations, Hydrographs, Systems analysis.

A distributed watershed model that provides a framework for evaluating the hydrologic impact of change from agricultural to urban land use is described. The model incorporates a grid system for obtaining and structuring input of spatially distributed watershed and rainfall information. The SCS curve number system is used to quantify watershed soil-cover complexes and is linked to a retention function for determining effective rain and runoff. Routing of overland and channel flow is done by convolution with the impulse response of a linear reservoir. The reservoir time constant is related to Manning's flow equation and a feedback mechanism is incorporated to give piecewise linearization of the watershed response. The watershed model is tested on three instrumented watersheds by simulating runoff hydrographs and comparing them with measure hydrographs. Use of the model for evaluating hydrologic effects of urbanization is demonstrated by simulating and comparing hydrographs for several different land-use patterns. (Bell-Cornell)
W78-07061

METHOD FOR SIMULATING RIVER RUNOFF STATISTICALLY,
G. G. Svanidze.
Soviet Hydrology: Selected Papers, Vol. 15, No. 2, p 114-118, 1976. 2 tab, 1 fig, 16 ref. Translated from Transactions of the IV All-Union Hydrologic Conference (Trudy IV Vsesoyuznogo gidrologicheskogo s'yezda), Vol. 3, p 119-127, 1975.

Descriptors: *Model studies, *Runoff, *Rivers, *Statistical methods, Mathematical studies, Monte Carlo method, Markov processes, Correlation analysis, Foreign research, Foreign countries, Discharge(Water), Monthly, River flow, *USSR, Markov chain.

The solution of current problems of engineering hydrology and river runoff regulation theory, directly associated with the national use of water resources, depends largely on the use of statistical computation methods and, in particular, on the statistical simulation of hydrologic series. At the present time, hydrologic series are constructed with allowance for the intra-annual runoff distribution by the method of fragments or by direct simulation of monthly or 10-day runoff values according to the scheme of a simple or complex Markov chain. The method of fragments was used to simulate mean monthly discharges and to construct a statistical distribution function for a 2,000-year series. Agreement of this function with 80 years of mean monthly discharges was quite satisfactory. (Humphrey-ISWS)
W78-07115

2B. Precipitation

RAINFALL SIMULATION FOR ENVIRONMENTAL APPLICATION,
Oak Ridge National Lab., TN. Environmental Sciences Div.
D. S. Shriner, C. H. Abner, and L. K. Mann.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-5151, Price codes: A02 in paper copy, A01 in microfiche. Report ORNL-5151, August 1977. 28 p, 4 fig, 3 tab, 19 ref.

Descriptors: *Simulated rainfall, *Rainfall simulators, *Equipment, *Evaluation, On-site investigations, Laboratory tests, Greenhouses, Ions, Cations, Solutes, Rainfall, Precipitation(Atmospheric), Environment, Vegetation effects, Environmental engineering.

Rain simulation systems were designed for field and greenhouse studies. The systems have the capability of reproducing the physical and chemical characteristics of natural rainfall. Important parameters of natural precipitation which were duplicated include: (1) rainfall rate (intensity controllable between 0.5 and 2.7 cm/hr), (2) droplet size range (0.1 - 3.2 mm), and (3) chemical composition (metering pumps supply carefully concentrations of ions to deionized water stream). The systems permit the simulation of variations in rainfall and droplet size similar to that of the natural precipitation. The systems are completely automatic and programmable, allowing unattended operation for periods of up to one week, and have been used to expose not only vegetation, but also soils and engineering materials, making them versatile tools for studies involving simulated precipitation. (Sims-ISWS)
W78-06726

CLEARING FOG BY SEEDING WITH CHARGED WATER DROPS: A NUMERICAL STUDY,
Naval Environmental Prediction Research Facility, Monterey, CA.
For primary bibliographic entry see Field 3B.
W78-06727

AN INTERPRETIVE HISTORY OF THIRTY-YEARS (1945-1975) OF WEATHER MODIFICATION,
Florida State Univ., Tallahassee. Dept. of Statistics.
For primary bibliographic entry see Field 3B.
W78-06729

AN HOURLY PRECIPITATION MODEL FOR RALSTON CREEK,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2A.
W78-06732

A MULTIDIMENSIONAL MODEL FOR THE SYNTHESIS OF PROCESSES OF AREAL RAINFALL AVERAGES,
Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.
R. L. Lenton, and I. Rodriguez-Iturbe.
Water Resources Research, Vol 13, No 3, p 605-612, June 1977. 6 fig, 2 tab, 9 ref, 2 append. OWRT C-4118 (9021)(16), NWS 4-36738.

Descriptors: *Rainfall, *Synthesis, *Model studies, *Stochastic processes, Areal, Rainfall disposition, Mathematical models, Mathematical studies, Statistical methods, Numerical analysis, Correlation analysis, Analysis, Analytical techniques, Theoretical analysis, Spatial distribution.

The synthesis of processes of areal rainfall was treated by proposing an extension to a previous model of point rainfall synthesis. The proposed model generates sample functions of a random process of areal rainfall that preserves its areal covariance structure, but uses as input not the areal covariance itself, but the point covariance of the corresponding point rainfall process. A numerical application of the model was presented, and the practical implications of preserving areal covariance rather than point covariance when rainfall models are used in conjunction with distributed rainfall-runoff models were discussed. (See also W74-12312) (Humphreys-ISWS)
W78-06734

SOME STATISTICAL RELATIONSHIPS BETWEEN RAINFALL AND RUNOFF,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2A.
W78-06735

INFLUENCE OF INFILTRATION ON OVERLAND FLOW,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06736

SPECTRAL ANALYSIS OF HYDROMETEOROLOGICAL TIME SERIES,
Central and Southern Florida Flood Control District, West Palm Beach. Resource Planning Dept.
A. N. Shahane, D. Thomas, and P. Bock.
Water Resources Research, Vol 13, No 1, p 41-49, February 1977. 5 fig, 5 tab, 8 ref, 2 append. OWRT A-033-CONN(5).

Descriptors: *Spatial distribution, *Time series analysis, *Fourier analysis, *Meteorological data, Water vapor, Precipitation(Atmospheric), Runoff, Evapotranspiration, Storage, Watersheds(Basins), Data processing, Analytical techniques, Weather data, Hydrologic data, Meteorology, Hydrology, *Spectral analysis.

As part of the interdisciplinary methodology for exploring the characteristic behavior of the hydrometeorological components of the United States, spectral analysis (consisting of spectral density and cross-spectral density techniques) was employed to provide statistical information in frequency domain. The spectral density technique was applied to analyze the 5 years of mean monthly time series of atmospheric vapor transport, atmospheric precipitable water, runoff, precipitation, evapotranspiration, and change in storage for 76 drainage basins of the United States. And on an experimental basis, cross-spectral techniques were tried for the time series in 10 large combined drainage basins. The outcome from the spectral density analysis provides information about the spatial variation in the periodic properties of these time series over the United States, whereas the cross-spectral analysis illuminates the cross-correlation characteristics of the hydrometeorological data in light of the variations in coherence, partial coherence, and leading and lagging phase angles. (See also W77-10805; W77-03086; W76-00891; W75-09605; W75-01400 and W74-12596) (Sims - ISWS)
W78-06737

SUMMARY OF METROMEX, VOLUME 1: WEATHER ANOMALIES AND IMPACTS,
Illinois State Water Survey, Urbana.
S. A. Changnon, F. A. Huff, P. T. Schickedanz, and J. L. Vogel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 168, Price codes: A12 in paper copy, A01 in microfiche. Bulletin 62, 1977. 264 p, 95 fig, 109 tab, 138 ref. NSF ENV73-07796, GA-28189X, GA-33371, GI-38317.

Descriptors: *Weather modification, *Climatology, *Weather patterns, *Hydrology, *Illinois, *On-site investigations, Weather data, Meteorological data, Data collections, Rainfall, Storms, Synoptic analysis, Rainfall disposition, Analysis, Analytical techniques, Instrumentation, Networks, Diurnal distribution, Distribution patterns, Water resources, Hail, Cities, Ecology, Agriculture, Water quality, Orography, Seasonal, Frequency, Spatial distribution, *METROMEX, Weather anomalies, Thunder, Weather impacts.

This is the first of two volumes presenting the major findings from the 1971-1975 METROMEX field operations at St. Louis. It focused on final interpretations and conclusions obtained primarily through climatological-statistical analyses of spatial and temporal distributions of surface precipitation and severe storms. It also addressed the impacts related to the urban-produced precipitation anomalies. Volume 2 concerned the causes of the anomalies. Key climatic effects are increased cloudiness (+10%), increased total summer rainfall (+30%), and increased severe storm activity (+100%). These increases occur over the city and 10 to 25 miles beyond (east) the urban-industrial areas. The urban-induced anomalies occur most often with squall lines and cold fronts; they maximize in the afternoon and again at night (2100-2400); they appear to be as active in dry periods as in wet periods. Impacts include more runoff, but also more local flooding, soil erosion, silting, and water pollution. The effect of altered weather leads to a 3 to 4% average increase in local crop yields. The urban-induced anomalies are not generally beneficial in the floodplain area and have mixed impacts in the rural uplands. (Humphreys-ISWS)
W78-06738

UTILIZING CLIMATIC DATA TO APPRAISE POTENTIAL WATER YIELDS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
R. L. Smith.
In: Design of Water Resources Projects With Inadequate Data, Volume 2; Proceedings of the Madrid Symposium, June 1973: International Association of Hydrological Sciences Publication No. 108 (2 Vol), p 253-264, 1974. 4 fig, 1 tab, 10 ref. OWRT B-041-KAN(1).

Descriptors: *Water yield, *Watersheds(Basins), *Water supply, *Water balance, Flow duration, Water resources, Hydrology, Hydrologic aspects, Runoff, Runoff coefficient, Surface waters, Groundwater, Temperature, Climatic data, Precipitation(Atmospheric), Streamflow, Analysis, Analytical techniques, Inadequate data, Ungaged areas.

Precipitation and temperature measurements often represent the only significant hydrologic data available in developing areas. Initial assessments of potential surface and groundwater supplies must build on this limited climatic base. Early in the planning studies there is need for an accurate estimate of mean annual streamflow and of the probable variance in annual flows. These determinations can be made utilizing an empirical function relating the mean annual runoff coefficient to the aforementioned climatic parameters. The relationships have been tested in a wide range of environments, and their general utility can be extended appreciably with limited surface and subsurface observations. Applicability of the recommended relationships was demonstrated by selected case studies involving a variety of problems. Included were examples illustrating the calculation of: (1) mean yields for ungaged areas, (2) the probability distribution of annual flows for ungaged areas, (3) daily flow duration curves, (4) potential yield of selected groundwater areas, and (5) the potential impact of precipitation augmentation on surface water supplies. (See also W78-03783) (Humphreys-ISWS)
W78-06850

REPORT ON THE HAIL SUPPRESSION PROGRAM AT NELSPRUIT, TRANSVAAL, REPUBLIC OF SOUTH AFRICA,
Simpson Weather Associates, Charlottesville, VA.; and Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 3B.
W78-06875

CHICAGO AREA PROGRAM: A MAJOR NEW ATMOSPHERIC EFFORT,
Illinois State Water Survey, Urbana.
S. A. Changnon, Jr., and R. G. Semonin
Bulletin of the American Meteorological Society, Vol. 59, No. 2, p 153-160, February 1978. 3 fig, 1 tab, 12 ref.

Descriptors: *Projects, *Weather, *Lake Michigan, *Illinois, *Indiana, Rainfall, Weather modification, Pollutants, Storms, Urban runoff, Networks, Rain gages, Instrumentation, Lakes, Cities, Meteorology, *Chicago(Ill).

A series of mesoscale meteorological research projects have developed since 1975 in the area over and around the south end of Lake Michigan. These regionally focused projects, under the label of the Chicago Area Program (CAP), are being performed by scientists from 12 research groups or universities using funds from a variety of state and federal agencies. Efforts to date have led to the installation and operation of a major rain gage network, other weather networks and sondes, several weather radars, meteorological aircraft, and a ship. This sizeable program is addressing five major study areas including lake meteorology, water resources and hydrometeorology, inadvertent weather modification, air pollution and its impacts, and severe weather. Multigroup field experiments and the exchange of data are coordinated at the scientist level. (Sims-ISWS)
W78-06885

AN AVERAGE GEOPOTENTIAL SEA LEVEL SERIES FOR THE UNITED STATES,
National Ocean Survey, Rockville, MD.
For primary bibliographic entry see Field 2L.
W78-06890

GLACIAL LOESS--IS IT REALLY GLACIAL,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
For primary bibliographic entry see Field 2C.
W78-06899

SEEDABILITY OF WINTER OROGRAPHIC STORMS IN UTAH,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 3B.
W78-06926

COMPUTER MODELING OF CUMULUS CLOUDS DURING PROJECT CLOUD CATCHER,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W78-06927

RELATION OF BULK PRECIPITATION AND EVAPOTRANSPIRATION TO WATER QUALITY AND WATER RESOURCES, ST. THOMAS, VIRGIN ISLANDS,
Geological Survey, Atlanta, GA. Water Resources Div.; and Geological Survey, Reston, VA. Water Resources Division.
For primary bibliographic entry see Field 2D.
W78-06934

APPLICATION OF THE KALMAN FILTER TO CYCLONE FORECASTING 3. HURRICANE FORECASTING 4. ADDITIONAL TYPHOON FORECASTING,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
K. Takeuchi.
Research Memorandum RM-76-62, July 1976. 38 p, 10 fig, 5 tab, 2 ref.

Descriptors: *Kalman filter, *Hurricanes, *Forecasting, Linear regression models, Equations, Cyclones, Error covariance matrices, Computer models, Systems analysis.

This is the second part of a report on application of the Kalman filter to cyclone forecasting. Following the preliminary experiments of typhoon forecasting, this paper presents the results of hurricane experiments and further typhoon experiments. The 12 and 24 hour forecasting NHC72 model and the 24 hour forecasting SN1 model developed by the National Hurricane Center, NOAA, USA and the Japan Meteorological Agency, respectively, were examined. The improvements obtained by using the Kalman filter over the original models were found to be roughly 10% for hurricane forecasting and 20% for 24-hour typhoon forecasting, on the average, in terms of vector errors. The conclusion drawn by the previous experiments was reconfirmed. The application of the Kalman filter to utilize better simple linear regression models is effective when the original regression model gives consecutively biased forecasts for a considerably long time. It is not effective when the performance of the original model is poor, yet its residual errors are not highly correlated. In addition, a statistical test of the validity of forecasting regression models showed that the structure of the model should be further improved before considering application of the Kalman filter. (Bell-Cornell)
W78-07015

ACCELERATION OF DESSICATION AND POPULATION TRAUMA IN SUB-SAHARAN AFRICA,
Indiana Univ., Bloomington. Dept. of Geography.
For primary bibliographic entry see Field 6G
W78-07036

PROBABLE EFFECT OF SUMMER WEATHER MODIFICATION ON RUNOFF,
Agricultural Research Service, Boise, ID. Northwest Watershed Research Center.
For primary bibliographic entry see Field 3B.
W78-07086

THE RAIN PARAMETER DIAGRAM: METHODS AND APPLICATIONS,
Clemson Univ., SC. Dept. of Physics and Astronomy.
C. W. Ulbrich, and D. Atlas.
Journal of Geophysical Research, Vol. 83, No. C3, p 1319-1325, March 20, 1978. 6 fig, 20 ref.

Descriptors: *Rainfall, *Analytical techniques, *Radar, *Remote sensing, Data processing, Rain, Raindrops, Particle size, Equations, Meteorology, Rainfall parameters, Diagrams, Rainfall-radar relationships, Water content, Radar reflectivity.

A rain parameter diagram was presented which displays the relationships between all rainfall parameters defined in terms of an exponential drop size distribution. Special emphasis was given to remotely measurable quantities such as radar reflectivity, microwave attenuation, and optical extinction. Although an exponential distribution was used to construct the diagram, it was shown to have general application for arbitrary size distributions and for a wide variety of rainfall-related problems. Some of the problems were: (1) analysis of the sources of error which result from the use of empirical rainfall relations, (2) depiction of the physical differences between different types of rainfall and of the similarity between all empirical relations which apply to the same type of rainfall, and (3) determination of the accuracy with which remote measurements must be made to obtain accurate measurements of rain parameters. A set of overlays was shown for four common radar wavelengths and for four temperatures which display the relationships between microwave attenuation and the other rainfall parameters. Methods were discussed by which these diagrams can be used to determine rainfall parameters remotely in

dual-measurement techniques. The diagrams also can be used to find in these rainfall parameters the errors which result from errors in the two quantities involved in the dual-measurement technique. (Sims-ISWS)
W78-07106

TIME-RESOLVED HAILSTONE ANALYSES AND RADAR STRUCTURE OF SWISS STORMS,
Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. fuer Atmosphaerenphysik.
B. Federer, and A. Waldvogel.
Quarterly Journal of the Royal Meteorological Society, Vol. 104, No. 439, p 69-90, January 1978. 18 fig, 3 tab, 47 ref.

Descriptors: *Hail, *Sampling, *Radar, Precipitation(Atmospheric), Storms, Rainfall, Classification, Foreign countries, Statistics, Foreign research, Data processing, Cloud physics, Meteorology, *Switzerland.

Time-resolved, quenched, hailstone size distributions for five hailstorms simultaneously monitored by 10 cm and 3 cm radar (in the PPI and RHI mode, respectively) were measured. A total of 1,220 hailstones were sectioned, and the embryo types (rimed embryos of frozen drop embryos) were classified according to the crystallographic and bubble structure of the center unit and the initial growth layer. For three hailstones the trajectories deduced from crystallography were checked by deuterium analyses. The most important findings were: (1) In storms with relatively warm cloud bases, a big-top zone containing large drops which freeze and become efficient hal embryos exists. (2) The time variation of the parameters of the hailstone spectra reveals the fundamental storm dynamics (multicell or steady-state). (3) Variability of embryo types is smaller in steady-state storms than in multicellular storms, implying that hail formation zones are regions of rather uniform temperature and liquid water content in steady-state storms; whereas in multicell storms, growth occurs in a more heterogeneous environment, possibly in different updraft branches. (4) The two embryo growth mechanisms-riming, and freezing of supercooled drops-coexist in the storms. (5) A characteristic change of embryo type with time is observed consistently in the storms. (6) The size frequency distributions of those frozen drops whose diameters could be measured showed a maximum at 2 mm; this can be explained by 'freezing' an exponential spectrum of raindrops according to the stochastic hypothesis. (Sims-ISWS)
W78-07111

SCHEDULING OF NON-STATIONARY HOURLY PRECIPITATION,
Iowa Univ., Iowa City. Inst. of Hydrological Research.
R. N. Eli, II, and T. E. Croley, II.
(1975). 10 p, 5 fig, 4 tab, 13 ref. OWRT A-053-IA(1).

Descriptors: *Model studies, *Precipitation(Atmospheric), *Precipitation intensity, History, *Iowa, *Storm occurrence model, *Hourly precipitation, Persistence models.

An analysis of the Iowa City Ralston Creek hourly precipitation record was conducted prior to construction of data generation models to be used in an urbanization-flooding hazard study. The historical record of hourly precipitation was constructed from a high density recording gage network within the watershed, with an unbroken length of 33 years (50 years with some discontinuities). A stochastic precipitation model is proposed on phenomenological terms for the time occurrence of storm events. Wet time intervals are scheduled using models for inter-arrival times. Traditional computation difficulties are circumvented in modeling certain time-related persistence effects through the use of independent random variables. The models are presented, described, fit to the data, and discussed; future work is outlined. (Seip-IPA)
W78-07124

2C. Snow, Ice, and Frost

ICE SHEET LOADS ON MARINA PILES,
Federal Highway Administration, Springfield, IL. Illinois Div.
For primary bibliographic entry see Field 8B.
W78-06715

WEST ANTARCTIC ICE SHEET AND CO2 GREENHOUSE EFFECT: A THREAT OF DISASTER,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
For primary bibliographic entry see Field 5B.
W78-06721

PASSIVE MICROWAVE MAPPING OF ICE THICKNESS,
Ohio State Univ., Columbus. Dept. of Electrical Engineering.
J. J. Apinis, and W. H. Peake.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-10611, Price codes: A08 in paper copy, A01 in microfiche. Final Report 3892-2, August 1976. 155 p, 51 fig, 13 tab, 102 ref, 1 append.

Descriptors: *Remote sensing, *Ice cover, *Model studies, Mathematical models, Theoretical analysis, Satellites(Artificial), Ice, Snow, Sea ice, Lake ice, Glaciers, Microwaves, Mapping, Ice thickness, Microwave radiometers.

Basic calculations are presented from which the feasibility of a scanning microwave radiometer system for mapping the thickness of lake ice may be evaluated. An analytical model for the apparent brightness temperature as a function of ice thickness was developed and elaborated to include such variables as galactic and atmospheric noise, aspect angle, polarization, temperature gradient in the ice, the presence of transition layers such as snow, slush, and water, increased loss due to air inclusions in the ice layer, and the presence of multiple ice thicknesses within the antenna footprint. It was found that brightness temperature measurements at six or seven frequencies in the range of 0.4 to 0.7 GHz were required to obtain unambiguous thickness estimates. A number of data processing methods were examined; a minimum-distance algorithm and a ternary brightness temperature quantization scheme were found to give accuracies of about 1 cm for ice thicknesses up to one meter. A brief system study of the effects of antenna beamwidth, scanning rate, receiver bandwidth, noise figure, and integration time showed that the receiver sensitivity requirements could be met with state-of-the-art components. The radiometric system was found to fail for sea ice thickness measurement due to the very high losses of sea ice. (Sims-ISWS)
W78-06728

SNOW BACKSCATTER IN THE 1-8 GHZ REGION,
Kansas Univ./Center for Research, Inc., Lawrence. Remote Sensing Lab.
H. Stiles, F. Ulaby, B. Hanson, and L. Dellwig.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-16193, Price codes: A03 in paper copy, A01 in microfiche. RSL Technical Report 177-61, June 1976. 105 p, 46 fig, 1 tab, 24 ref, 2 append. NASA NAS9-10261.

Descriptors: *Snow, *Microwaves, *Remote sensing, Radar, Physical properties, Moisture content, Snowpacks, Measurement, Depth, Ice, On-site investigations, Equipment, Soil water, Soil temperature, Snow water content.

The 1-8 GHz Microwave Active Spectrometer (MAS 1-8) system was used to measure the backscatter response of snow covered ground between 21 February and 23 April 1975. The scattering coefficient was measured for all linear polarization combinations at angles of incidence between nadir and 70 deg. Ground truth data consisted of soil moisture, soil temperature profile, snow depth, snow temperature profile, and snow water equivalent. The results of the experiment indicated that the radar sensitivity to snow water equivalent increases in magnitude with increasing frequency and is almost angle independent for angles of incidence higher than 30 deg, particularly at the higher frequencies. In the 50-70 deg angular range and in the 6-8 GHz frequency range, the sensitivity is typically between -0.4 dB/.1 g/sq m and -0.5 dB/.1 g/sq m, and the associated linear correlation coefficient has a magnitude of about 0.8. (Sims-ISWS)
W78-06731

APPARENT ANOMALY IN FREEZING OF ORDINARY WATER,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 1A.
W78-06882

THE PREDICTION OF UNFROZEN WATER CONTENTS IN FROZEN SOILS FROM LIQUID LIMIT DETERMINATIONS,
Cold Regions Research and Engineering Lab., Hanover, NH.
A. R. Tice, D. M. Anderson, and A. Banin.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 632, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-8, April 1976. 13 p, 8 fig, 1 tab, 30 ref. DA 4A161102AT24.

Descriptors: *Frozen soils, *Permafrost, *Liquid limits, *Soil mechanics, *Frozen ground, Ice, Soil types, Thawing, Tundra, Freezing, Environmental effects, Soil properties, Earth materials, Soil stability, Soil chemical properties.

During the past decade a number of methods for measuring the amount of unfrozen water in partially frozen ground have emerged. Means of quickly and simply predicting unfrozen water contents in clay have become increasingly important with the growth of interest in encapsulating clay soils compacted at low water contents to serve as base courses for roads. Unfortunately the measurements require sophisticated equipment and, in most instances, specially trained operators. In an effort to simplify the task of obtaining water-ice phase composition data, methods of calculating phase composition curves from other, simpler measurements on soils have been sought. In this paper a method was presented of deriving the measurement of unfrozen water contents at various temperatures from liquid limit determinations. Previous studies have indicated that phase composition curves can be well represented by a simple power equation, W sub u = alpha times theta to the beta power, where W sub u is the unfrozen water content in g H2O/g soil, theta is the temperature in degrees below freezing and alpha and beta are empirical constants characteristic of a given soil. When the liquid limits of a large group of soils encompassing a wide range of textures were regressed against values of alpha, the correlation was found to be remarkably good. This has permitted the development of a prediction equation of sufficient accuracy for general engineering use. (Henley-ISWS)
W78-06883

INTERPRETATION OF THE TENSILE STRENGTH OF ICE UNDER TRIAXIAL STRESSES,
Cold Regions Research and Engineering Lab., Hanover, NH.
D. E. Nevel, and F. D. Haynes.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A027 042, Price codes: A02 in paper copy, A01 in microfiche. CRREL Report 76-5, April 1976. 12 p, 7 fig, 12 ref.

Descriptors: *Ice, *Tensile strength, *Tensile stress, *Model studies, Mathematical models, Strength, Stress, Theoretical analysis, Snow, Mechanical properties.

Griffith, and later Babel, have developed previously a tensile fracture criterion for a two-dimensional state of stress. This theory was extended to the compression-compression region. From this theory, the angle of fracture was developed. The theory was extended conceptually to three dimensions. Triaxial test data by Haynes for snow-ice were shown in this three-dimensional fracture theory. The test data were slightly less than those predicted when the void in the snow-ice is spherical. (Sims-ISWS)
W78-06884

ARAPAHO ROCK GLACIER, COLORADO FRONT RANGE,
Eastern Illinois Univ., Charleston. Dept. of Geography and Geology.
R. G. Wallace.
Transactions of the Illinois State Academy of Science, Vol. 69, No. 4, p 415-424, December 1977. 3 fig, 19 ref.

Descriptors: *Glaciers, *Rocks, *Colorado, *Rocky Mountain region, Ice, Movement, Melting, On-site investigations, Mountains, Cirques, Geology, Glaciology, Rock glaciers, Front Range(Colo).

Considerable field evidence, such as ridge and furrow patterns, steep fronts, lichen growth, and other data from plane table surveys, along the Colorado Front Range shows that rock glaciers there have moved in the past and are moving presently. This study showed that Arapaho rock glacier, which occupies part of a cirque at the head of Arapaho Valley west of Boulder, Colorado, has an ice glacier buried beneath rock cover in the upvalley one-third of glacier, and the downvalley two-thirds contains rock debris and interstitial ice. The buried glacier may be helpful, but it is not essential, in the movement of this rock glacier, rather, interstitial ice is probably the primary factor. Arapaho rock glacier may have originated when interstitial ice developed in accumulations of talus at the front of the present buried rock glacier. (Sims-ISWS)
W78-06886

GLACIAL LOESS--IS IT REALLY GLACIAL,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
J. M. Moran.
Transactions of the Illinois State Academy of Science, Vol. 69, No. 4, p 479-484, December 1977. 1 fig, 15 ref.

Descriptors: *Loess, *Glaciers, *Paleoclimatology, Soils, Glacial soils, Erosion, Wind erosion, Flood plains, Melt water, Sedimentation, Glacial sediments, Silts, Geology, Climatology.

Glacial-nonglacial climatic shifts exhibit an episodic or square-wave behavior, while the growth-decay response of glacial ice approximates a normal curve. If this model is realistic, Laurentide melt-water discharge and alluviation along proglacial drainageways peaked several thousand years after the last major Wisconsinan climatic shift from dominantly glacial to dominantly nonglacial regimes. This also implies that the principal period of wind erosion of floodplain deposits (and loess accumulation) occurred during climatic episodes that were distinctly nonglacial. (Sims-ISWS)
W78-06899

SEEDABILITY OF WINTER OROGRAPHIC STORMS IN UTAH,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 3B.
W78-06926

PRODUCTION PROCESSES UNDER THE ICE IN LAKE ST. CLAIR I. IRRADIATION AND TEMPERATURE,
Windsor Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-07039

PRODUCTION PROCESSES UNDER THE ICE IN LAKE ST. CLAIR II. NUTRIENTS (SILICATE) AS A LIMITING FACTOR,
Windsor Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-07040

GEOGRAPHIC INVESTIGATIONS OF SNOW AVALANCHES AND MUDFLOWS,
Moscow State Univ., Moscow (USSR). Lab. of Snow Avalanche and Mudflow Problems.
G. K. Tushinskiy, and S. M. Fleyshman.
Soviet Hydrology: Selected Papers, Vol. 15, No. 2, p 163-166, 1976. 2 fig. Translated from Herald of Moscow University (Vestnik Moskovskogo universiteta, No. 3, p 62-69, 1976.

Descriptors: *Avalanches, *Mudflows, *Maps, *Foreign countries, Snow, Regions, Hazards, Foreign research, Laboratories, Research and development, *USSR.

The huge territory of the Soviet Union includes a large number of mountains and high-mountain regions. Snow avalanches and mudflows are typical of almost all of them. One of the main tasks of the Laboratory of Snow Avalanche and Mudflow Problems is to forecast the site of avalanches and mudflows. A second and equally important task of the Laboratory is to study the physics and mechanics of formation, movement, and deposition of snow avalanches and mudflows for the purpose of improving control measures under various physiographic conditions. Creep and compaction were studied experimentally and theoretically, and some patterns in the changes of snow during these processes were identified. Two general maps showed the distribution of mudflow hazard regions and avalanche hazard regions. Varying degrees of hazard were indicated. (Humphreys-ISWS)
W78-07117

GLACIER SURVEYS IN BRITISH COLUMBIA - 1972,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
I. A. Reid, and J. O. G. Charbonneau.
Report Series No. 54, 1978, 19 p, 10 fig, 8 ref, 31 tab, 5 maps.

Descriptors: *Glaciers, *Surveys, Streamflow, Maps, Runoff, Methodology, Photogrammetry, Analytical techniques, Water quantity, On-site investigations, Mathematics, *Canada, *British Columbia, Volumetric changes, Directional changes, Areal changes, Linear changes, Sentinel Glacier, Sphinx Glacier, Nadahini Glacier, Kokanee Glacier, Bugaboo Glacier.

Glaciers act as natural regulators, storing water in winter and releasing it in summer. To gain some understanding of this phenomenon and the contribution which glaciers make to streamflow, the predecessors of the Water Survey of Canada began glacier surveys in 1945. The earlier surveys offered some clue to the role of the glacier, but the data collected were not sufficient to provide the overall picture. Following adoption of photogrammetric survey techniques, however, the glacier surveys have evolved to the extent that it is now feasible to produce a series of maps from which the linear, areal, directional and volumetric changes can be determined. The surveys have revealed that the glaciers, in general, are becoming smaller in size; hence the regulating effect on streamflow is diminishing. (WATDOC)
W78-07169

2D. Evaporation and Transpiration

SPECTRAL ANALYSIS OF HYDROMETEOROLOGICAL TIME SERIES,
Central and Southern Florida Flood Control District, West Palm Beach. Resource Planning Dept.
For primary bibliographic entry see Field 2B.
W78-06737

GEOLOGICAL APPLICATIONS OF NIMBUS RADIATION DATA IN THE MIDDLE EAST,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W78-06869

RELATION OF BULK PRECIPITATION AND EVAPOTRANSPIRATION TO WATER QUALITY AND WATER RESOURCES, ST. THOMAS, VIRGIN ISLANDS,
Geological Survey, Atlanta, GA. Water Resources Div.; and Geological Survey, Reston, VA. Water Resources Division.
D. G. Jordan, and D. W. Fisher.
Available from Branch of Distribution, USGS 1200 S. Eads St., Arlington, VA 22202, price $1.40. Water-Supply Paper 1663-I, 1977. 130 p, 12 fig, 4 tab, 13 ref.

Descriptors: *Rainfall, *Fallout, *Water quality, *Evapotranspiration, *Virgin Islands, Surface waters, Groundwater recharge, Chemical properties, Base flow, Evaluation, *St. Thomas(Virgin Islands), *Bulk precipitation, Maritime environment.

St. Thomas, Virgin Islands, is composed almost entirely of volcanic rocks mantled by a thin soil seldom more than 2 feet thick. Rainfall, averaging about 40 inches annually, has an orographic distribution related to the central ridge of the island, altitude 600 to 1500 feet, and the easterly to northeasterly trade winds. The mineral content of bulk precipitation falling on the island is derived principally from the sea although soil dust contributes much of the calcium, sodium, and bicarbonate. Two-thirds of the sulfate in the precipitation is provided by sea salts; the remainder is derived from other sources. The concentration of the constituents of bulk precipitation fluctuates widely month to month, but the load of the constituents shows little monthly variation. Bulk precipitation is concentrated on the land surface and in the soil zone. From there it is carried into the ground water during recharge or is removed by storm-water runoff. It is the principal source of minerals in the waters of the island. Soil-moisture demand and evaporation limits recharge to 1 and 2 inches annually for the greater part of the island. Evapotranspiration also occurs directly from the aquifer. The salts left further increase the mineralization of the ground water. Water loss from the aquifer by evapotranspiration ranges from 40 to 80 percent of the recharge. (Woodard-USGS)
W78-06934

WATER EVAPORATION FROM THE SOIL IN THE MAIN TYPES OF FORESTS IN THE BELORUSSIAN POLES'YE,
Belorussian Scientific Research Inst. of Forest Management, Minsk (USSR).
M. F. Andreychik.
Soviet Hydrology: Selected Papers, Vol. 15, No. 3, p 250-255, 1976. 3 fig, 4 tab, 20 ref. Translated from Lesovedeiya, No. 2, p 18-26, March-April 1976.

Descriptors: *Evaporation, *Soil, *Forests, *Vegetation effects, Moisture content, Trees, Pine trees, Vegetation, Evapotranspiration, Soil horizons, Heat transfer, Solar radiation, Forestry, *USSR.

The heat exchange and phase transformations of water in the upper 20 cm of the root zone in tree stands of varying density of the most common types of forests were analyzed. Evaporation was determined from the heat budget of the soil during the growing periods of 1971-73. The nature of hydrophysical processes in tree stands of a density of 0.7 was found to be much more distinct than in stands with a density of 0.9-1.1. For example, internal evaporation in the root zone of stands of moderate density was 2-5 times higher than in high-density stands. (Sims-ISWS)
W78-07113

2E. Streamflow and Runoff

AN HOURLY PRECIPITATION MODEL FOR RALSTON CREEK,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 2A.
W78-06732

SOME STATISTICAL RELATIONSHIPS BETWEEN RAINFALL AND RUNOFF,
New Mexico Inst. of Mining and Technology, Socorro.
For primary bibliographic entry see Field 2A.
W78-06735

INFLUENCE OF INFILTRATION ON OVERLAND FLOW,
Missouri Univ., Columbia. Dept. of Civil Engineering.
A. T. Hjelmfelt, Jr.
Journal of Hydrology, Vol 36, No 1/2, p 179-185, January 1978. 3 fig, 5 ref. OWRT A-076-MO(2).

Descriptors: *Overland flow, *Infiltration, *Model studies, Mathematical models, Runoff, Precipitation(Atmospheric), Rainfall, Infiltration rates, Flow, Storage, Hydrographs, Equations, Hydrology, Wave equations.

A mathematical model of overland flow with constant rainfall intensity but with varying infiltration rate was presented. The flow was described by the kinematic wave equations and the infiltration by the U.S. Soil Conservation Service storage-depletion process. The outflow hydrograph was determined for various infiltration conditions and compared with measured hydrographs. The influence of infiltration on the time of concentration also was indicated. (Sims-ISWS)
W78-06736

SPECTRAL ANALYSIS OF HYDROMETEOROLOGICAL TIME SERIES,
Central and Southern Florida Flood Control District, West Palm Beach. Resource Planning Dept.
For primary bibliographic entry see Field 2B.
W78-06737

FLOOD HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 6F.
W78-06786

NONSTATIONARY STREAMFLOW FROM URBANIZING WATERSHEDS: A CASE STUDY,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 4C.
W78-06823

COMPARISON OF ANNUAL STREAMFLOW MODELS
Washington Univ., Seattle. Department of Civil Engineering.
S. J. Burges, and D. P. Lettenmaier.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY9, Proceedings Paper 13194, p 991-1006, September 1977. 9 fig, 1 tab, 23 ref, 2 append. OWRT A-078-WASH(2).

Descriptors: *Streamflow, *Model studies, *Mathematical models, Annual, Statistical models, Markov processes, Flow, Correlation analysis, Forecasting, Precipitation(Atmospheric), Runoff, Streams, Rivers, Hydrology.

The operational importance of the form of an annual synthetic streamflow model and the level of its parameters were investigated. Both short-term and long-tern memory models were used to generate flow traces which were run through the Thomas-Fiering Sequent Peak Algorithm. Population parameters were used in the models in all cases. Operation life was held constant at 40 yrs. The coupled flow generation-flow demand situations examined showed the marginal distribution parameters to be much more important, even in cases where substantial long-term persistence is present, than had earlier been thought. The most important conclusion to be drawn from the test is that the effect of uncertainty in any of the model parameters cannot be dismissed a priori; failure to estimate and to model accurately the marginal distribution as well as the correlation structure of flow may result in substantial design errors. (Sims-ISWS)
W78-06851

A DISTRIBUTED KINEMATIC MODEL OF UPLAND WATERSHEDS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4D.
W78-06876

COMPUTATION OF THE ROUGHNESS OF GRASS COVERS OF DRAINAGE CHANNELS,
For primary bibliographic entry see Field 8B.
W78-06901

MEAN ANNUAL RUNOFF IN THE UPPER OHIO RIVER BASIN, 1941-70, AND ITS HISTORICAL VARIATION,
Geological Survey, Reston, VA. Water Resources Div.
R. M. Beall.
Available from the Supt. of Documents, GPO, Washington, DC 20402. Price $2.00. Water-Supply Paper 2042, 1978. 32 p, 6 fig, 1 plate, 4 tab, 9 ref.

Descriptors: *Average runoff, *Ohio River, *Tributaries, *Streamflow, *Flow rates, Annual, River basins, Hydrologic data, Drainage area, Gaging stations, *Upper Ohio River basin, Mean annual runoff, 30-year reference period, Historical variation.

A map of the Ohio River basin above the Muskingum River shows patterns of mean annual runoff for the new climatologic and hydrologic reference period, 1941-70, and provides an up-to-date, consistent basis for consideration of this streamflow characteristic. The primary data base consisted of 98 long-term gaging-station records collected within this 27,300-square-mile headwater area of the Ohio River basin. Supplemental information was derived from 83 short-term records. Mean annual runoff is at a regional minimum of less than 12 inches in an area extending from the northern West Virginia panhandle to the headwaters of the Mahoning River in Ohio. Mean annual runoff of more than 32 inches occurs in parts of the upper Cheat River basin in West Virginia. The zone of high runoff trends northeastward along the western slopes of the Allegheny Mountains; magnitudes diminish to about 25 inches at the eastern basin boundary near Ebensburg, Pa. Runoff of this magnitude occurs also in a band across the upper Allegheny River basin in Pennsylvania. Ratios of mean annual discharge to the 30-year reference-period average were computed for each year of record for all long-term gaging stations. Annual discharges have ranged from about 30 percent to 200 percent of the 30-year mean. (Woodard-USGS)
W78-06932

APPLICATION OF A MATHEMATICAL MODEL TO ESTIMATE WATER LEVELS,
Geological Survey, Reston, VA. Water Resources Div.; and Geological Survey, Boston, MA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06944

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS,
Ecosystems International, Inc., Gambrille, Md.
For primary bibliographic entry see Field 2A.
W78-07013

ON SOME MULTI-SITE MULTI-SEASON STREAMFLOW GENERATION MODELS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2A.
W78-07014

THE ANALYSIS OF MULTIVARIATE TIME SERIES WITH A VIEW TO APPLICATIONS IN HYDROLOGY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2A.
W78-07016

DECONVOLUTION AND AUTOMATIC IDENTIFICATION OF PARAMETERS IN HYDROLOGY,
Ecole Nationale Superieure des Mines de Paris (France).
For primary bibliographic entry see Field 2A.
W78-07055

FORMULATION AND ANALYSIS OF SOME DIMENSIONAL CRITERIA OF OPTIMIZATION,
Quebec Univ., Montreal.
J. P. Fortin, R. Charbonneau, J. Lefevre, and G. Girard.
In: Mathematical Models in Hydrology, Volume 2. Proceedings of the Warsaw Symposium, Poland, July 1971. International Association of Hydrological Sciences Publication No. 101, p 548-557, 1974. 4 fig, 6 ref.

Descriptors: *Simulation analysis, *Automatic optimization, *Hydrology, Flow, Equations, *Optimization.

Criteria which are dimensional, such as the standard error of estimate or any derived or analogous formula, lead to different values for a similar relative precision according to the order of magnitude of the flow. Thus, the authors suggest a certain number of non-dimensional criteria in order not only to judge the quality of the simulation, but also with a view to the choice of an automatic optimization criterion. They have analyzed the sensitivity of those criteria in a few cases which could occur in reality. Even if the parameter being optimized remains the essential element in determining the choice of a criterion, results seem to indicate that one of these criteria behaves well in all known cases and is relatively sensitive and reliable both in periods of low and high flow. (See also W77-06708) (Bell-Cornell)
W78-07057

PENN STATE RUNOFF MODEL FOR THE ANALYSIS OF TIMING OF SUBWATERSHED RESPONSE TO STORMS,
Weston (Roy F.), Inc., West Chester, PA.
For primary bibliographic entry see Field 5G.
W78-07060

A NEW MULTIVARIATE GAMMA DISTRIBUTION AND ITS FITTING TO EMPIRICAL STREAMFLOW DATA,
Technical Univ. of Budapest (Hungary). Dept. of Mathematics.
A. Prekopa, and T. Szantai.
Water Resources Research, Vol. 14, No. 1, p 19-24, February 1978. 1 tab, 21 ref.

Descriptors: *Streamflow, *Model studies, *Mathematical models, Stochastic processes, Probability, Rivers, Streams, Equations, Mathematics, Statistics, Statistical models, Hydrology, *Gamma distributions.

A new multivariate gamma distribution was presented which can be fitted successfully to empirical data where the one-dimensional marginal distributions are gamma distributions with prescribed parameters and the correlations are nonnegative. It was not intended to give explicit formulae either for the joint density or for the joint characteristic function of the random variables. This representation of the individual gamme-distributed random variables was used for simulation, with the aid of which probabilities of sets in higher-dimensional spaces were approximated. Since streamflow and other hydrological data frequently follow gamma distribution and also they are frequently stochastically dependent, this multivariate distribution and fitting technique seemed to be of particular interest from the hydrological point of view. (Sims-ISWS)
W78-07089

COMPARISON OF THE TWO- AND THREE-PARAMETER LOG NORMAL DISTRIBUTIONS USED IN STREAMFLOW SYNTHESIS,
Stanford Univ., CA. Dept. of Civil Engineering.
R. J. Charbeneau.
Water Resources Research, Vol. 14, No. 1, p 149-150, February 1978. 5 ref.

Descriptors: *Streamflow, *Synthetic hydrology, *Model studies, *Mathematical models, Synthesis, Equations, Mathematics, Hydrology, Log normal models.

A direct solution was found for the algebraic system of equations relating the statistics of an observed flow sequence to those of the three-parameter log normal distribution. This solution can be used to compare the two- and three-parameter log normal distributions. (Sims-ISWS)
W78-07093

HISTORICAL STREAMFLOW SUMMARY, ALBERTA, TO 1976.
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C
W78-07165

MATHEMATICAL MODELLING OF SEDIMENT-LADEN FLOWS IN NATURAL STREAMS,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-07173

2F. Groundwater

QUARTERNARY EVOLUTION IN TAMA COUNTY, IOWA,
Queen's Univ., Kingston (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 2J.
W78-06827

GEOLOGICAL APPLICATIONS OF NIMBUS RADIATION DATA IN THE MIDDLE EAST,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W78-06869

ESTIMATING TRANSMISSIVITY AND STORAGE COEFFICIENT FROM ABSTRACTION WELL DATA,
Birmingham Univ. (England). Dept. of Civil Engineering.
K. R. Rushton.
Ground Water, Vol. 16, No. 2, p 81-85, March-April 1978. 6 fig, 2 tab, 4 ref.

Descriptors: *Transmissivity, *Storage coefficient, *Well data, *Model studies, Mathematical models, Water wells, Water levels, Groundwater, Groundwater movement, Aquifers, Pumping, Drawdown, Recharge, Hydrology.

A numerical model for analyzing pumping tests was used to estimate the transmissivity and the storage coefficient from abstraction well-water levels measured during both the abstraction and recovery phases. The technique was applied to a practical test. In addition, an ideal test was devised, and the technique was used to give satisfactory estimates of the original parameters. (Sims-ISWS)
W78-06897

DEPENDENCE OF THE CHEMICAL COMPOSITION OF GROUND WATERS IN THE NORTHERN CAUCASUS ON THE COMPOSITION OF ENCLOSING ROCKS,
Gidrokhimicheskii Inst., Novocherkassk (USSR).
For primary bibliographic entry see Field 2K.
W78-06900

THE APPLICATION OF THE DIGITAL SIMULATION LANGUAGE PDEL TO SUBSURFACE HYDROLOGY PROBLEMS,
California Univ., Los Angeles. School of Engineering and Applied Science.
W. J. Karplus, and A. Cardenas.
Report UCLA-ENG-7432, April, 1974. 68 p, 24 fig, 3 tab, 21 ref, append. Jointly issued by California Water Resources Center as Report UCAL-WRC-W340. OWRT B-150-CAL(17). GK 31463:W340.

Descriptors: Digital computers, *Equations, *Computer programs, *Computer models, *Subsurface waters, Hydrology, *Aquifers, Aquifer characterisics, *Model studies, Water resources, Environment, *Groundwater, *Partial differential equation language(PDEL), Digital simulation, Computer languages.

PDEL, one of over 60 different problem-oriented higher-level languages designed specifically for system simulation, permits the digital computer programming of nonlinear elliptic, parabolic, hyperbolic, and biharmonic partial differential equations with only minimal programming knowledge. Results are summarized of effort undertaken (from 1972 to 1974) to apply digital simulation techniques to subsurface hydrology problems, including modeling and solution of basic aquifer problems to investigate the utility and shortcomings of PDEL applications, and development of new models to facilitate the solution of parameter identification problems arising in water resources work. The philosophy and structure of PDEL is briefly explained, applications to hydrology are described, and current and future plans are described. Reprints of five published papers dealing with PDEL and related topics are presented in an appendix. (See also W78-08930) (Wares-IPA)
W78-06923

A THEORETICAL BASIS FOR EXPLORATION FOR NATIVE COPPER IN NORTHERN WISCONSIN,
Geological Survey, Reston, VA. Geology Div.
For primary bibliographic entry see Field 4B.
W78-06938

GROUND-WATER RESOURCES OF THE NORTH BEACH PENINSULA, PACIFIC COUNTY, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W78-06941

THE USE OF TEMPERATURE LOGS TO TRACE THE MOVEMENT OF INJECTED WATER,
Geological Survey, Denver, CO. Water Resources Div.; and Geological Survey, Anchorage, AL. Water Resources Div.
W. S. Keys, and R. F. Brown.
Ground Water, Vol 16, No 1, p 32-48, January-February 1978. 8 fig, 3 tab, 11 ref.

Descriptors: *Tracking techniques, *Groundwater movement, *Injection wells, *Thermal water, *Tracers, Analytical techniques, Boreholes, Water temperature, Measurement, Logging(Recording), Aquifer characteristics, Evaluation, *Texas High Plains, *Ogallala aquifer.

Temperature logs were used to study the movement of water injected into wells penetrating the Pliocene Ogallala Formation in the High PLains of Texas. The water used for artificial recharge of the aquifer was derived from playa lakes in which the diurnal fluctuation of temperature was as much as 17 deg Celsius. Daily thermal cycles that resulted from injection of this water were traced through the aquifer by use of a series of temperature logs made at frequent intervals in cased holes specially constructed for logging. The thermal pulses were detected by logging holes as far as 46 meters (150 ft) from the recharge well. In areas where this technique was used, the Ogallala Formation consists of thick sections of uniform medium-grained sand that visually appear uniform and were thought to have uniform hydraulic conductivity. However, the results of temperature logging at each of the three test sites clearly demonstrate that the hydraulic conductivity varies greatly through these seemingly uniform lithologic units. Thermal pulse velocities were as high as 4.6 meters (15 ft) per hour in thin zones immediately adjacent to sand where velocities were a few feet per day. Tracing with temperature logs is potentially useful in locating zones of high intrinsic permeability and in detecting apparent changes in rate of flow as a function of time. (Woodard-USGS)

W78-06945

GEOCHEMISTRY,
Geological Survey, Reston, VA. Geologic Div.; and Geological Survey, Reston, VA. Water Resource Div.
For primary bibliographic entry see Field 2K.
W78-06946

REGIONAL GEOLOGY SERIES: PART III, UNGLACIATED APPALACHIAN REGION,
National Water Well Association, Worthington, OH.
J. A. Hunt.
Water Well Journal, Vol 32, No 4, p 42-43, April, 1978.

Descriptors: *Groundwater, *Aquifers, *Appalachian Mountain Region, Geology, Rotary drilling, Water wells, Water supply, Bedrock.

The Unglaciated Appalachian ground water region receives abundant rainfall and has rugged terrain composed primarily of hard rocks. The bedrock is covered by an extensive thick layer of weathered rock material. Although physiography varies significantly over the region, the hydrogeology is much the same throughout. Ground water occurs to considerable depth in bedrock joints or fractures, and in the loose and weathered surfical material. Aquifers in the region provide a good source for domestic wells, although such wells are frequently of rather low capacity. Municipal and industrial wells are not as numerous and are harder to locate than domestic supplies, but are still viable alternatives to surface water development. Air rotary drilling methods with downhole hammer are fast and efficient in these formations, and are constantly gaining in popularity. Few drilling problems are encountered in this area, and well development techniques are not normally used in hard rock. (See also W78-04291 and W78-05199) (Eberle-NWWA)
W78-06970

PUBLIC GROUNDWATER SUPPLIES IN EDWARDS COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W78-07085

AN APPROXIMATE DIFFERENTIAL EQUATION TO DESCRIBE LEAKY AQUIFER BEHAVIOR DURING INTERMEDIATE AND LARGE VALUES OF TIME,
Universidad Nacional Autonoma de Mexico, Mexico City. Dept. of Ingeniera.
L. Rodarte.
Water Resources Research, Vol. 14, No. 1, p 39-44, February 1978. 6 fig, 12 ref.

Descriptors: *Aquifers, *Groundwater, *Model studies, Mathematical models, Equations, Leakage, Flow, Pumping, Drawdown, Storage, Permeability, Water levels, Hydrology, *Leaky aquifers.

In analyzing a leaky aquifer for application in regional studies, it is of great interest to have available simplified mathematical representations from which an analogical or digital model of the problem can be constructed. In this paper, a differential equation valid for intermediate and large values of time was proposed. Also, an analytical solution corresponding to an isolated well as a test of the range of applicability of the proposed equation was obtained. (Sims-ISWS)
W78-07090

2G. Water In Soils

STABILITY CHARTS FOR SIMPLE EARTH SLOPES,
University of Tasmania, Hobart (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W78-06719

METHODS OF SOIL STABILIZATION FOR EROSION CONTROL,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 4D.
W78-06724

SNOW BACKSCATTER IN THE 1-8 GHZ REGION,
Kansas Univ./Center for Research, Inc., Lawrence. Remote Sensing Lab.
For primary bibliographic entry see Field 2C.
W78-06731

REMARKS ON THE DETERMINATION OF THE UNSATURATED HYDRAULIC CONDUCTIVITY BASED ON FIELD MEASUREMENTS, (IN GERMAN),
W. Ehlers.
Z Pflanzenernaehr Bodenk 4, p 417-427, 1976.

Descriptors: *Hydraulic conductivity, Measurement, *Soil moisture, Loess, Error, *Moisture tension, Transpiration, Unsaturated soils, Winter wheat.

Hydraulic conductivity-moisture tension functions were previously evaluated by a field method for various layers of a fallow loess soil (grey brown podzolic soil). The magnitude of error when the hydraulic functions are calculated in the presence of transpiring plants is discussed. The error arises because the water uptake rates of roots are added to the capillary water flux through the soil matrix. With advancing growing stages of winter wheat and the increasing water extraction ability, the error becomes more pronounced. The conductivity values may then be over-estimated by a factor of half the power of 10 as compared to the results computed from the fallow soil.--Copyright 1977, Biological Abstracts, Inc.
W78-06774

EFFECT OF ROCK COMPOSITION AND STEEPNESS AND EXPOSURE OF SLOPES ON SURFACE AND UNDERGROUND RUNOFF (IN RUSSIAN),
Kislovodsk Mountain-Forest Lab. (USSR).
A. P. Kazankin.
Pochvovedenie 6, p 46-58, 1976.

Descriptors: *Subsurface runoff, *Soil erosion, *Leaching, Conglomerates, Forests, Leaching, Mountain, Phyllite, Quartzite, *Rocks, *Runoff, *Slopes(Steepness).

The runoff and leaching of erosion products on different soils are considered. Mountain-forest soils, underlain by large blocks of conglomerates, monolithic quartzites and phyllities, are characterized by a runoff which outcrops on slopes in places where rocks jut out. The conditions of stratal-fissure water elimination are absent and the vadose water, moving with accelerating velocity, erodes the thin soil layer. The highest resistance to erosion is demonstrated by soils formed on clay shales with strata dipping in the direction opposite to slope orientation.--Copyright 1977 Biological Abstracts, Inc.
W78-06781

DETERMINATION OF AMMONIUM N AND NITRATE N IN ACID PERMANGANATE SOLUTION USED TO ABSORB AMMONIA, NITRIC OXIDE, AND NITROGEN DIOXIDE EVOLVED FROM SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W78-06828

SOIL MOISTURE GROUND TRUTH, STEAMBOAT SPRINGS, COLORADO, SITE, AND WALDEN, COLORADO, SITE, MARCH 8-10, 1976,
Bittinger (M.W.) and Associates, Inc., Fort Collins, CO.
E. B. Jones.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-25708, Price codes: A04 in paper copy, A01 in microfiche. Mission Report--March 8-10, 1976, April 1976. 51 p, 5 fig, 3 tab, 4 ref, 6 append.

Descriptors: *Soil moisture, *Remote sensing, *On-site data collections, *Colorado, Sampling, Measurement, Snow, Snowpacks, Snow surveys, Depth, Density, Vegetation, Aircraft, Surveys, Ground-truth data.

This report contained the ground-truth data taken at Steamboat Springs and Walden, Colorado, in support of the NASA mission in these areas during the period of March 8, 1976, through March 11, 1976. The Steamboat Springs site is located a few miles south of Steamboat Springs, Colorado. This line was approximately 4 miles (6.45 km) in length oriented in a generally north-south direction in the Yampa River Valley. Data taken on this primary line were as follows: (1) snow depths at intervals of 100 feet, (2) snow densities and water equivalents at intervals of 1000 feet, (3) snowpack characterizations at intervals of 1000 feet, and (4) snow pits for liquid water determinations and vertical layer classification at five selected locations. In addition to this primary line, six east-west transects of 1000 feet each were used for additional depth and density measurements. Two lines were sampled in the vicinity of Walden, Colorado. The first was the north-south line, approximately 4.5 miles (7.25 km) in length. The shorter east-west line was approximately 2.75 miles (4.5 km) in length. These lines were sampled much less intensively than was the Steamboat Springs line. The Walden lines were of a lesser snow depth than Steamboat Springs, and for much of the lines the vegetation was of a 'sagebrush type' which extended above the snowpack. The line at Steamboat Springs was generally located over flat meadowland, and all but riparian vegetation, excluding farmsteads, was totally snow covered. (Sims-ISWS)
W78-06870

THE PREDICTION OF UNFROZEN WATER CONTENTS IN FROZEN SOILS FROM LIQUID LIMIT DETERMINATIONS,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-06883

NUMERICAL STUDY OF QUASI-ANALYTIC AND FINITE DIFFERENCE SOLUTIONS OF THE SOIL-WATER TRANSFER EQUATION,
Department of Agriculture, Ottawa (Ontario).
H. N. Hayhoe.
Soil Science, Vol. 125, No. 2, p 68-74, February 1978. 3 fig, 3 tab, 9 ref.

Descriptors: *Infiltration, *Soil water movement, *Wetting, *Model studies, Mathematical models, Soil water, Moisture content, Analytical techniques, Equations, Soil science, Horizontal infiltration, Wetting fronts, Finite difference solutions.

The special case of horizontal infiltration of water into a dry soil was utilized to study the problem of

using standard finite differencing with an economic grid refinement to locate the wetting front accurately. The procedure used to determine an average value on grid subintervals for the strongly concentration-dependent soil-water diffusivity was identified as being a critical factor in accurately approximating the moisture profile. New averaging techniques were proposed which were shown to locate the steep front with significantly more accuracy. The exact solution was required as a basis for this study. To meet this need, a quasi-analytic technique was introduced and shown to be effective through numerical experiments and comparison with an alternative scheme. (Sims-ISWS)
W78-06887

THE USE OF DYNAMIC SOIL WATER CHARACTERISTICS IN A NUMERICAL DESORPTION MODEL,
Mississippi Agricultural and Forestry Experiment Station, Mississippi State.
K. K. Watson, and F. D. Whisler.
Soil Science, Vol. 125, No. 2, p 83-91, February 1978. 6 fig, 11 ref.

Descriptors: *Soil water, *Pressure head, *Soil water movement, *Model studies, Mathematical models, Moisture content, Soils, Porous media, Water table, Drainage, Hysteresis, Soil properties, Soil science, Hydrology, Desorption.

A numerical solution of the gravity drainage to a water table of an initially saturated column of porous material was used to examine the results of experimental studies where the volumetric water content (theta) during desorption was found to be dependent on both the soil water pressure head (h) and the rate of change of h with time (dh/dt). In keeping with the experimental findings, the h(theta) relationship was made space-dependent, and the water content and soil water pressure head profiles for this case were compared with the results obtained for two analyses in which the h(theta) relationship was held constant during drainage. These comparisons indicated that the water content profile is generally an insensitive measure of h(theta) variations. The relationship between h and dh/dt for specified theta values was determined from the space-dependent h(theta) analysis and compared with the shape of the curves reported in the experimental studies. (Sims-ISWS)
W78-06888

USE OF FERROUS HYDROXIDE FOR DETERMINATION OF NITRATE IN SOIL EXTRACTS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W78-06925

SOIL CHANGES AFTER HAY MEADOW ABANDONMENT IN SOUTHWESTERN WISCONSIN,
North Central Forest Experiment Station, St. Paul, MN.
For primary bibliographic entry see Field 4D.
W78-06978

MOVEMENT OF PESTICIDES IN THE SOIL WATER FERTILIZER SYSTEM,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-06999

FEASIBILITY OF USING IRON ORE OVERBURDEN MATERIAL AS A MEDIA FOR DISPOSAL OF SECONDARY SEWAGE EFFLUENT IN NORTHEASTERN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Forest Resources.
For primary bibliographic entry see Field 5E.
W78-07000

EFFECT OF DRAIN TUBE OPENINGS ON WATER-TABLE DRAWDOWN,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W78-07087

STUDY OF THE RELATIVE EFFICIENCY OF FINITE DIFFERENCE AND GALERKIN TECHNIQUES FOR MODELING SOIL-WATER TRANSFER,
Department of Agriculture, Ottawa (Ontario). Chemistry and Biology Research Inst.
H. N. Hayhoe.
Water Resources Research, Vol 14, No 1, p 97-102, February 1978. 8 fig, 2 tab, 14 ref.

Descriptors: *Infiltration, *Soil water, *Soil water movement, *Model studies, Mathematical models, Numerical analysis, Analytical technique, Moisture content, Soils, Soil science, Horizontal infiltration.

Horizontal infiltration of water into a dry soil was used to study the efficiency of finite difference and Galerkin procedures in accurately locating the steep wetting front. The location of the wetting front was determined by a quasi-analytic solution to Richard's equation. The Galerkin technique was evaluated by using linear, Hermite cubic, and Lagrange quintic elements. These schemes were compared with the performances of the Crank-Nicolson central difference method where a standard and a modified averaging procedure for soil-water diffusivity on grid subintervals is utilized. The comparisons were made on the basis of error as a function of spatial grid refinement and the relative efficiency in achieving a practical level of accuracy. The results lead to the conclusion that the Galerkin scheme with linear elements or the finite differencing scheme with the modified averaging procedure is preferable to the other techniques. (Sims-ISWS)
W78-07091

VARIABILITY OF HYDRAULIC CONDUCTIVITY WITHIN AND BETWEEN NINE WISCONSIN SOIL SERIES,
Wisconsin Univ.-Madison. Dept. of Soil Science.
F. G. Baker.
Water Resources Research, Vol. 14, No. 1, p 103-108, February 1978. 3 fig, 2 tab, 17 ref. EPA R802874.

Descriptors: *Hydraulic conductivity, *Moisture content, *Variability, *Soil types, Soil horizons, Infiltration, Soils, Soil water, Soil water movement, On-site data collections, Data processing, Soil properties, Soil science, *Wisconsin.

Hydraulic conductivity was measured in selected subsurface horizons of nine soil series by using the crust test method. Measurements were made for several moisture potentials in the range 0 to -150 cm of water at several randomly selected sites per soil series. The morphological character of the soil series spanned a broad range, from sands to clay loam soils. The hydraulic conductivity characteristic of each series was described mathematically and the series conductivity curves were related as a family of curves. By using multivariate discriminant analysis, the series were grouped into classes of similar hydraulic behavior, based on the dispersion of moisture potential and hydraulic conductivity data within and between series. A 95% prediction interval was constructed to include the range of conductivities to be expected at future sites. (Sims-ISWS)
W78-07092

LEAD IN SOILS AND PLANTS,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5B.
W78-07138

ANAEROBIC MICROBIAL COMMUNITY METABOLISM IN SPARTINA ALTERNIFLORA SOILS,
Georgia Univ., Athens. Dept. of Microbiology.
R. R. Christian and W. J. Wiebe.
Limnology and Oceanography, Vol. 23, No. 2, p 328-336, March, 1978. 3 fig, 2 tab, 25 ref.

Descriptors: *Salt marshes, *Marine microorganisms, *Soil bacteria, *Anaerobic bacteria, Wetlands, Marshes, Tidal marshes, Grasses, Marsh plants, Microorganisms, Soil environment, Anaerobic digestion, Tidal effects, Spartina alterniflora.

The anaerobic uptake of C14 glucose was used as an index of potential microbial activity in the soils of a Spartina alterniflora salt marsh. The turnover times of glucose were consistently faster in the soils where tall S. alterniflora grew along a creek-bank than in the high marsh soils where S. alterniflora productivity was lower, this difference was magnified with increased depth. The distribution of label, followed through CO2, particulate, and ether-soluble fractions indicated rapid recycling in the soil of the tall S. alterniflora marsh. In an experiment designed to assess the effects of tidal inundation on the activity of the microbial community in the tall S. alterniflora marsh soils, no consistent changes in glucose uptake or ATP concentration were evident after 2 months of restricting water movement. No direct link of tidal inundation with the microbial community was obseved. (Steiner-Mass)
W78-07156

CHEMICAL COMPOSITION OF RAIN AND BROOK WATER IN BRITTANY (FRANCE), (IN FRENCH),
Rennes Univ. (France). Hydrobiological Lab.
For primary bibliographic entry see Field 2K.
W78-07192

2H. Lakes

ICE SHEET LOADS ON MARINA PILES,
Federal Highway Administration, Springfield, IL. Illinois Div.
For primary bibliographic entry see Field 8B.
W78-06715

REANALYSIS OF THE GREAT LAKES DROGUE STUDIES DATA,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
A. Okubo, C. C. Ebbesmeyer, J. M. Helseth, and A. S. Robbins.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 081. Price codes: A05 in paper copy, A01 in microfiche. Special Report 2, Reference 76-2, February 15, 1976. 84 p, 15 fig, 6 tab, 14 ref. NOAA 03-5-022-65.

Descriptors: *Lake Michigan, *Lake Erie, *Diffusion, *Turbulence, Analytical techniques, *On-site data collections, Water circulation, Dispersion, Statistics, Buoys, Methodology, Fluid mechanics, *Regression analysis, Advection, *Drogues, Lagrangian deformations.

During the summer of 1964, a series of field studies were conducted with the use of drogues or current followers in southern Lake Michigan and western Lake Erie. These data were edited and then processed using linear regression procedures to calculate Lagrangian deformations and velocity gradient parameters. These procedures allowed evaluation of turbulent characteristics. The results showed that the drogue area is controlled primarily by the cumulative effect of horizontal divergence, and that the turbulent characteristics generally are consistent with the previous estimates. Analytical solution of time-dependent advection-diffusion equation compared favorably with observed gross-

scale drogue dispersion. Gross-scale drogue groups revealed an average of five clusters per group. A statistical test showed that 10-15 drogues are required to achieve a standard deviation equal to the 95% confidence limit of the gross-scale drogue group. This can be used as a guideline for designing future dispersion experiments. (Singh-ISWS)
W78-06723

ACCUMULATION OF WATER SOLUBLE PHOSPHORUS AND HYDROLYSIS OF POLYPHOSPHATES BY CLADOPHERA GLOMERATA (CHLOROPHYCEAE),
Wisconsin Univ., Milwaukee. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W78-06747

FIFTH ANNUAL REPORT: GREAT LAKES WATER QUALITY.
International Joint Commission-United States and Canada.
For primary bibliographic entry see Field 5G.
W78-06762

SHORELINE ECOLOGY OF LAKE POWELL,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
L. D. Potter, and N. B. Pattison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 122, Price codes: A11 in paper copy, A01 in microfiche. Lake Powell Research Project Bulletin No 29, September 1976, Prepared for Research Applied to National Needs (RANN), National Science Foundation, (NSF-RA-760571), 238 p, 63 fig, 12 tab, 34 ref, append. GI-34840.

Descriptors: *Shores, *Shore protection, *Management, *Vegetation, *Aquatic vegetation, Shoreline cover, Soils, Sands, Soil properties, Terracing, Biomass, Reservoirs, Benthic flora, *Utah, Arizona, *Lake Powell(UT), *Benthic organisms, Tamarisk, Aquatic biology, Contaminants.

The study sets the biogeologic history of Lake Powell, Utah and discusses its conversion from river to reservoir. The lake's 1800 miles of shoreline are mapped by contour; also, the surface materials of the shoreline are categorized into seven major types and each type is assessed for its susceptibility to fluctuating water levels. Shoreline vegetation is investigated in terms of biomass and species composition with an eye toward weighing the use of selected shoreline vegetation versus terracing for shore protection during drawdown periods. Tamarisk is a principal species and a persistent invader; it is hardy and has a great variety of adaptations to overcome problems of a fluctuating shoreline. However, it rapidly becomes resistant to submergence mortality, and if allowed to develop without control, Tamarisk stands would change the chief recreational areas from highly desirable to highly undesirable. Because of the multiple disadvantages of Tamarisk, a method for shoreline management is recommended to protect the sandy shores for recreational use, involving a program of control in selected areas combined with supplementary plantings of more desirable shade species. (Zayac-NC)
W78-06773

A TOXONOMIC STUDY OF THE SPONGILLA ALBA, S. CENOTA, S. WAGNERI SPECIES GROUP (PORIFERA: SPONGILLIDAE) WITH ECOLOGICAL OBSERVATIONS OF S. ALBA,
New Orleans Univ., LA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W78-06805

IMPROVING LAKE WATER QUALITY BY DESTRATIFICATION,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5G.
W78-06852

SALT REGIME OF RESERVOIRS, CHAPTER 6: ELEMENTARY HYDROBIOLOGICAL PROGNOSIS,
For primary bibliographic entry see Field 5C.
W78-06880

CONTRIBUTION TO THE PROBLEM OF FORECASTING THE MINERAL CONTENT AND CHEMICAL COMPOSITION OF RESERVOIR WATER,
Novocherkassk Inst. of Chemical Hydrology (USSR).
M. I. Kriventsov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 658, Price codes: A03 in paper copy, A01 in microfiche. CRREL Draft Translation 610, March 1977. 25 p, 5 tab, 39 ref. Translated from Gidrokhimicheskiye Materialy, Vol. 45, p 89-106, 1967.

Descriptors: *Reservoirs, *Water quality, *Mineral water, *Model studies, Mathematical models, Chemical analysis, Chemicals, Dams, Lakes, Runoff, Erosion, Pollutants, Water pollution, Water chemistry, Minerals, Mineral content.

This article examined the problem of forecasting the mineral content and chemical composition of reservoir water, the problem of the magnitude of calculation errors when using various forecasting methods, and the tasks facing the forecasting of the chemical composition of reservoir water. (Sims-ISWS)
W78-06881

EFFECTS OF HYDROXAMIC ACIDS, IRON-SPECIFIC CHELATORS, ON THE GROWTH OF ALGAE,
Washington Univ., Seattle. Coll. of Seattle.
For primary bibliographic entry see Field 5C.
W78-06930

CONTRIBUTION OF REMOTE SENSING TO HABITAT EVALUATION AND MANAGEMENT IN A HIGHLY ALTERED ECOSYSTEM,
Great Dismal Swamp National Wildlife Refuge, Suffolk, VA.; and Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06935

SATELLITE REMOTE SENSING STUDY OF THE TRANS-BOUNDARY MOVEMENT OF POLLUTANTS,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 5A.
W78-06979

STRUCTURAL COMPARISONS OF FOUR PLANT COMMUNITIES IN THE GREAT DISMAL SWAMP, VIRGINIA,
Old Dominion Univ., Norfolk, VA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 2I.
W78-06988

SPRING WATERFOWL UTILIZATION OF WESTERN WISCONSIN WETLANDS,
Wisconsin Univ., River Falls. Dept. of Biology.
S. F. Goddard.
The Passenger Pigeon, Vol. 37, No. 1, p 32-44, 1975. 1 fig, 4 tab, 10 ref.

Descriptors: *Waterfowl, *Ducks, *Habitat, Wetlands, Mallard duck, Ring-necked duck, Blue-winged teal, Green-winged teal, Ponds, *Wisconsin, *Habitat preference, Spring duck use, Coot, St. Croix County(Wisc).

A four-year study on the use of western Wisconsin wetlands by waterfowl was carried out using 17 study ponds. During the study, 77,892 waterfowl representing 24 species were observed. Six species made up 85.7% of the total. These were Scaup (24.6%), coot (19.3%), ring-necked duck (14.8%), blue-winged teal (14.4%), mallard (8.0%) and green-winged teal (4.6%). Chi square analysis indicated a significant dependency between pond and total waterfowl use or use by species. Generally, larger ponds were used by larger numbers of birds; smaller ponds had the greatest use/acre. All six major species exhibited definite habitat preferences. Coots were the most selective species, followed by mallards, green-winged teal, scaup, ring-necks and blue-winged teal. (Stihler-Mass)
W78-06991

NESTING HABITAT OF CANADA GEESE IN SOUTHEASTERN MICHIGAN,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
R. M. Kaminski, and H. H. Prince.
Wilson Bulletin, Vol. 89, No. 4, p 523-531, December, 1977. 3 fig, 2 tab, 26 ref.

Descriptors: *Canada Goose, *Nesting, *Michigan, Wetlands, Vegetation, Islands, *Huron River Valley(Mich), Muskrat lodges.

Nesting habitat of Canada Geese in southeastern Michigan is described. Most nesting pairs (92%) preferred 2 or more hectares of open water. Data were collected from both muskrat lodges and islands used and not used as nesting sites. Discriminant function analysis was used to determine which factors best separated used from unused sites. Top width of muskrat lodges and percent slope of island relief along with the density of island vegetation were most important in the discrimination. (Stihler-Mass)
W78-06992

PRODUCTION PROCESSES UNDER THE ICE IN LAKE ST. CLAIR I. IRRADIATION AND TEMPERATURE,
Windsor Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-07039

PRODUCTION PROCESSES UNDER THE ICE IN LAKE ST. CLAIR II. NUTRIENTS (SILICATE) AS A LIMITING FACTOR,
Windsor Univ. (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-07040

SEASONAL GROWTH AND FOLIAR NUTRIENTS OF LARIX LARICINA IN THREE WETLAND ECOSYSTEMS,
Michigan Univ., Ann Arbor. Wetlands Ecosystem Research Group.
For primary bibliographic entry see Field 2I.
W78-07065

THE GENUS SPHAGNUM IN ALBERTA,
Alberta Univ., Edmonton. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-07066

CHANGES IN THE VEGETATION OF A MOORLAND FISHPOND IN TWENTY-ONE YEARS,
Freshwater Biological Association, Ambleside (England).
For primary bibliographic entry see Field 2I.
W78-07067

OBSERVATIONS ON THE GROWTH OF SPHAGNUM CUSPIDATUM IN A BOG POOL ON THE SILVER FLOWE NATIONAL NATURE RESERVE,
Hull Univ. (England). Dept. of Plant Biology.
For primary bibliographic entry see Field 5C.
W78-07070

SECULAR WATER LEVEL FLUCTUATIONS IN THE LARGE NATURAL BODIES OF WATER OF KAZAKHSTAN AND SOVIET CENTRAL ASIA,
R. D. Kudrin.
Soviet Hydrology: Selected Papers, Vol. 15, No. 3, p 190-194, 1976. 3 fig, 1 tab, 17 ref. Translated from Trudy IV Vsesoyuznogo Gidrologicheskogo S'yezda, Vol. 5, p 98-107, 1975.

Descriptors: *Lakes, *Water level fluctuations, *Hydrologic budget, Data processing, Water levels, Fluctuations, Runoff, Discharge(Water), Evaporation, Geomorphology, Lake morphology, Groundwater, Climatic zones, Climatology, *USSR.

A comparison of lakes in the sufficiently wet zone of temperate latitudes with the lakes of the moisture-deficient zone of more southerly latitudes revealed significant differences in their water regimes because of the difference in their climatic conditions. The hydologic budget of the first zone is positive, i.e., precipitation depth exceeds evaporation depth and river runoff variations are small. The lakes are drained here, as a rule, which regulates their water level. The combination of relatively small climatic variations with the drainage of the lakes results in relatively small long peiod and secular water level fluctuations whose amplitude is comparable to that of intra-annual fluctuations. The hydrologic budget is negative in the second zone (with the exception of mountain regions), i.e., evaporation depth exceeds precipitation depth and river runoff variations are considerably greater, while the lakes are closed, as a rule, or occasionally draned. The combination of relatively strong variations of climatic elements with closed lakes produces a high amplitude of level fluctuations even in large bodies of water. The amplitude of secular fluctuations is one order of magnitude higher than that of intra-annual fluctuations. (Sims-ISWS)
W78-07114

APPLICATION OF LANDSAT SYSTEM FOR IMPROVING METHODOLOGY FOR INVENTORY AND CLASSIFICATION OF WETLANDS,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
For primary bibliographic entry see Field 7B.
W78-07143

USE OF LANDSAT DATA TO ASSESS WATERFOWL HABITAT QUALITY,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7B.
W78-07147

THREE APPROACHES TO THE CLASSIFICATION AND MAPPING OF INLAND WETLANDS,
Geological Survey, Suffolk, VA.
For primary bibliographic entry see Field 7B.
W78-07154

THE AQUATIC MACROPHYTES OF SOME LAKES IN SOUTHEASTERN ONTARIO,
Queen's Univ., Kingston (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-07161

THE DECOMPOSITION OF STANDING AND FALLEN LITTER OF TYPHA GLAUCA AND SCIRPUS FLUVIATILIS,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology
For primary bibliographic entry see Field 5C
W78-07162

WATERFOWL POPULATIONS AS RELATED TO HABITAT CHANGES IN BOG WETLANDS OF THE MOOSEHORN NATIONAL WILDLIFE REFUGE,
Maine Cooperative Wildlife Research Unit, Orono.
For primary bibliographic entry see Field 4A
W78-07164

PROCESSES IN SEDIMENT DEPOSITION AND SHORELINE CHANGES IN THE POINT PELEE AREA, ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 2J.
W78-07171

ALGAL NUTRIENT LIMITATION IN LAKE ONTARIO AND TRIBUTARY WATERS,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5C.
W78-07189

2I. Water In Plants

METHYLMERCURY: FORMATION IN PLANT TISSUES,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W78-06753

WASTEWATER RECYCLING: DEVELOPMENT OF MYCORRHIZAL ROOT SYSTEMS FOR INCREASED EFFICIENCY,
Michigan State Univ., East Lansing. Dept. of Botany.
For primary bibliographic entry see Field 5G.
W78-06808

DRAINAGE MAP OF ARIZONA SHOWING PERENNIAL STREAMS AND SOME IMPORTANT WETLANDS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06950

MISSISSIPPI FLORA. IV. DICOTYLEDON FAMILIES WITH AQUATIC OR WETLAND SPECIES,
Georgia Univ., Athens. Dept. of Botany.
S. B. Jones, Jr.
Gulf Research Reports, Vol 5, No 1, p 7-22, 1975. 6 fig, 31 ref.

Descriptors: *Aquatic plants, *Mississippi, Wetlands, *Distribution, Habitats, *Classification, *Maps, *Dicotyledon families, Species keys.

Keys, distribution maps, habitats, references, nomenclature, and notes are given for some 12 families of dicotyledons occurring naturally or naturalized in Mississippi. These families contain one or more species which are found in aquatic or wetland habitats. They are: Bataceae, Callitrichaceae, Ceratophyllaceae, Elatinaceae, Haloragaceae, Hydrophyllaceae, Lentibulariaceae, Lythraceae, Nymphaeaceae, Podostemaceae, Polygonaceae, and Sururaceae. (Stihler-Mass)
W78-06985

GROWTH, MORTALITY, AND BIOMASS PARTITIONING IN FRESHWATER TIDAL WETLAND POPULATIONS OF WILD RICE (ZIZANIA AQUATICA VAR. AQUATICA),
Rider Coll., NJ. Dept. of Biology
D. Whigham, and R. Simpson.
Bulletin of the Torrey Botanical Club, Vol 104, No 4, p 347-351, October-December, 1977. 2 fig, 1 tab, 21 ref.

Descriptors: *Tidal marshes, *Primary productivity, *Wild rice, *New Jersey, Delaware River, Coastal marshes, Rooted aquatic plants, Wetlands, Biomass, *Biomass partitioning(Aquatic plants), Seed production, Hamilton Marshes(NJ).

Eight populations of wild rice in the Hamilton Marshes were sampled from April into September. Net productivity was as high as 20.9 g/sq m/day and varied seasonally. Lowest production occurred during the seedling phenophase; highest followed seedling establishment. Most of the net primary production is used in shoot growth except during the seedling phenophase when a larger percentage of biomass is allocated to root development. Large numbers of seeds were produced (an estimated 37,300 seeds/sq m). Mortality was constant throughout the growing season. (Stihler-Mass)
W78-06986

NUTRIENT CYCLING IN A CAREX LACUSTRIS WETLAND,
Ithaca Coll., N.Y. Dept. of Biology.
J. M. Bernard, and B. A. Solsky.
Canadian Journal of Botany, Vol 55, No 6, p 630-638, 1977.

Descriptors: *Freshwater marshes, *Marsh plants, *Cycling nutrients, *Productivity, Wetlands, Aquatic plants, Nutrients, Nutrient requirements, Crop production, Plant growth, Potassium, Phosphorus, Nitrogen, Magnesium, Calcium, *Seasonal, Standing crops.

Seasonal changes in aboveground and belowground life history of the sedge, Carex lacustris, were determined and used to study primary production and nutrient cycling in the ecosystem. Seasonal aboveground production was estimated to be about 965 g/sq m per year, with a peak rate of 20.9 g/sq m per day reached in late July. Belowground production was estimated to be 208 g/sq m per year for a total production estimate of 1173 g/sq m per year. Nitrogen, phosphorus, and potassium begin the season with high percentage concentrations in green overwintering shoots but the percentages decline to only about one-third of the original at death in December, resulting in large losses of nutrients from the marsh into surrounding waters. Early growth in spring is characterized by a redistribution of the nutrients in the shoots, some translocation from belowground tissues, and uptake from the soil. Calcium and magnesium do not show any important translocation patterns during the year. The yearly budget of uptake and loss of nutrients during a year is estimated to be 15.9 g/sq m nitrogen, 1.9 g/sq m phosphorus, 16.6 g/sq m potassium, 2.9 g/sq m calcium, and 1.5 g/sq m magnesium. (Steiner-Mass)
W78-06987

STRUCTURAL COMPARISONS OF FOUR PLANT COMMUNITIES IN THE GREAT DISMAL SWAMP, VIRGINIA,
Old Dominion Univ., Norfolk, VA. Dept. of Biological Sciences.
C. V. Dabel, and F. P. Day, Jr.
Bulletin of the Torrey Botanical Club, Vol 104, No 4, p 352-360, 8 tab, 28 ref, Oct-Dec 1977.

Descriptors: *Swamps, *Biomass, Wetlands, White-cedar trees, Oak trees, *Virginia, *Great

Dismal Swamp(Va), *Plant communities, *Shrub biomass, *Species richness, Black gum trees, Water gum trees, Red maple trees, Bald cypress trees, Mixed hardwoods type.

Series of nested quadrats were used to measure vegetation on four sites, each representing a different community type. The four types and dominant species in each (by biomass and basal area) are: (1) Cedar--Atlantic white cedar and black gum, (2) Maple-gum--water gum and red maple, (3) Cypress--bald cypress, (4) Mixed hardwoods--laurel and white oak. Total biomass for the cedar, maple-gum, and mixed hardwoods communities (comprising 70% of the vegetation of the swamp) was approximately 200,000 kg/ha; that for cypress, comprising only 2% of the vegetation of Dismal Swamp, was 345,300 kg/ha. The cedar site had the largest shrub biomass; cypress had the least. Species richness was low at each site as calculated for the tree strata. Richness was highest at the mixed hardwood site and lowest at the maple-gum site. (Stihler-Mass)
W78-06988

BEACH PHYTOMASS ALONG THE CALIFORNIA COAST,
California Univ., Davis. Dept. of Botany.
M. G. Barbour, and R. H. Robichaux.
Bulletin of the Torrey Botanical Club, Vol. 103, No. 1, p 16-20. 1 fig, 2 tab, 13 ref. Jan-Feb 1976.

Descriptors: *Beaches, *Biomass, *Primary productivity, *Aquatic plants, *California, Pacific Coast region, Wetlands, *Community biomass, Cover:weight curves, Latitudinal changes.

Above-ground plant community biomass was determined for 19 representative beaches scattered along the California coast. Community biomass was determined indirectly by extrapolating from cover:weight curves for each species to transect data showing average cover by species for a 40-100-m-wide portion of the beach. Regressions showed that weight was linearly related to cover and, for most species, was not affected by latitudinal gradients in macroclimate. Some species such as Ambrosia chamissonis ssp. bipinnatisecta, however, exhibited up to 3-fold changes with latitude. Average community biomass was highly viable from beach to beach, reflecting the dominant species. It ranged from 20 to 395 g dry wt.sq m. (Stihler-Mass)
W78-06989

NESTING BEHAVIOR OF HERRING GULLS: INVASION INTO SPARTINA SALT MARSH AREAS OF NEW JERSEY,
Livingston Coll., New Brunswick, NJ. Dept. of Biology.
For primary bibliographic entry see Field 2L.
W78-06990

SPRING WATERFOWL UTILIZATION OF WESTERN WISCONSIN WETLANDS,
Wisconsin Univ., River Falls. Dept. of Biology.
For primary bibliographic entry see Field 2H.
W78-06991

NESTING HABITAT OF CANADA GEESE IN SOUTHEASTERN MICHIGAN,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 2H.
W78-06992

A STUDY OF THE COMMON REEDGRASS (PHRAGMITES COMMUNIS TRIN.) IN THE COASTAL ZONE OF DELAWARE,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W78-06993

THE UPTAKE OF BORON BY LEMNA MINOR,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W78-07027

A MANUAL OF MARSH AND AQUATIC VASCULAR PLANTS OF NORTH CAROLINA WITH HABITAT DATA,
North Carolina Agricultural Experiment Station, Raleigh.
E. O. Beal.
Technical Bulletin No. 247, 1977. 298 p, 4 fig, 34 ref.

Descriptors: *Aquatic plants, *North Carolina, Rooted aquatic plants, Ecological distribution, Habitats, Hydrogen ion concentration, Specific conductivity, Wetlands, Marshes, Keys, Chloride content, Organic matter content.

Plants from 76 families are presented including some species which occur in, but are not limited to, marshy areas. Many, but not all, species occurring in North Carolina are included. Two basic keys are provided: a key to all marsh and aquatic families and/or genera known to occur in North Carolina, and a restricted key to plants of brackish water, salt marshes, and marine areas. Specific keys to genera within families and species within genera are also provided. Species are represented by line drawings, comments on distribution in North Carolina and the contiguous United States. Where appropriate, comments on taxonomic treatment are included. Habitat data, in terms of pH, chloride content, organic matter content, and specific conductance of the water, is presented by bar graphs where original data are available. (Stihler-Mass)
W78-07062

PRODUCTION AND ECOLOGY OF EELGRASS (ZOSTERA MARINA L.) IN GREVELINGEN ESTUARY, THE NETHERLANDS, BEFORE AND AFTER THE CLOSURE,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
P. H. Nienhuis, and B. H. H. De Bree.
Hydrobiologia, Vol. 52, No. 1, p 55-66, 1977. 9 fig, 1 tab, 26 ref.

Descriptors: *Primary productivity, Distribution, *Eelgrass, Aboveground production, Belowground production, *Grevelingen Estuary(The Netherlands), Water transparency, Stagnant saltwater lake, Closure.

In 1971 Grevelingen Estuary was cut off from the North Sea and the influence of the Rhine River by a dam and became a stagnant salt-water lake. After closure eelgrass populations extended downward to 5 m below lake level, probably a result of increased water transparency. Annual aboveground production in eelgrass beds, based on doubled maximum standing crop in July-August, was estimated at 50 g C/sq m in 1968 and 121 g C/sq m in 1973 and 91 g C/sq m in 1975. A minimum estimate of net production in eelgrass beds at a depth of 0.50 to 0.75 m, based on short-term changes in biomass in two permanent quadrats, was 40.5 g C/sq m/yr for aboveground and 12.7 g C/sq m/yr for belowground parts. Horizontal distribution of eelgrass was limited mainly by exposure to wave action and currents. The largest proportion of eelgrass production apparently enters detritus food chains. (Stihler-Mass)
W78-07063

HABITAT, MORPHOLOGY AND PHENOLOGY OF SOUTHERN WILD RICE (ZIZANIA AQUATICA L.) FROM THE WADING RIVER IN NEW JERSEY,
Academy of Natural Sciences of Philadelphia, PA. Dept. of Botany.
W. R. Ferren, Jr., and R. E. Good.
Bulletin of the Torrey Botanical Club, Vol. 104, No. 4, p 392-396, October-December, 1977. 2 fig, 8 ref.

Descriptors: *Wild rice, *Habitats, *Ecotypes, Plant morphology, Coastal marshes, Wetlands, Estuaries, New Jersey, *Wading River(New Jersey).

A unique population of southern wild rice, perhaps an ecotype, is described from the estuary of the Wading River. Individuals of this population grow below low tide in shallow protected areas and broad, slip-off slopes of river meanets on substrates of mud or soft, black muck. Wading River plants have decumbent stems which root at the lower 3 to 6 nodes, 2 to 6 branches with axillary panicles on the upper nodes, unusually narrow submerged, floating, and aerial leaves, and emergent inflorescences which bear pistillate florets with long lemma awns averaging 6.5 cm. These plants flower, produce mature grain, and shatter over a longer period later in the fall than do plants of other New Jersey populations. (Stihler-Mass)
W78-07064

SEASONAL GROWTH AND FOLIAR NUTRIENTS OF LARIX LARICINA IN THREE WETLAND ECOSYSTEMS,
Michigan Univ., Ann Arbor. Wetlands Ecosystem Research Group.
D. L. Tilton.
Canadian Journal of Botany, Vol. 55, No. 10, p 1291-1298, 1977. 3 fig, 4 tab, 38 ref.

Descriptors: *Wetlands, *Leaves, *Plant growth, *Nutrient requirements, Bogs, Fens, Swamps, Growth rates, Foliar, Seasonal, Nutrients, Plant physiology, Inorganic compounds, Trees, Deciduous trees, Phosphorus, *Tamarack, Conifer swamps, Needles, Lateral shoots, *Larix laricina.

Nutrient levels were determined in foliage from tamarack in a bog, conifer swamp, and fen from budbreak to leaf abscission. Elongation of needles and shoots ceased at similar dates for all sites, but trees in the fen had significantly longer needles and lateral shoots. At the time of complete leaf and shoot development, foliar concentrations of N, Ca, and Mg were higher in the fen than in the conifer swamp or bog, while concentrations of Al, Fe, Zn, Mn, and B were higher in the bog than the other two sites. Phosphorus concentrations in foliage were similar in the fen and conifer swamp but were lower in the bog site. Despite significant between-site variation for certain foliar elements, two patterns of seasonal variation were discerned. Significant between-site differences in the amounts and rates of needle and shoot elongation, foliar nutrient concentrations, and patterns of certain foliar elements were associated with variations in nutrient status and moisture-aeration conditions of the study sites. (Steiner-Mass)
W78-07065

THE GENUS SPHAGNUM IN ALBERTA,
Alberta Univ., Edmonton. Dept. of Botany.
D. H. Vitt, and R. E. Andrus.
Canadian Journal of Botany, Vol. 55, No. 3, p 331-357, 1977. 67 fig, 3 tab, 24 ref.

Descriptors: *Fens, *Mosses, *Systematics, *Distribution patterns, Wetlands, Bogs, Aquatic plants, Classification, Speciation, Environmental gradient, Aquatic habitats, Niches, *Sphagnum, *Alberta(Canada), Geographical distribution.

Wetland plant communities in which Sphagnum species are common or are the dominant bryophytes occur on about one-quarter to one-third of the landscape occupied by coniferous forests. A multiple-access key and an illustrated, dichotomous key are given for the species, and the habitat and distribution of each species in Alberta are presented. In most areas, Sphagnum forms the most conspicuous part of the lowland ground

cover, particularly in regions of mineral poor fens to fens transitional to mineral rich fens. Sphagnum is of great importance because of its ability to retard decomposition, acidify its surroundings, and hold large quantities of water. The species of Sphagnum that occur in the province have either widespread of continental tendencies in their distribution patterns. Oceanic and suboceanic species are absent from the flora. (Steiner-Mass)
W78-07066

CHANGES IN THE VEGETATION OF A MOORLAND FISHPOND IN TWENTY-ONE YEARS,
Freshwater Biological Association, Ambleside (England).
T. T. Macan.
Journal of Ecology, Vol. 65, p 95-106, 1977. 3 fig, 2 tab, 7 ref.

Descriptors: *Rooted aquatic plants, *Vegetation regrowth, Ecological distribution, Limiting factors, Wetlands, Aquatic plants, Submerged plants, Pondweeds, *Vegetation effects, Fluctuation, Aquatic habitats, Distribution patterns, Environmental effects, Lakes, Ponds.

Vegetative change has been a feature of Hodson's Tarn for many years, but there has not been a progressive seral change. There have been marked fluctuations in the abundance of the three most frequent species (Myriophyllum alterniflorum, Littorella uniflora, Carex rostrata). M. alterniflorum, after decline and recovery, has disappeared as a continuous stand. Other less frequent species have changed position (Potamogeton natans), fluctuated in abundance (Juncus fluitans, Nitella flexilis), disappeared (Alisma plantago-aquatica, Glyceria fluitans), or invaded and expanded (Potamogeton alpinus). It is likely that the vegetative changes were caused by changes in the substratum. The stand of Myriophyllum at the start was due to the exceptional condition that the soil had been exposed to the air a few years previously. Erosion or decomposition of lacustrine deposits during the dry period had rendered the soil favorable, but it gradually became unfavorable as the deposits accumulated once more. The decline of Carex and Littorella and the changes in abundance of Juncus fluitans and Nitella may be attributed to some unfavorable factor in the soil as vegetable remains accumulated. The vegetation declined, the plant remains decomposed, and the soil gradually became suitable for the return of vegetation. (Steiner-Mass)
W78-07067

EFFECTS OF GRASS CARP INTRODUCTION ON WATERFOWL HABITAT,
Florida State Game and Fresh Water Fish Commission, Lake Wales.
For primary bibliographic entry see Field 6G.
W78-07068

TIDAL WETLAND PLANTS OF VIRGINIA,
Virginia Inst. of Marine Science, Gloucester Point.
G. M. Silberhorn.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-260 837, Price codes: A05 in paper copy, A01 in microfiche. Educational Series No. 19, April, 1976. 90 p.

Descriptors: *Rooted aquatic plants, *Virginia, *Coastal marshes, Wetlands, Cattails, Bulrushes, Grasses, Woody plants, Sedges, Key to plant species.

A descriptive key to and description of the common tidal flora of Virginia is presented. A description of individual species (including distinguishing characteristics and habitat) is accompanied by an appropriate illustration. Species are divided into four groups: 1. Grass and grasslike plants, 2. Plants with minute, inconspicuous flowers, 3. Woody plants, and 4. Plants with conspicuous or pod-like inflorescences. (Stihler-Mass)
W78-07072

SALT MARSH CULICOIDES (DIPTERA: CERATOPOGONIDAE): SPECIES, SEASONAL ABUNDANCE AND COMPARISONS OF TRAPPING METHODS,
North Carolina Agriculture Experiment Stations, Raleigh.
D. L. Kline, and R. C. Axtell
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 077, Price codes: A02 in paper copy, A01 in microfiche. Mosquito News, Vol. 36, No. 1, p 1-10, March, 1976. 2 fig, 2 tab, 36 ref.

Descriptors: *Diptera, *Coastal marshes, *North Carolina, Trapping, *Biting gnats, *Seasonal variations, Culicoides, Trapping methods.

The spatial and seasonal abundance of adult biting gnats in a coastal Spartina salt marsh in North Carolina was determined during a 2-year period using a light trap, emergence traps, and sticky cylinder traps. Twelve species were collected, the greatest number (11) by the light trap. Culicoides hollensis and C. furens were the most abundant species. C. hollensis was abundant in spring and fall; C. furens, from later spring to early fall. Emergence traps provided the most precise data on seasonal occurrence of both species. The light trap and sticky cylinder traps were less effective in attracting C. hollensis than C. furens. With these two trap types a lower percentage of males of both species was obtained, than was obtained using emergence traps. Adult catches were correlated with temperature, rainfall, and the percentage of time the marsh was flooded. (Stihler-Mass)
W78-07074

PLANT SPECIES CHECKLIST FOR THE LAC DES ALLEMANDS SWAMP AREA OF LOUISIANA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
W. H. Conner, R. E. Noble, and S. W. Day, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 078, Price codes: A02 in paper copy, A01 in microfiche. Agricultural Experiment Station Research Release, Note No. 113, July, 1975. 5 p, 8 ref.

Descriptors: *Swamps, *Louisiana, *Aquatic plants, *Census, Wetlands, Marsh plants, Data collections, Surveys, Lac Des Allemands Swamp(Louisiana), Checklist.

The compilation of a checklist of plants found in the area was one aspect of a study of productivity and plant composition in the freshwater swamp system. The list is composed of those plants personally observed by the authors. Within the swamp, two forest types--bottomland hardwood and baldcypress-water tupelo--were studied. In the bottomland hardwood area, Drummond red maple, boxelder, roughleaf dogwood, and black willow dominate with only a few baldcypress and water tupelo. In the swamp areas, however, baldcypress and water tupelo dominate with only a few Drummond red maples and pumpkin ashes present. (Steiner-Mass)
W78-07144

A TECHNIQUE FOR THE DETERMINATION OF LOUISIANA MARSH SALINITY ZONES FROM VEGETATION MAPPED BY MULTISPECTRAL SCANNER DATA: A COMPARISON OF SATELLITE AND AIRCRAFT DATA,
National Aeronautics and Space Administration, Houston, TX.
For primary bibliographic entry see Field 7B.
W78-07148

REMOTE SENSING OF AQUATIC PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 7B.
W78-07153

THREE APPROACHES TO THE CLASSIFICATION AND MAPPING OF INLAND WETLANDS,
Geological Survey, Suffolk, VA
For primary bibliographic entry see Field 7B
W78-07154

VEGETATION ON ROCKY SHORES AT SOME NORTH IRISH SEA SITES,
Liverpool Univ (England) Hartley Botanical Labs.
For primary bibliographic entry see Field 5C.
W78-07155

NITROGEN FIXATION BY ALGAE IN A MASSACHUSETTS SALT MARSH,
State Univ of New York at Stony Brook. Marine Sciences Research Center
For primary bibliographic entry see Field 2I.
W78-07157

THE AQUATIC MACROPHYTES OF SOME LAKES IN SOUTHEASTERN ONTARIO,
Queen's Univ., Kingston (Ontario) Dept. of Biology.
A. A. Crowder, J. M. Bristow, M. R. King, and S. Vanderkloet.
Le Naturaliste Canadien, Vol. 104, p 457-464, 1977. 1 fig, 2 tab, 13 ref.

Descriptors: *Aquatic plants, *Census, *Distribution patterns, Wetlands, Lakes, Rooted aquatic plants, Submerged plants, Floating plants, Aquatic habitats, Canada, Southeastern Ontario.

Results of a survey of the submerged aquatic macrophytes in 16 sites in southeastern Ontario varying widely in geology and nutrient status are presented. When comparisons could be made, the majority of the submerged and floating-leaved aquatic macrophyte found showed similar distribution patterns in relation to water conductivity as these same species growing in other parts of North America or in Europe. (Steiner-Mass)
W78-07161

OUR DYNAMIC TIDAL MARSHES: VEGETATION CHANGES AS REVEALED BY PEAT ANALYSIS,
Connecticut Coll., New London.
For primary bibliographic entry see Field 2L.
W78-07163

2J. Erosion and Sedimentation

EROSION RATES OF COHESIVE SOILS,
Nielsen Engineering and Research Inc., Mountain View, CA.
R. Ariathurai, and K. Arulanandan.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 104, No HY2, Technical Notes, p 279-283, February 1978. 5 fig, 4 ref, 1 append.

Descriptors: *Erosion rates, *Cohesive soils, *Laboratory tests, Erosion, Soils, Shear stress, Clays, Soil types, Cation exchange, Loam, Illitie, Temperature, Chemical properties, Mechanical properties, Expansive soils, Testing procedures, Yolo loam, Sodium adsorption ratio.

The objective was to describe the effects of the principal physical and chemical factors on the rate of erosion of saturated cohesive soils. A number of remolded samples with different types and amounts of clay and different pore fluid compositions were preconsolidated in a 7.6-cm diam cylindrical tube at a normal stress of 1 kg/sq cm. After consolidation, the samples were placed in the eroding fluid to be used and were allowed to swell for a few hours. The results of erosion tests on over 200 natural and made-up soil samples indicated that the erosion rate constant, M, lies in

the range 0.003 g/sq cm x min to 0.03 g/sq cm x min with few exceptions. The slopes, of the erosion rate curves increases with increase in critical shear stress. If the relationship between s and critical shear stress were inverse, then M would be independent of the critical shear stress, although M may vary with other chemical and physical parameters. If further measurements designed to investigate the relationship between the erodibility constants critical shear stress and M should yield a functional relationship between the two, there will be one less parameter to deal with in problems such as the determination of soil yield from watersheds, and estuarial sediment transport. (Humphreys-ISWS)
W78-06720

REANALYSIS OF THE GREAT LAKES DROGUE STUDIES DATA,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2H.
W78-06723

METHODS OF SOIL STABILIZATION FOR EROSION CONTROL,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 4D.
W78-06724

EFFECT OF ROCK COMPOSITION AND STEEPNESS AND EXPOSURE OF SLOPES ON SURFACE AND UNDERGROUND RUNOFF (IN RUSSIAN),
Kislovodsk Mountain-Forest Lab. (USSR).
For primary bibliographic entry see Field 2G.
W78-06781

URBAN CHANNEL EROSION: PRELIMINARY ANALYSIS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 4D.
W78-06810

QUARTERNARY EVOLUTION IN TAMA COUNTY, IOWA,
Queen's Univ., Kingston (Ontario). Dept. of Geography.
W. J. Vreeken.
Annals of the Association of American Geographers, Vol 65, No 2, p 283-296, June, 1975. 13 fig, 13 ref. OWRT A-999-IA(11).

Descriptors: *Geomorphology, *Gullies, *Loess, *Paleosols, *Iowa, *Stratigraphy, *Erosion, Interglacial periods, Paha, Stoneline, Land evolution.

The geomorphic history of two fingertip drainage basins in northeast Iowa was reconstructed from borehole observations. A multicyclic land surface (a residual upland with Yarmouth-Sangamon paleosols on Kansan till, a lower erosion surface with late Sangamon palesosols, and still lower Iowan erosion surfaces in till without palesols) is cloaked by Wisconsin loess. The upper two of these three levels were buried about 29,000 years B.P. Successively lower protions of the Iowan surfaces are overlain by successively younger subdivisions of the loess, indicating time-trangressive burial owing to continuing erosion. Burial was completed around 18,300 years B.P. Locally thick loess on top of the Iowan surfaces is indicative of spatially different rates of deposition. Iowan surfaces served as the source of sand in the loess. Modifications since the close of loess deposition around 14,000 years B.P. were inferred from valley fills. They include a major gully cycle with terminated around 6,200 years B.P., followed by massive sheet erosion. Anthropogenic influences after white settlement are evidenced by an uppermost increment of valley fill that is locally breached by discontinuous gullies. (Seip - IPA)
W78-06827

BYPASSING SAND AT COASTAL INLETS.
For primary bibliographic entry see Field 2L.
W78-06891

CONTROL OF TURBIDITY AT CONSTRUCTION SITES.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 5G.
W78-06904

STOCHASTIC ANALYSIS OF PARTICLE MOVEMENT OVER A DUNE BED,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
B. K. Lee, and H. E. Jobson.
Available from Supt. of Documents, GPO, Washington, DC 20402, price $2.50. Professional Paper 1040, 1977. 72 p, 20 fig, 75 tab, 14 ref.

Descriptors: *Sediment transport, *Particle size, *Model studies, *Alluvial channels, *Stochastic processes, Streamflow, Analytical techniques, Equations, Dune sands, Sediments, River dune bed.

Stochastic models are available that can be used to predict the transport and dispersion of bed-material sediment particles in an alluvial channel. These models are based on the proposition that the movement of a single bed-material sediment particle consists of a series of steps of random length separated by rest periods of random duration and, therefore, application of the models requires a knowledge of the probability distributions of the step lengths, the rest periods, the elevation of particle deposition, and the elevation of particle erosion. The procedure was tested by determining distributions from bed profiles formed in a large laboratory flume with a coarse sand as the bed material. The elevation of particle deposition and the elevation of particle erosion can be considered to be identically distributed, and their distribution can be described by either a 'truncated Gaussian' or a 'triangular' density function. The conditional probability distribution of the rest period given the elevation of particle deposition closely followed the two-parameter gamma distribution. The conditional probability distribution of the step length given the elevation of particle erosion and the elevation of particle deposition also closely followed the two-parameter gamma density function. For a given flow, the scale and shape parameters describing the gamma probability distributions can be expressed as functions of bed-elevation. (Woodard-USGS)
W78-06948

EROSION AND SEDIMENT YIELDS IN THE TRANSVERSE RANGES, SOUTHERN CALIFORNIA,
Geological Survey, Laguna Niguel, CA. Water Resources Div.
K. M. Scott, and R. P. Williams.
Available from Supt of Documents, GPO, Washington, DC 20402, price $1.70. Professional Paper 1030, 1978. 38 p, 12 fig, 8 tab, 54 ref.

Descriptors: *Erosion rates, *Sediment yield, *Storms, *California, Mountains, Watersheds(Basins), Landslides, Uplift pressure, Forecasting, Equations, Analytical techniques, *Ventura County(Calif), Transverse ranges.

Major-storm and long-term erosion rates in mountain watersheds of the western Transverse Ranges of Ventura County, Calif., are estimated to range from low values that would not require the construction of catchments or channel-stabilization structures to values as high as those recorded anywhere for comparable bedrock erodibilities. A major reason for this extreme variability is the high degree of tectonic activity in the area--watersheds are locally being uplifted by at least as much as 25 feet per 1,000 years, yet the maximum extrapolated rate of denudation measured over the longest available period of record is 7.5 feet per 1,000 years adjusted to a drainage area of 0.5 square mile. Evidence of large amounts of uplift continuing into historic time includes structurally overturned strata of Pleistocene age, active thrust faulting, demonstrable stream antecedence, uplifted and deformed terraces, and other results of base-level change seen in stream channels. Such evidence is widespread in the Transverse Ranges, and aspects of the landscape are locally more a function of tectonic activity than of the denudational process. (Woodard-USGS)
W78-06949

AN EVALUATION OF THE USE OF REDOX MEASUREMENTS FOR CHARACTERIZING RECENT SEDIMENTS,
Stockholm Univ. (Sweden). Dept. of Geology.
L. E. Bagander, and L. Niemistro.
Estuarine and Coastal Marine Science, Vol. 6, No. 2, p 127-134, February 1978. 7 fig, 15 ref.

Descriptors: *Sediments, *Oxidation-reduction potential, *Cores, Sampling, Analytical techniques, Electrodes, Laboratory tests, Analysis, Regression analysis, Profiles, Depth, Sedimentation, Sedimentology, *Baltic Sea, *Gulf of Bothnia.

Redox measurements, in sediment cores from 17 stations in the Baltic Sea and the Gulf of Bothnia, were carried out in order to compare the results from two separate pieces of equipment for measuring. Linear regression analysis of the results from 107 parallel measurements gave a coefficient of correlation of 0.98. The measured redox values were grouped into three distinct clusters which reflected the predominance of a 'strong' redox couple or couples within each of these redox ranges. The good correlation between the results indicated that redox measurements can be made with reasonable reproducibility. (Sims-ISWS)
W78-07098

MEASUREMENT OF 239 - 240 PU IN THE NORTHWESTERN MEDITERRANEAN,
International Lab. of Marine Radioactivity.
For primary bibliographic entry see Field 2L.
W78-07099

SOIL DISTRUBANCE CAUSED BY SKYLINE CABLE LOGGING ON STEEP SLOPES IN WEST VIRGINIA,
Northeastern Forest Experiment Station, Parson, WV. Timber and Watershed Lab.
For primary bibliographic entry see Field 4C.
W78-07109

GEOGRAPHIC INVESTIGATIONS OF SNOW AVALANCHES AND MUDFLOWS,
Moscow State Univ., Moscow (USSR). Lab. of Snow Avalanche and Mudflow Problems.
For primary bibliographic entry see Field 2C.
W78-07117

DEPOSITIONAL ENVIRONMENTS IN THE COLVILLE RIVER DELTA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 2L.
W78-07149

PROCESSES IN SEDIMENT DEPOSITION AND SHORELINE CHANGES IN THE POINT PELEE AREA, ONTARIO,
Canada Centre for Inland Waters, Burlington (Ontario).
J. P. Coakley.

Scientific Series No. 79, 1977, 76 p, 26 fig, 40 ref, 9 tab.

Descriptors: *Sediment transport, *Beach erosion, *Littoral drift, Shoals, Shores, Currents(Water), Circulation, Seiches, Waves(Water), Sedimentology, Dredging, *Canada, Lake Erie, Lake sediments, *Point Pelee(Ontario)

Ever since its formation as a much larger coastal feature some 4000 years ago, Point Pelee has been receding landward (i.e. northward and westward) under the influence of rising lake levels and increasing wave stress. Using some reasonable assumptions, we estimate the average rate of retreat since that time as being in the order of 2.5 m per yr (northward) and 0.25 m per yr (westward). More recent trends inferred from the historical record (reports, surveys and charts) indicate significant change from this overall trend. Average westward recession since 1918 for large portions of the east side of the Point now reaches more than 3 m per yr, and the partially submerged spit south of the Point has been greatly reduced in length. At the same time, however, some areas have remained stable or show a degree of accession over this period. Short-term monitoring of bottom currents in the area are for the most part consistent with the above sediment dispersal patterns, but the energy spectra of the currents suggest that agents such as lake circulation effects (especially those related to seiching) are of greater importance than waves in sediment distribution patterns on the shoal. On the basis of the above information, it is concluded that there is little evidence that commercial dredging in the southernmost areas of the shoal is an important factor in shoreline changes on the Point. However, the dredging operations in the vicinity of the spit itself during the early 1900's, and the proximity of more recent operations (until 1973) to the postulated storage area in the northern areas of the shoal should definitely be considered as adverse factors in explaining the recent trends in shoreline changes at Point Pelee. (WATDOC)
W78-07171

MATHEMATICAL MODELLING OF SEDIMENT-LADEN FLOWS IN NATURAL STREAMS,
Canada Centre for Inland Waters, Burlington (Ontario).
B. G. Krishnappan, and N. Snider.
Scientific Series No. 81, 1977, 48 p, 8 fig, 13 ref, append

Descriptors: *Sediment transport, *Flow, *Unsteady flow, *Natural flow, Streams, Streamflow, *Mathematical models, Laboratory tests, Momentum, Friction, Equation, Momentum transfer, Velocity, Continuous flow, Upstream, Downstream, *Hypothetical river, *Alluvial streams.

In this report, a mathematical model of a stream carrying sediment has been described. This model solves the continuity equation for the sediment water mixture and the momentum equation numerically, and corrects the solution at each time step using the continuity equation of the sediment. This model uses an implicit finite difference approximation scheme to discretize the governing equations and a Double Sweep method to solve the system of algebraic equations. The roughness characteristics of the natural streams are predicted using a method proposed recently by two Japanese scientists, Kishi and Kuroki. This method considers the effects of the various bed configurations (sand waves) present in natural streams in an adequate manner and also considers the flow regime and 'skin friction' characteristics. The sediment transport rate required for the model is predicted using the method of Ackers and White, which has been found to be superior to most existing methods. The model thus incorporates the most recent advances in the field of sediment transport and should be capable of yielding reliable predictions of the responses of natural streams to changes in flow and sediment inputs, and to changes in geometry due to river crossings, protection works, realignment, etc. The application of the model is indicated using a hypothetical river reach. The flow charts, the description of the input data, the listing of the computer program and the sample model output are also given. (WATDOC)
W78-07173

2K. Chemical Processes

URANIUM IN RIVER RUNOFF,
Akademiya Nauk SSSR, Moscow. Inst. Okeanologii.
For primary bibliographic entry see Field 5B.
W78-06713

INTRODUCTION TO INSTRUMENTAL ANALYSIS OF WATER POLLUTANTS: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, OH. Office of Water Program Operations
For primary bibliographic entry see Field 5A.
W78-06769

DETERMINATION OF AMMONIUM N AND NITRATE N IN ACID PERMANGANATE SOLUTION USED TO ABSORB AMMONIA, NITRIC OXIDE, AND NITROGEN DIOXIDE EVOLVED FROM SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
For primary bibliographic entry see Field 5A.
W78-06828

CONTRIBUTION TO THE PROBLEM OF FORECASTING THE MINERAL CONTENT AND CHEMICAL COMPOSITION OF RESERVOIR WATER,
Novocherkassk Inst. of Chemical Hydrology (USSR).
For primary bibliographic entry see Field 2H.
W78-06881

APPARENT ANOMALY IN FREEZING OF ORDINARY WATER,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 1A.
W78-06882

A FILTRATION UNIT FOR USE WITH CONTINUOUS AUTOANALYTICAL SYSTEMS APPLIED TO HIGHLY TURBID WATERS,
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5A.
W78-06894

DEPENDENCE OF THE CHEMICAL COMPOSITION OF GROUND WATERS IN THE NORTHERN CAUCASUS ON THE COMPOSITION OF ENCLOSING ROCKS,
Gidrokhimicheskii Inst., Novocherkassk (USSR).
P. P. Kutseva, and G. S. Konovalov.
Soviet Hydrology, Selected Papers, Vol. 15, No. 2, p 152-159, 1976. 7 fig, 2 tab, 17 ref. Translated from Gidrokhimicheskiye Materialy, Vol. 62, p 83-94, 1975.

Descriptors: *Groundwater, *Water chemistry, *Rocks, *Geochemistry, Chemicals, Chemistry, Chemical analysis, Sampling, Mountains, Geology, *USSR, *Caucasus(USSR).

Groundwaters are in closest and most prolonged contact with rocks, the effect of which is primarily reflected in the composition of these waters. For this reason, it is necessary to study the effect of rocks on the chemistry of groundwaters, which are an important source of supply to surface waters. The dependence of the chemistry of groundwaters on the chemistry of rocks in the high mountain regions of the Northern Caucasus was investigated. The groundwaters of the zone of intense water exchange of the high mountain regions of the Northern Caucasus, formed in certain rocks or rock complexes, have specific chemical features. The groundwaters of the region can be subdivided into the following groups, depending on the type of enclosing rock and on their chemical composition: waters of extrusive rocks, granites, ultrabasic rocks, phyllite schists, youthful Elbrus lavas, crystalline schists, sulfide rocks, clastic and sandy clay rocks, and metamorphic rocks. The cation composition of the waters is determined by the mineralogical composition of the enclosing rocks. The content of sulfate and chloride ions in the waters depends on the content of these ions in the rocks. The extreme variety of the cation and anion compositions of waters forming in the region of development of Elbrus lavas is produced to a large extent by the composition of the products of volcanic activity contained in the lavas. (Sims-ISWS)
W78-06900

USE OF FERROUS HYDROXIDE FOR DETERMINATION OF NITRATE IN SOIL EXTRACTS,
Iowa State Univ., Ames. Dept. of Agronomy
For primary bibliographic entry see Field 5A
W78-06925

THE KINETICS OF CALCITE DISSOLUTION IN C02-WATER SYSTEMS AT 5 DEG TO 60 DEG C AND 0.0 TO 1.0 ATM C02,
Geological Survey, Reston, VA. Water Resources Div.; and University of East Anglia, Norwich (England).
For primary bibliographic entry see Field 1B.
W78-06936

PROGRAM FOR EVALUATING STREAM QUALITY IN NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06939

GEOCHEMISTRY,
Geological Survey, Reston, VA. Geologic Div.; and Geological Survey, Reston, VA. Water Resource Div.
R. Brett, and B. B. Hanshaw.
Geotimes, Vol. 28, No. 1, p 27, January 1978.

Descriptors: *Geochemistry, *Reviews, *Projects, *North America, *Chemical reactions, Solvents, Rocks, Solutes, Leaching, Clays, Surface waters, Subsurface waters, Minerology, Physical properties, Water properties, Model studies, Earthquakes, Oceans, Meteoric water, Annual review, Global aspects.

The past year has seen a blossoming of certain fields of geochemical research where previously isolated area were cultivated by a single group. Some of these burgeoning fields owe their existence to techniques developed in response to the lunar-sample program. Examples include: Nd-Sm isotopic studies of meteorites and ancient terrestrial rocks; the use of the consortium approach of assembling a multidisciplined team to tackle a problem; and the handling and analysis of small quantities of material. (Woodard-USGS)
W78-06946

MEASUREMENT OF ABSORPTION COEFFICIENTS OF WATER IN THE VISIBLE SPECTRAL REGION (PHASE I & II),
Missouri Univ., Kansas City.
For primary bibliographic entry see Field 1A.
W78-07052

CHEMICAL COMPOSITION OF RAIN AND BROOK WATER IN BRITTANY (FRANCE), (IN FRENCH),
Rennes Univ. (France). Hydrobiological Lab.
G. Bertru.
Ann Hydrobiol 8(1), p 99-110, 1977.

Descriptors: Seasonal, Water pollution sources, Rain, *Water analysis, Chemicals, Streams, Sodium, Potassium, Calcium, Magnesium, Ions, Leaching, Soils, Chlorides, Sulfates, *Pollutant identification, *France(Brittany).

A study was made of the composition of rain water over a period of 12 mo, and the analyses compared with those of stream water. Analyses were made for Na, K, Ca, Mg, chlorides and sulfates. The composition of stream water may be very dependent of that of the precipitation. The composition of rain water is partly dependent of that of the precipitation. The composition of rain water is partly dependent on geographical location and, perhaps, in part on atmospheric pollution. Examining the ratio to chlorides off all the other ions in the brooks and precipitation, the proportions of chlorides, Na and Mg were fairly close to that of sea water during winter and summer. At Kerloas the proportion of K was higher than in rain water and was from ground sources. Most of the Ca and sulfate in the brooks (Penlan, Kernec, Kerloas, Kerlegan (in France) was from ground sources at all times. The edges decreased the concentration of chlorides when the wind blew from south southeast and south southwest. The dissolved ions in rain water have considerable ecological significance, especially to heavily leached soils with mor humus layers.--Copyright 1978, Biological Abstracts, Inc
W78-07192

2L. Estuaries

SAFETY OF DIKES AGAINST STORM TIDES AND WAVE RUNUP,
Department of Coastal Protection, Aurich (West Germany).
For primary bibliographic entry see Field 8B.
W78-06714

A LOOK AT COASTAL ENGINEERING STUDY IN JAPAN,
Japan Society of Civil Engineers, Tokyo. Committee on Coastal Engineering.
For primary bibliographic entry see Field 8B.
W78-06716

WAVE RUNUP AROUND LARGE CIRCULAR CYLINDER,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-06718

INFLUENCE OF TIDAL INLETS ON SALINITY IN ESTUARIES,
Indian Inst of Tech., Madras. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 5B.
W78-06733

ASPECTS OF LAND-TREATED WASTE APPLICATIONS IN LOUISIANA WETLANDS,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
For primary bibliographic entry see Field 5D.
W78-06744

COMBINED EFFECT OF THERMAL AND ORGANIC POLLUTION ON OXYGEN SAG CURVE - PHASE II,
Worcester Polytechnic Inst., MA.
For primary bibliographic entry see Field 5C.
W78-06751

POLITICS OF SHORE EROSION: WESTHAMPTON BEACH,
State Univ. of New York at Albany. Graduate School of Public Affairs.
For primary bibliographic entry see Field 6E.
W78-06776

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE, SPECIAL REPORT IV: INSTITUTIONAL IMPACT OF ALTERNATIVE COASTAL ZONE MANAGEMENT SYSTEMS,
Lyndon B. Johnson School of Public Affairs, Austin, TX.
For primary bibliographic entry see Field 6B.
W78-06777

BENCHMARK ESTABLISHMENT AND WATER QUALITY MONITORING IN THE BRIDGEPORT AND BLACK ROCK HARBOR SYSTEMS,
Higher Education Center for Urban Studies, Bridgeport, CT.
For primary bibliographic entry see Field 5A.
W78-06787

BIOAVAILABILITY OF NAPHTHALENES FROM MARINE SEDIMENTS ARTIFICIALLY CONTAMINATED WITH PRUDHOE BAY CRUDE OIL,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
For primary bibliographic entry see Field 5C.
W78-06834

THE EFFECTS OF THE WATER-SOLUBLE FRACTIONS OF NO. 2 FUEL OIL ON THE EARLY DEVELOPMENT OF THE ESTUARINE FISH, FUNDULUS GRANDIS BAIRD AND GIRARD,
Texas A and M Univ., College Station. Dept. of Biology; and Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
For primary bibliographic entry see Field 5C.
W78-06841

DISTRIBUTION OF N-PARAFFINS IN SEAGRASSES, BENTHIC ALGAE, OYSTERS AND RECENT SEDIMENTS FROM TERMINOS LAGOON, CAMPECHE, MEXICO,
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Ciencias del Mar y Limnologia.
For primary bibliographic entry see Field 5B.
W78-06842

NET DRIFT IN AN ATYPICAL ESTUARY, LONG ISLAND SOUND,
Naval Ocean Research and Development Activity, Bay St. Louis, MS.
For primary bibliographic entry see Field 5B.
W78-06843

DISTRIBUTION OF TAR BALLS ON BAHAMIAN BEACHES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-06845

CONTAMINANT INPUTS TO THE NEW YORK BIGHT,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5B.
W78-06858

THE METULA OIL SPILL,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Lab.
For primary bibliographic entry see Field 5B.
W78-06862

COPPER IN THE SEA - A BIBLIOGRAPHY,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W78-06865

THE UTILITY OF SKYLAB PHOTO-INTERPRETED EARTH RESOURCES DATA IN STUDIES OF MARINE GEOLOGY AND COASTAL PROCESSES IN PUERTO RICO AND THE VIRGIN ISLANDS,
Geological Survey, San Juan, PR.
For primary bibliographic entry see Field 5B.
W78-06867

A REVIEW OF OIL POLLUTING INCIDENTS IN AND AROUND NEW ENGLAND,
Environmental Research Lab., Narragansett, RI.
For primary bibliographic entry see Field 5B.
W78-06868

A NOTE ON FREE OSCILLATIONS OF CHEDABUCTO BAY,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
F. G. Barber, and J. Taylor.
Manuscript Report Series No. 47, 1977. 43 p, 11 fig, 6 tab, 11 ref, 1 append.

Descriptors: *Tides, *Bays, *Canada, *Model studies, Mathematical models, On-site investigations, On-site data collections, Data processing, Analytical techniques, Water circulation, Tidal waters, Coasts, Estuaries, *Nova Scotia, *Lennox Passage, Causeways, *Chedabucto Bay.

A short series of current observations in Lennox Passage was analyzed using spectrum analysis techniques, and comparisons were made with an analysis of sea level data and with the output of a numerical model. Self-oscillations of Chedabucto Bay were clearly indicated, and possible relationships with other oceanographic parameters were noted. A number of tests of one of the methods of analysis was given. (Sims-ISWS)
W78-06877

THE IDENTIFICATION AND CLASSIFICATION OF TIDAL RECORDS THROUGH PATTERN RECOGNITION,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
G. Godin.
Manuscript Report Series No. 42, 1977. 45 p, 3 fig, 8 tab, 4 ref, 1 append.

Descriptors: *Tides, *Analytical techniques, *Time series analysis, Tidal waters, Water levels, Water level fluctuations, Classification, Data processing, Coasts, Estuaries, Oceans, Oceanography, Tidal records, Pattern recognition.

Tidal records can be characterized by patterns made up of simple statistics carried out on their behavior in time. These patterns may be used to identify and to classify this type of record without the need for a conventional spectral analysis. (Sims-ISWS)
W78-06878

THE USE OF THE ADMITTANCE FUNCTION FOR THE REDUCTION AND INTERPRETATION OF TIDAL RECORDS,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
G. Godin.

Manuscript Report Series No. 41, 1976. 49 p, 15 fig, 8 tab, 14 ref.

Descriptors: *Tides, *Analytical techniques, *Time series analysis, Tidal waters, Water levels, Water level fluctuations, Coasts, Estuaries, Oceans, Oceanography, Tidal records, Admittance function.

The admittance function, already used to calculate the response of water levels to specific physical inputs, was shown to be useful for the reduction of short series of tidal observations, for the construction of cotidal charts, and for the detection of irregularities in the tidal signal or in the recording instrument, provided some care is taken in the choice of the input function. (Sims-ISWS)
W78-06879

MODULATION OF COHERENT MICROWAVE BACKSCATTER BY SHOALING WAVES,
Naval Research Lab., Washington, DC. Ocean Sciences Div.
W. J. Plant, W. C. Keller, and J. W. Wright.
Journal of Geophysical Research, Vol. 83, No. C3, p 1347-1352, March 20, 1978. 7 fig, 1 tab, 14 ref.

Descriptors: *Waves(Water), *North Carolina, *Ocean waves, *Remote sensing, Radar, Instrumentation, Microwaves, Mathematical models, On-site investigations, Coasts, Shores, Oceanography, *Radar backscatter, *Shoaling waves.

The orbital speed of long shoaling waves and the modulation of centimetric wind-generated waves by the shoaling waves were obtained from the frequency and amplitude modulations, respectively, of the backscattered signal of a coherent CW 9.375-GHz radar operated from the end of a pier on the Outer Banks of North Carolina. Modulations anomalously large in comparison with those predicted by the relaxation time model were observed in the range of wind speeds 4.5-6.5 m/s, which was perhaps coincidentally near the shallow water wave speed. Outside this range of wind speeds, the model qualitatively accounted for the magnitude and wind speed dependence of the measured modulations. The phase of the modulation leads to the inference that the maximum amplitude of the short waves occurs near, and generally leeward of, the crests of long waves for wind speeds of up to 8 m/s, the highest wind speed encountered in the experiment. (Sims-ISWS)
W78-06889

AN AVERAGE GEOPOTENTIAL SEA LEVEL SERIES FOR THE UNITED STATES,
National Ocean Survey, Rockville, MD.
S. D. Hicks.
Journal of Geophysical Research, Vol. 83, No. C3, p 1377-1379, March 20, 1978. 1 fig, 1 tab, 11 ref.

Descriptors: *Sea level, *Time series analysis, *United States, Data collections, Data processing, Regression analysis, Tides, Water levels, Oceans, Climatology, Oceanography, Tide stations.

For climate monitoring purposes an average sea level series for the United States, from which a representative curve and a single-value rate were derived, was presented. In addition, the use of dynamic height was introduced in order to take into account the greatly differing latitudes of the tide stations used in the study. The series was obtained by averaging common length uninterrupted sea level elevations reduced from the tide gage measurements of each station. The averaging was by coastal area. The curve, with amplitudes of the averaged meteorological and oceanograhic oscillations of periods of less than 5-1/3 yr attenuated more than 90%, showed the relative apparent secular trend and its changes for the United States as a whole. During the 36-yr period 1940-1975, sea level rose along the coast of the United States at the average rate of 1.5 dynamic mm/yr. (Sims-ISWS)
W78-06890

BYPASSING SAND AT COASTAL INLETS.
Civil Engineering-American Society of Civil Engineers, p 57-60, March 1978. 6 fig, 3 ref.

Descriptors: *Inlets, *Inlets(Waterways), *Beach erosion, *Coastal structures, *Bypasses, Littoral drift, Beaches, Breakwaters, Jetties, *Sands, Dredging, Erosion, Channels, Seashores, Coasts, Deposition(Sediments), Coastal engineering, *Sand bypassing.

To reduce dredging requirements and to provide calm navigation channels, the Corps of Engineers often constructs jetties and breakwaters. These structures block sand drifting along the shoreline, so beaches downstream can disappear when eroded sand is not replaced. To remedy this problem, the Corps has used weir jetties and eductor bypass systems. A weir jetty or weir breakwater has a depressed section on it to allow sand to wash over it into an impoundment basin. The basin is then emptied, and the sand is pumped to nourish downstream beaches. One system for excavating sand is the eductor system, which uses water circulating through a submerged nozzle to create a suction; a shore-mounted pump discharges the sand downstream. The Corps is developing design guidelines for weir jetties, has fixed-bed physical models to design them, and has conducted field demonstrtions of weir jetties and the eductor system. (Sims-ISWS)
W78-06891

THE BEHAVIOUR OF DISSOLVED ALUMINUM IN ESTUARINE AND COASTAL WATERS,
University of East Anglia, Norwich (England). School of Environmental Science.
For primary bibliographic entry see Field 5B.
W78-06893

A FILTRATION UNIT FOR USE WITH CONTINUOUS AUTOANALYTICAL SYSTEMS APPLIED TO HIGHLY TURBID WATERS,
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5A.
W78-06894

THE SOURCES OF DISSOLVED MANGANESE TO CALICO CREEK, NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Curriculum in Marine Sciences.
For primary bibliographic entry see Field 5B.
W78-06895

IDENTIFICATION OF RELEVANT CRITERIA AND SURVEY OF POTENTIAL APPLICATION SITES FOR ARTIFICIAL HABITAT CREATION, VOLUME II, SURVEY OF POTENTIAL APPLICATION SITUATIONS AND SELECTION AND DESCRIPTION OF OPTIMUM PROJECT AREAS.
Coastal Zone Resources Corp., Wilmington, NC.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 526. Price codes: A16 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station Contract Report D-76-2, Volume II, October 1976. 383 p, 93 fig, 94 ref, 1 append. Army DACW39-73-C-0116 (Neg).

Descriptors: *Dredging, *Spoil banks, *Marshes, *Habitats, Wetlands, Shoreline cover, Vegetation, Salt marshes, Coastal marshes, Islands, Sediments, Coasts, Estuaries, *Disposal site selection, Dredged materials, Artificial marsh construction, Artificial habitats.

This report developed a process for the selection of areas appropriate for artificial marsh construction using dredged material. By application of the methodology set forth, Engineer District personnel will be able to identify such areas efficiently. In Volume I of the report, the biophysical and socioeconomic information needed to evaluate potential marsh creation sites was described and the rationale for the importance of such data was presented. A two-scaled approach to analyzing the information base typically available to the Engineer District was detailed. Specific kinds of problems that might arise and theoretical approaches to their solution also were discussed. The selection rationale was tested in Volume II by the choice and description of 50 prime candidate project areas, 10 within each of 5 major coastal geographical regions. From this compilation, 10 optimum project areas, 2 in each geographical region, were selected and described further using data gathered in the project areas and from relevant Engineer Districts. (Sims-ISWS)
W78-06902

PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON MARINE POLLUTION RESEARCH.
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5G.
W78-06906

RESEARCH NEEDS CONCERNING POLLUTION OF THE MARINE BENTHOS,
Pacific Northwest Environmental Research Lab., Newport, OR. Marine Science Center.
For primary bibliographic entry see Field 5G.
W78-06914

MICROBIOLOGY AND CHEMISTRY OF ESTUARINE SURFACE MICROLAYERS,
Environmental Research Lab., Gulf Breeze, Fl.; and Georgia State Univ., Atlanta. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-06917

PETROLEUM HYDROCARBONS IN THE NORTHERN PUGET SOUND AREA--A PILOT DESIGN STUDY,
NOAA National Analytical Facility, Seattle, WA.
For primary bibliographic entry see Field 5C.
W78-06981

HYDROCARBONS IN SEDIMENTS AND BENTHIC ORGANISMS FROM A DREDGE SPOIL DISPOSAL SITE IN RHODE ISLAND SOUND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-06982

GROWTH, MORTALITY, AND BIOMASS PARTITIONING IN FRESHWATER TIDAL WETLAND POPULATIONS OF WILD RICE (ZIZANIA AQUATICA VAR. AQUATICA),
Rider Coll., NJ. Dept. of Biology.
For primary bibliographic entry see Field 2I.
W78-06986

BEACH PHYTOMASS ALONG THE CALIFORNIA COAST,
California Univ., Davis. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-06989

NESTING BEHAVIOR OF HERRING GULLS: INVASION INTO SPARTINA SALT MARSH AREAS OF NEW JERSEY,
Livingston Coll., New Brunswick, NJ. Dept. of Biology.
J. Burger.
Condor, Vol. 79, p 162-169, 1977. 4 fig, 3 tab, 22 ref.

Descriptors: *Nesting, *Coastal marshes, *Gulls, Wetlands, Hatching, New Jersey, Herring gulls, Spartina marsh, Phragmites.

Herring gull nesting behavior and success was examined on types of areas: dry shrub, edge Spartina mat, and wet Spartina areas. Gulls constructed larger and deeper nests in wet, than in dry areas. The behavior of repairing damaged nests was more pronounced in gulls nesting in wet areas. Nests in dry areas had at least one egg hatch in 95-100% of the nests, depending on site. In wet-dry areas hatching success varied from 45 to 88%, and in the wettest areas no eggs hatched. Herring gulls can successfully hatch eggs in Spartina if they select high marsh areas. (Stihler)
W78-06990

A STUDY OF THE COMMON REEDGRASS (PHRAGMITES COMMUNIS TRIN.) IN THE COASTAL ZONE OF DELAWARE,
Delaware Univ., Newark. Coll. of Marine Studies.
J. M. Tyrawski.
M.S. Thesis, June 1977, 164 p, 20 fig, 24 tab, 105 ref.

Descriptors: *Wetlands, *Coastal marshes, *Aquatic plants, *Grasses, *Standing crop, *Detritus, *Primary productivity, Biomass, Root development, Rhizomes, Estuarine environment, *Delaware, Coastal plains, Estuaries, Decomposing organic matter, Carbon, Nitrogen, *Reedgrass, Phragmites communis, Biometrical characteristics.

Four colonies of Phragmites communis growing in the coastal zone areas of Delaware were monitored over a period extending from April, 1974, to October, 1975. Investigated were the productive capacities, resource allocation patterns and biometrical characteristics of the colonies and the production and decomposition of the litter. In general, the species was found to be capable of producing large amounts of organic material approaching or exceeding 2000 gm dry weight per square meter and the standing crops of subsurface root and rhizome materials on the order of 4000-6000 gm dry weight per square meter. In areas where a direct link exists between the reed colonies and the other estuarine ecosystem components, a positive contribution can be made to the estuary through the large amount of detritus produced. Significant inter-colony differences were noted to occur in several of the parameters measured including total culm, leaf, and stem weights, leaf weight ratios, culm heights and densities, carbon and nitrogen ratios of the leaf and stem materials. Differences also existed in the leaf area indices, subsurface standing crops, root/shoot ratios, panicle production and reproductive efforts. (Steiner-Mass)
W78-06993

MAN-MADE DEBRIS ON THE BERING SEA FLOOR,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W78-07033

A MANUAL OF MARSH AND AQUATIC VASCULAR PLANTS OF NORTH CAROLINA WITH HABITAT DATA,
North Carolina Agricultural Experiment Station, Raleigh.
For primary bibliographic entry see Field 2I.
W78-07062

PRODUCTION AND ECOLOGY OF EELGRASS (ZOSTERA MARINA L.) IN GREVELINGEN ESTUARY, THE NETHERLANDS, BEFORE AND AFTER THE CLOSURE,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
For primary bibliographic entry see Field 2I.
W78-07063

HABITAT, MORPHOLOGY AND PHENOLOGY OF SOUTHERN WILD RICE (ZIZANIA AQUATICA L.) FROM THE WADING RIVER IN NEW JERSEY,
Academy of Natural Sciences of Philadelphia, PA. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-07064

THE MYXOPHYCEAE OF THE MARSHES OF SOUTHERN DELAWARE,
Delaware Univ., Newark. School of Life and Health Sciences.
For primary bibliographic entry see Field 5C.
W78-07069

SALTWATER POND RESEARCH -- STUDY NO. 2,
Texas Parks and Wildlife Dept., Austin.
R. L. Colura, B. Hysmith, and L. L. Elam.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 230. Price codes: A08 in paper copy, A01 in microfiche. National Oceanic and Atmospheric Administration, Washington, D.C., National Marine Fisheries Service, March, 1976. 156 p.

Descriptors: *Fish farming, *Marine fish, *Shrimp, *Oysters, *Secondary productivity, Fish, Fish management, Fisheries, Marine fisheries, Aquatic animals, Commercial shellfish, Trout, Fungi, Parasitism, Commercial fish, Aquatic productivity, *Saltwater pond research, Fish propagation, Shrimp propagation.

Four saltwater pond research projects, are described. Job 1 is on a study done to determine the feasibility of raising penacid shrimp in a pond culture, to develop and evaluate a water circulation method to aid in the removal of metabolites in a static pond, and to evaluate varying feeding rates and stocking methods for optimum shrimp growth. Job 2 is on research to adapt oysters from several Texas bays exhibiting some resistance to a lethal spawn and rear spotted seatrout, red drum, southern flounder, black drum, and sheepshead in a controlled environment. Job 4 studies the relationship between mortality rate of selected species of fish released after capture with commercial fish gear and the mortality rate of a controlled group of fish. (Steiner-Mass)
W78-07071

TIDAL WETLAND PLANTS OF VIRGINIA,
Virginia Inst. of Marine Science, Gloucester Point.
For primary bibliographic entry see Field 2I.
W78-07072

A SURVEY OF GRAMMARID AMPHIPODS OF THE BARATARIA BAY, LOUISIANA REGION,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
J. D. Thomas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 796. Price codes: A02 in paper copy, A01 in microfiche. Sea Grant Reprint No. LSU-R-76-016. Reprinted from: Contributions in Marine Science, Vol. 20, p 87-100, Sept., 1976. 1 fig, 31 ref.

Descriptors: *Amphipoda, *Crustaceans, *Louisiana, Aquatic animals, Invertebrates, Marshes, Deltas, Gulf of Mexico, Ecology, Fish, *Grammarid amphipods, *Barataria Bay(Louisiana), Fish stomach contents analysis.

A study was initiated to investigate the species composition, distribution, and ecology of the indigenous amphipod fauna of the Barataria Bay area. Collecting methods included beam trawl, bottom grabs, dipnets, otter trawls, core samples, and examination of marsh grasses and algae by hand. Twenty-one species and one genus appear to be new to science. Largest amphipod populations were found in the Caminada chenier marsh (old beach ridges), as epifaunal components in and among submerged root systems of eroded stands of Distichlis spicata. Analysis of stomach contents of several species of fish in the area revealed Grandidierella bonnieroides Stephenson, Corophium louisianum Shoemaker, and Ampelisca abdita Mills to be the most frequently encountered amphipods. (Stihler-Mass)
W78-07073

SALT MARSH CULICOIDES (DIPTERA: CERATOPOGONIDAE): SPECIES, SEASONAL ABUNDANCE AND COMPARISONS OF TRAPPING METHODS,
North Carolina Agriculture Experiment Stations, Raleigh.
For primary bibliographic entry see Field 2I.
W78-07074

EXISTING LEGAL FRAMEWORK FOR MANAGEMENT OF VIRGINIA'S COASTAL WETLANDS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W78-07075

PHYSICAL MANAGEMENT OF COASTAL FLOOD PLAINS: GUIDELINES FOR HAZARDS AND ECOSYSTEMS MANAGEMENT,
Conservation Foundation, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-07077

ATMOSPHERIC DISPERSION CHARACTERISTICS IN COASTAL ENVIRONMENTS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 5A.
W78-07083

ABUNDANCE AND PRODUCTION OF MACROINVERTEBRATES FROM NATURAL AND ARTIFICIALLY ESTABLISHED SALT MARSHES IN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
L. M. Cammen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 010. Price codes: A02 in paper copy, A01 in microfiche. Sea Grant Reprint No. 102. Reprinted from: The American Midland Naturalist, Vol. 96, No. 2, p 487-493, October, 1976. 3 tab, 9 ref.

Descriptors: *Salt marshes, *North Carolina, *Dredging, *Invertebrates, Wetlands, Marshes, Aquatic plants, Grasses, Mussels, Aquatic insects, Annelids, Mollusks, *Drum Inlet(NC), *Snow's Cut(NC).

Core samples were taken from dredge soil planted with Spartina alterniflora, soil left bare, and nearby natural marshes at Drum Inlet and Snow's Cut, North Carolina. Insect larvae were dominant in the fauna of both spoil areas in Drum Inlet while polychaetes dominated the natural marsh fauna. At Snow's Cut, polychaetes were dominant in the fauna of the bare spoil, while the planted spoil fauna consisted mainly of amphipods and insect larvae; polychaetes, isopods, and mussels were the most abundant natural marsh fauna. The creek fauna of both areas was dominated by polychaetes. Annual macrofaunal production was estimated for both areas. Production estimates for creek stations generally were higher. There was no consistent relation between the presence of Spartina and the abundance of macrofauna in the spoil plots. (Steiner-Mass)
W78-07084

TIME DEPENDENT MIXING IN A SALT WEDGE ESTUARY,
Washington Univ., Seattle. Dept. of Oceanography.
E. N. Partch, and J. D. Smith.
Estuarine and Coastal Marine Science, Vol. 6, No. 1, p 3-19, January 1978. 8 fig, 3 tab, 15 ref. NSF GA-14178.

Descriptors: *Mixing, *Estuaries, *Salts, *Oregon, Coasts, Tidal waters, Rivers, Sampling, On-site investigations, Profiles, Temperature, Water temperature, *Salinity, Velocity, Water circulation, Turbulence, Internal waves, Tides, Tidal effects, Diffusivity, Froude number, Salt wedges.

Measurements of the profiles of salinity and velocity at a station in the Duwamish River estuary indicated that the turbulent mixing through the density interface is highly time dependent, with the most intense mixing occurring at the maximum current speed during the ebb. Additional measurements of the turbulent kinetic energy and the turbulent flux of salt by the eddy correlation technique verified that interpretation. The vertical turbulent salt flux and the turbulent kinetic energy vary by an order of magnitude over the tidal cycle, and approximately half of the total vertical salt transport takes place during a short time centered about the maximum ebb. Different mechanism of turbulence generation operate at various times during the tidal cycle, and the intense mixing periods were shown to coincide with conditions favorable for the formation of an internal hydraulic jump. (Sims-ISWS)
W78-07094

TIDAL RESUSPENSION IN BUZZARDS BAY, MASSACHUSETTS, I. SEASONAL CHANGES IN THE RESUSPENSION OR ORGANIC CARBON AND CHLOROPHYLL A,
New Hampshire Univ., Durham. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-07095

TIDAL RESUSPENSION IN BUZZARDS BAY, MASSACHUSETTS, II. SEASONAL CHANGES IN THE SIZE DISTRIBUTION OF CHOROPHYLL, PARTICLE CONCENTRATION, CARBON AND NITROGEN IN RESUSPENDED PARTICLE MATTER,
New Hampshire Univ., Durham. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-07096

THE M2 TIDE OF THE IRISH SEA: HOURLY CONFIGURATIONS OF THE SEA SURFACE AND OF THE DEPTH-MEAN CURRENTS,
Alaska Univ., College. Inst. of Marine Science.
J. C. H. Mungall, and J. B. Matthews.
Estuarine and Coastal Marine Science, Vol. 6, No. 1, p 55-74, January 1978. 13 fig, 2 tab, 19 ref. ONR N00014-67-A-0317-0002.

Descriptors: *Tides, *Currents(Water), *Model studies, Mathematical models, Numerical analysis, Water levels, Water circulation, Velocity, Tidal waters, Cycles, Oceanography, *Irish Sea.

The M2 tide of the Irish Sea was described. Following a review of previous work on the area, an overall view of the Irish Sea tides was presented by treating the sea as a one-dimensional channel closed at its northern end. The curves so obtained for the amplitudes and phases of the height and current distributions, along with hourly profiles of the sea surface, served as a convenient graphical summary of the main features of the tide. The time-dependent two-dimensional behavior of the Irish Sea was described with the aid of hourly perspective views of the sea surface and hourly charts of depth-mean current vectors superimposed on lines of equal sea surface heights, a method of display which markedly supplements the conventional co-range and co-tidal charts. The data used for generating the displays were obtained by analyzing the output of a two-dimensional barotropic numerical tidal model. (Sims-ISWS)
W78-07097

AN EVALUATION OF THE USE OF REDOX MEASUREMENTS FOR CHARACTERIZING RECENT SEDIMENTS,
Stockholm Univ. (Sweden). Dept. of Geology.
For primary bibliographic entry see Field 2J.
W78-07098

MEASUREMENT OF 239 + 240 PU IN THE NORTHWESTERN MEDITERRANEAN,
International Lab. of Marine Radioactivity.
C. N. Murray, and R. Fukai.
Estuarine and Coastal Marine Science, Vol. 6, No. 2, p 145-151, February 1978. 1 fig, 3 tab, 16 ref.

Descriptors: *Radioisotopes, *Sea water, *Sediments, *Mussels, Sampling, Data collections, Cores, Oceans, Chemical analysis, Radiochemical analysis, Radioactivity, Oceanography, *Plutonium, *Mediterranean Sea.

Measurements of 239 + 240 Pu were performed on seawater, coastal shore sediments, and mussels collected from the northwestern part of the Mediterranean Sea during 1973-1974. The ranges of 239 + 240 Pu concentrations determined in these samples were respectively 0.5-8.5 fCi/kg for seawater, 0.3-4.2 pCi/kg for dried sediments and 0.42-0.74 pCi/kg wet for total mussel. The relatively higher 239 + 240 Pu concentration found in the deep water may be correlated to the vertical water movement characteristic in the northwestern Mediterranean. (Sims-ISWS)
W78-07099

LATERAL DYNAMIC BALANCE IN THE SANDY HOOK TO ROCKAWAY POINT TRANSECT,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
B. E. Doyle, and R. E. Wilson.
Estuarine and Coastal Marine Science, Vol. 6, No. 2, p 165-174, February 1978. 6 fig, 3 tab, 6 ref.

Descriptors: *Currents(Water), *Estuaries, *Harbors, *Atlantic Ocean, Circulation, Water circulation, Tides, Tidal waters, Coasts, Bays, Flow, Current meters, Measurement, Data processing, *Lateral dynamic balance, *New York Harbor.

Currents associated with the residual nontidal flow through the Sandy Hook to Rockaway Point Transect exhibit considerable vertical and lateral structure, including a two-layer estuarine flow pattern over much of the Transect and inflow to New York harbor at all depths near Rockaway Point. To determine the relative importance of different dynamic processes in maintaining this structure, the nontidal lateral momentum balance in the Transect was examined using current meter and hydrographic data from the 1952 and 1958-1959 Coast and Geodetic Survey field studies in New York Harbor. Results suggested that over the entire Transect the lateral pressure gradient force balances the sum of the centrifugal force associated with the oscillating tidal flow and the Coriolis force due to the non-tidal flow normal to the Transect. This balance is maintain without significant contribution from turbulent shear stresses. Over much of the Transect, the primary balance is between the lateral pressure gradient force and the centrifugal force. (Sims-ISWS)
W78-07100

THE INFLUENCE OF DENSITY VARIATIONS ON ESTUARINE TIDES AND CIRCULATIONS,
Princeton Univ., NJ. Geophysical Fluid Dynamics Lab.
A. F. Blumberg.
Estuarine and Coastal Marine Science, Vol. 6, No. 2, p 209-215, February 1978. 5 fig, 1 tab, 5 ref. NOAA 04-3-022-33.

Descriptors: *Water circulation, *Estuaries, *Model studies, *Chesapeake Bay, Mathematical models, Tidal waters, Rivers, Salinity, Density, Variability, Circulation, Tides, Dynamics, Coasts, Estuarine circulation, Salinity variations, Circulation processes.

Numerical experiments were carried out to investigate the influence of density variations on estuarine tides and circulations. The mathematical model, which was published previously, was outlined. A detailed analysis of the tidal properties and circulations in an estuary was made for two cases. One case involved density variations, while the other assumed a constant density. It was found that the discharge through any section, the tidal range, and the tidal phases were independent of the density structure. However, the actual tidal amplitudes, the mean elevation, and the vertical structure of longitudinal velocity changed considerably in the various experiments. Both cases assumed the same coefficient of bottom friction and bathymetric schematization. (Sims-ISWS)
W78-07101

ON THE CALIFORNIA UNDERCURRENT OVER THE CONTINENTAL SLOPE OFF OREGON,
National Oceanic and Atmospheric Administration, Seattle, Washington. Pacific Marine Environmental Lab.
D. Halpern, R. L. Smith, and R. K. Reed.
Journal of Geophysical Research, Vol. 83, No. C3, p 1366-1372, March 20, 1978. 6 fig, 23 ref. NSF ID071-04211, OCE74-22290.

Descriptors: *Ocean currents, *Continental slope, *Oregon, *Pacific Ocean, On-site data collections, On-site investigations, Currents(Water), Salinity, Temperature, Water temperature, Depth, Current meters, Data processing, Oceans, Oceanography, *California undercurrent.

During July 1975, moored current measurements and a spatially dense approximately isochronal hydrographic survey were made off Oregon. The patterns of geopotential topography, the longshore and onshore-offshore variations in temperature and salinity, and the current measurements indicated a poleward flow of warmer, more saline water at intermediate depths over the continental slope throughout a longshore distance of about 600 km. The agreement between linear approximations of the north-south velocity shears determined from baroclinic geostrophic currents and from 3-day vector-averaged current measurements was within 3%. The current measurements at intermediate depths indicated a wavelike oscillation, lateral meander, or eddy with a time scale of about 7-10 days, and the surface pattern of the geopotential topography (referred to 1000 dbar) contained eddies or a wavelike feature with a wavelength of about 200 km. Comparison of the time variations of currents recorded simultaneously over the slope and shelf indicated that the subsurface poleward flows observed there were connected. (Sims-ISWS)
W78-07107

NORTHEASTWARD DRIFT IN THE NORTHERN MID-ATLANTIC BIGHT DURING LATE SPRING AND SUMMER 1976,
National Ocean Survey, Rockville, MD.
H. R. Frey.
Journal of Geophysical Research, Vol. 83, No. C1, p 503-504, January 20, 1978. 1 fig, 2 ref.

Descriptors: *Ocean circulation, *Ocean currents, *Aquatic drift, *Atlantic Ocean, Drift bottles, Winds, Currents(Water), Water pollution, Pollutants, Oil, Path of pollutants, Oceans, Oceanography, Drifters, Drifter cards.

Air drops of surface drifter cards were made by helicopter south of Long Island approximately monthly from December 1975 to September 1976. Drifters from three successive releases on April 13, May 25, and July 1 were recovered at Cape Cod, Martha's Vineyard, and Nantucket. The northeastward drift is attributed to anomalously persistent southerly winds. (Sims-ISWS)
W78-07108

MATHEMATICAL STUDIES OF TIDAL BEHAVIOUR IN THE BAY OF FUNDY,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
D. A. Greenberg.
Manuscript Report Series No. 46, 1977. 127 p, 45 fig, 11 tab, 27 ref, 1 append.

Descriptors: *Tides, *Bays, *Canada, *Model studies, Mathematical models, Water levels, Water level fluctuations, Barriers, Effects, Tidal waters, Coasts, Estuaries, *Bay of Fundy.

The Bay of Fundy is situated near the border of Canada and the United States. It feeds into the Gulf of Maine which opens out to the north-west Atlantic. The presence of extraordinary high tides in the Bay of Fundy has led to interest in the possibility of establishing tidal power schemes there. A numerical tidal model was set up to test the effects of tidal barrier schemes installed in the upper reaches of the bay. Because it is now thought that such barriers could influence a large area including the Gulf of Maine, it was felt necessary to model this entire area. The model was run for four different barrier schemes with different experiments to simulate permeable and impermeable barries. The permeable barriers were representative of those used in ebb-flow power generation. Significant changes in the M sub 2 tidal regime in the Gulf of Maine were found for some barrier configurations. Perhaps the result which differed most significantly from earlier predictions was a rise rather than a fall in tidal amplitude in front of a barrier placed across from Economy Point to the opposite shore in Minas Basin. (Sims-ISWS)
W78-07116

PLANT SPECIES CHECKLIST FOR THE LAC DES ALLEMANDS SWAMP AREA OF LOUISIANA,
Louisiana State Univ., Baton Rouge. School of Forestry and Wildlife Management.
For primary bibliographic entry see Field 2I.
W78-07144

ESTIMATING THE ECONOMIC VALUE OF NATURAL COASTAL WETLANDS: A CAUTIONARY NOTE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W78-07146

A TECHNIQUE FOR THE DETERMINATION OF LOUISIANA MARSH SALINITY ZONES FROM VEGETATION MAPPED BY MULTISPECTRAL SCANNER DATA: A COMPARISON OF SATELLITE AND AIRCRAFT DATA,
National Aeronautics and Space Administration, Houston, TX.
For primary bibliographic entry see Field 7B.
W78-07148

DEPOSITIONAL ENVIRONMENTS IN THE COLVILLE RIVER DELTA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
H. J. Walker.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 539, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. 227, July, 1977. 22 p, 18 fig, 19 ref.

Descriptors: *Alaska, *Sediment discharge, *Geomorphology, *Deltas, Rivers, Estuaries, Ice breakup, Sedimentology, Alluvial channels, Bank erosion, Arctic, Tundra, *Colville River Delta(Alaska).

The Colville River delta is highly varied and complex. The extreme seasonality of processes operating in the Arctic affect river discharge and sedimentation. Most morphologic changes within the delta occur during the short spring and summer especially during the high floods accompanying breakup. Despite the relatively short activity period during the year, morphologic changes may be great. Riverbank erosion is often rapid and the numerous lakes are frequently tapped by meandering distributaries. These tapped lakes, portions of the general tundra surface, and the numerous sand bars and mud flats receive much sediment during flooding. Because river flooding occurs before the breakup of sea ice, floodwater advances over the bootmfast ice prior to draining through the ice to continue seaward as a wedge of fresh but turbid water. The presence of a sea ice cover during the time when most sediment is carried seaward results in the creation of three distinct depositional environments in the subaqueous delta. These are the bottomfast ice zone which receives musch of its sediment secondarily from the sea ice as it melts, sea ice drainage zone which is a narrow band seaward of the bottomfast ice zone, and the freshwater-wedge zone. (Steiner-Mass)
W78-07149

VEGETATION ON ROCKY SHORES AT SOME NORTH IRISH SEA SITES,
Liverpool Univ. (England). Hartley Botanical Labs.
For primary bibliographic entry see Field 5C.
W78-07155

ANAEROBIC MICROBIAL COMMUNITY METABOLISM IN SPARTINA ALTERNIFLORA SOILS,
Georgia Univ., Athens. Dept. of Microbiology.
For primary bibliographic entry see Field 2G.
W78-07156

NITROGEN FIXATION BY ALGAE IN A MASSACHUSETTS SALT MARSH,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
E. J. Carpenter, C. D. Van Raalte, and I. Valiela.
Limnology and Oceanography, Vol. 23, No. 2, p 318-327, 1978. 9 fig, 2 tab, 34 ref.

Descriptors: *Salt marshes, *Cyanophyta, *Nitrogen fixation, *Massachusetts, Wetlands, Marshes, Marsh plants, Aquatic plants, Aquatic algae, Rhizosphere, Great Sippewissett Marsh(Mass).

Over a three-year period, N2 fixation on the surface of a Cape Cod salt marsh was highest in summer, with overall rates of about 10-20 mg N/sq m/day. This average, coupled with N2 fixation in the rhizosphere (ca. 80 mg N/sq m/day), compared favorably with the highest N2 fixation rates measured anywhere. There were significant variations from one marsh habitat to another: the blue-green algae mat had the highest rate of N2 fixation per unit area (100-200 mg N/sq cm/Hour), but due to its large area, the low marsh with short Spartina contributed the greatest amount of fixed N. Nitrogen is fixed on the marsh surface primarily by blue-green algae. (Steiner-Mass)
W78-07157

HABITAT DEVELOPMENT ASPECTS OF THE DREDGED MATERIAL RESEARCH PROGRAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 6G.
W78-07158

THE GROWTH OF AQUATIC MACROPHYTES IN THE BAY OF QUINTE PRIOR TO PHOSPHATE REMOVAL BY TERTIARY SEWAGE TREATMENT (1975-1976),
Queen's Univ., Kingston (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W78-07160

OUR DYNAMIC TIDAL MARSHES: VEGETATION CHANGES AS REVEALED BY PEAT ANALYSIS,
Connecticut Coll., New London.
W. A. Niering, R. W. Warren, and C. G. Weymouth.
Available from Ct Arboretum, Ct Coll., New London, Ct 06320 $.50 + $.30 pstge/copy. The Connecticut Arboretum Bulletin No. 22, January, 1977. 12 p, 6 fig, 14 ref.

Descriptors: *Peat, *Cores, *Sampling, *Tidal marshes, *Connecticut, Coastal marshes, Rhizomes, Wetlands, Storms, Marshes, *Salt marsh dynamics, *Peat analysis, Distichlis sp., Spartina sp., Tidal gates.

Twenty-three one-meter length peat cores were cut from eight different marsh systems representing both shallow and deep marshes along the Connecticut shoreline. Use of the McCaffrey samplet to obtain cores is described in detail. Peat color and texture, type of sediment, and depth of sand layers and shell fragments are noted. The peat is then teased apart and rhizomes present identified. A key to plant remains in salt marsh peat is provided. Cores collected provide evidence of marsh encroachment landward, marsh development seaward, shifts in dominant species over time within a marsh, and the impact of tidal gates. Storms leave evidence of their occurrence in 'sand lines,' some of which are associated with major vegetation changes. (Stihler-Mass)
W78-07163

WATER QUALITY INTERPRETIVE REPORT, PRINCE EDWARD ISLAND, 1961 - 1973,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5A.
W78-07176

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

ROTATING BIOLOGICAL CONTACTORS TREAT ISLAND'S SALINE SEWAGE,
Rhode Island Univ., Kingston. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5D.
W78-06708

SPIRAL-WOUND POLY(ETHER AMIDE) THIN-FILM COMPOSITE MEMBRANE SYSTEMS,
Universal Oil Products Co., San Diego, CA. Fluid System Div.
R. L. Riley, R. L. Fox, C. R. Lyons, C. E. Milstead, and M. W. Seroy.
Desalination, Vol 19, p 113-126, 1976. 7 fig, 4 tab, 11 ref. OWRT Contract.

Descriptors: *Membranes, *Films, *Polymers, *Reverse osmosis, Saline water, Potable water, Brackish water, Water treatment, *Poly(Ether amide) thin films, Wrightsville Beach(NC), Commercial applications.

Recent advances in the development of poly(ether/amide) thin-film compsoite membrane systems, formed by in situ interfacial polymerization of the surface of a reinforced-porous supporting membrane, are described. These membrane systems make it possible to produce potable water from seawater by reverse osmosis in a single stage. Stable water fluxes of 0.54 M3/M2-day and sodium chloride rejections of 99% have been attained with 50% water recovery at an applied pressure of 68 atms (1,000 psi) in pilot tests at the Office of Water Research and Technology Seawater test facility, Wrightsville Beach, North Carolina. For brackish water, higher fluxes and rejections of 98-99% have been attained with 50% water recovery at an applied pressure of 33.3 atms (450 psi). The establishment of large-scale continuous membrane production combined with excellent seawater and brackish water performance of two, four, and six-inch diameter spiral-wound elements demonstrates a significant advance toward the commercial application of thin-film composite membranes. The superior performance, reliability, and apparent durability of the new thin-film composite membranes in comparison with previous cellulose acetate membranes, and the fact that they can be manufactured economically in quantity to rigid specifications indicate that these membranes will soon dominate the field of reverse osmosis for water treatment applications. (Wares - IPA)
W78-06829

GAS SEPARATION MEMBRANES: TECHNOLOGY AND APPLICATIONS,
Universal Oil Products, Inc., San Diego, CA. Basic Development Dept.
L. J. Burnett, and R. L. Riley.
Available from UOP Inc., 4901 Morena Blvd., Suite 806, San Diego, CA. March 15, 1977. 25 p, 13 fig, 4 tab.

Descriptors: *Separation techniques, *Technology, *Gases, Membranes, Polymers, Films, Conservation, *Commercial applications, Enrichment, Fuel conversion, Poly(Ether amide) thin films.

Gas separation membrane technology and applications are discussed. In the reverse osmosis membrane process, high pressure saline water is placed in contact with a semipermeable membrane (permeable to water but relatively impermeable to salt). The process requires less energy than distillation or freezing processes, since a phase change is not required. A similar process is now being used for separation and enrichment of multi-component gas streams. A discussion of transport phenomenology presents a solution-diffusion model and indicates that the ideal membrane would consist of a thin imperfection-free sheet of a polymer material. Membrane development and requirements are outlined. Advantages and specifications of the spiral-wound element, one of the most unique and useful configurations developed for membrane packaging, are presented. Installation is briefly reviewed. Commercial application in energy conservation practice and in fossil fuel conversion is anticipated. (Wares - IPA)
W78-06830

SCALE-FREE-VAPOR-COMPRESSION EVAPORATION,
Office of Water Research and Technology, Washington, DC
For primary bibliographic entry see Field 5D.
W78-06994

3B. Water Yield Improvement

CLEARING FOG BY SEEDING WITH CHARGED WATER DROPS: A NUMERICAL STUDY,
Naval Environmental Prediction Research Facility, Monterey, CA
P. M. Tag.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-027 410. Price codes: A04 in paper copy, A01 in microfiche. NEPRF Technical Paper 6-76, May 1976. 52 p, 17 fig, 1 tab, 28 ref. Prepared for Naval Air Systems Command, Washington, D.C.

Descriptors: *Fog, *Droplets, *Weather modification, *Mathematical models, Model studies, Numerical analysis, Simulation analysis, Mathematical studies, Coalescence, Cloud physics, Meteorology, *Fog dispersal, *Charged drops, Warm fog, Collision efficiencies, Electrical charges, Drop charging, Visibility, Fog seeding, Electrostatic effects.

A numerical study of the use of highly charged water drops to clear warm fog was conducted. The polarization of neutral fog droplets and their capture by the charged drops was the mechanism studied. A multi-leveled microphysical model was used to investigate the degree of visibility improvement resulting from variations in seeding drop size and charge, the type of fog being seeded, and the concentration of seeding material. An evaluation of this technique was made by comparing model results to comparable numerical experiments of hygroscopic seeding, a technique that has been field tested on several occasions. (See also W77-11828) (Sims-ISWS)
W78-06727

AN INTERPRETIVE HISTORY OF THIRTY-YEARS (1945-1975) OF WEATHER MODIFICATION,
Florida State Univ., Tallahassee. Dept. of Statistics.
C. L. Bach.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A039 669, Price codes: A06 in paper copy, A01 in microfiche. ONR Technical Report No. 112, March 1977. 111 p, 14 fig, 3 tab, 269 ref. ONR N00014-76-C-0394.

Descriptors: *Weather modification, *History, *Precipitation(Atmospheric), *Fog, Rainfall, Hail, Storms, Cloud seeding, Silver iodide, Carbon dioxide, Projects, Cloud physics, Meteorology, Weather-modification history.

The development of the physical understanding of weather modification and the evolution of statistical and meteorological design criteria for weather modification experiments for the 30-year period 1945-1975 were investigated. Also, social, economic, and legal problems of weather modification were discussed as they affect the above. Graphs were constructed depicting the chronology of reported articles on storm-system (in this paper 'storm-system' refers to attempts to increase rainfall from extratropical cyclones and organized systems of clouds), cold fog, warm fog, hail, and lightning modification. An attempt was made to explain the changes in the number of experiments reported during the description of the evolution of weather modification. The summary of the 30-year period of weather modification was for three 10-year periods. The first decade was shown to be dominated by scientific innovation and dispute. The second decade featured initiation of efforts by meteorologists and statisticians at ending the controversies of the first 10 years. The third decade was marked by increased exchange of ideas and results of weather modification operations at conferences and symposia and serious investigation into social, economic, and legal ramifications of weather modification. (Sims-ISWS)
W78-06729

REPORT ON THE HAIL SUPPRESSION PROGRAM AT NELSPRUIT, TRANSVAAL, REPUBLIC OF SOUTH AFRICA,
Simpson Weather Associates, Charlottesville, VA; and Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
J. Simpson
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 504. Price codes: A05 in paper copy, A01 in microfiche. NHRI Technical Report NCAR-TN/STR-76, June 1976. 91 p, 8 fig, 4 tab, 54 ref.

Descriptors: *Weather modification, *Hail, *Africa, *Tobacco, Damages, Crops, Cloud seeding, Silver iodide, Data processing, Statistics, Model studies, Mathematical models, Radar, Cloud physics, Meteorology, Precipitation(Atmospheric), *Hail suppression, *South Africa.

The Nelspruit (25 deg S latitude, 750 m elevation) hail suppression seeding project completed 4 1/2 years of operation in May 1976. Results of the first 3 1/2 years were reviewed. The 7000 sq km target area (about 1% planted in tobacco) experiences about 50 hail days yearly, produced by warm-based storms mainly of the multicell variety. Unique features of the project include on-top seeding with silver iodide flares dropped from jet aircraft into feeder towers, the joint use of models, and computer and PPI/RHI radar, from which natural hailfall has been associated empirically with the attainment of 8 km by the 45 dbz reflectivity contour. Statistical analyses comprised non-parametric and parametric comparison of two response variables derived from insurance-assessed hail damage to tobacco, comparing the seeded period with historical controls. Decrease of about 40% in damage and 20% in severity for the seeded sample were indicated, which would have been significant at better than 0.05 had the samples been random. Rainfall analyses are in progress; so far an overall decrease associated with the seeding has been shown to be unlikely. (Sims-ISWS)
W78-06875

CHICAGO AREA PROGRAM: A MAJOR NEW ATMOSPHERIC EFFORT,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-06885

SEEDABILITY OF WINTER OROGRAPHIC STORMS IN UTAH,
Utah Water Research Lab., Logan.
G. E. Hill.
Prepared for Bureau of Reclamation, Denver, Colo., Div of Atmospheric Water Resources Management. Atmospheric Water Resources Series, Report A2, Dec 1977. 78 p, 57 fig, 13 tab, 18 ref, 2 append. Bur Reclam 14-06-D-7184.

Descriptors: Clouds, *Cloud seeding, *Meteorology, *Orography, *Precipitation(Atmospheric), Silver iodide, Snow, Snowpack, *Weather modification, *Utah, *Winter storms, Wasatch Mountains(Utah).

The primary objective has been to collect and analyze data from (randomized) seeded and unseeded winter storms over the Wasatch Mountains for the purpose of developing and designing cloud seeding technology. Two field programs were conducted sequentially; the first was done by airborne seeding and the second by seeding from mountaintop generators. Analysis of precipitation estimators based upon radar and/or rawinsonde data and target precipitation show that increased precipitation due to seeding may occur under certain meteorological conditions. Favorable conditions were found when the supercooled water concentration as measured by aircraft icing rates was high. Precipitation in these particular seeded storms was several times the amount estimated from relationships derived from meteorological

parameters and unseeded precipitation. Based upon these a posteriori results, it is hypothesized that winter season orograhic precipitation may be increased by about 30 percent by seeding about one-sixth of the storms. Analysis of seeding effects using cloud top temperature on a a priori basis of stratification yielded inconclusive results. Other meteorological aspects related to cloud seeding technology are presented. (Bur Reclam)
W78-06926

COMPUTER MODELING OF CUMULUS CLOUDS DURING PROJECT CLOUD CATCHER,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
J. H. Hirsch.
Prepared for Bureau of Reclamation, Denver, Colo., Office of Atmospheric Resources Management. Technical Report 71-7, April 1971. 61 p 11 fig, 3 tab, 40 ref, 4 append. Bur Reclam 14-06-D-6796.

Descriptors: *Cumulus clouds, Precipitation(Atmospheric), *Computer models, *Cloud seeding, Cloud physics, *Weather modification, *Great Plains, Model studies, Project Skywater, *Project Cloud Catcher.

A steady-state, one-dimensional model of cumulus convection with parameterized microphysics is applied to cumulus clouds of the Northern Great Plains Region. The numerical model is reviewed and comparisons are made between diagnosed cloud characteristics of the model and observations obtained during an extensive field program in cumulus modification. Correlation coefficients near 0.8 are achieved between model predictions of cloud-top heights and radar reflectivity maxima whereas poorer agreements are reached between incloud characteristics measured by aircraft. The model appears to be a useful objective tool for diagnosis of potential for convective cloud development and the effects of cold cloud seeding. It is an inexpensive, fast, numerical model which may be used operationally in real-time on many rawinsondes. (Bur Reclam)
W78-06927

PROBABLE EFFECT OF SUMMER WEATHER MODIFICATION ON RUNOFF,
Agricultural Research Service, Boise, ID. Northwest Watershed Research Center.
C. L. Hanson, and D. A. Woolhiser.
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 104, No. IR1, Proceedings Paper 13608, p 1-11, March 1978. 4 fig, 3 tab, 17 ref, 2 append.

Descriptors: *Weather modification, *South Dakota, *Rainfall-runoff relationships, *Runoff, *Model studies, Rainfall, Precipitation(Atmospheric), Mathematical models, Simulation analysis, Effects, Stochastic processes, Markov processes, Probability, Cloud seeding, Summer, Watersheds(Basins), Hydrology.

A stochastic rainfall-runoff simulation procedure was developed and used to estimate effects of hypothetical increases or decreases in May-September rainfall due to weather modification programs on the runoff regime of western South Dakota rangeland watersheds. The distribution function used to simulate daily precipitation was assumed to be the sum of two exponential distributions. The beta function was used to simulate runoff on days when there was precipitation. The study indicated that, if precipitation increased 1.0 in (25 mm), runoff would be increased 8%-10%, or 0.04 in - 0.14 in (1.0 mm - 3.6 mm), depending on watershed soil characteristics. The study also showed that, if precipitation is decreased 10%, runoff would be decreased about 20% (Sims-ISWS)
W78-07086

3C. Use Of Water Of Impaired Quality

MOVEMENT OF PESTICIDES IN THE SOIL WATER FERTILIZER SYSTEM,
Arkansas Univ., Fayetteville. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W78-06999

3D. Conservation In Domestic and Municipal Use

HOUSEHOLD WATER CONSERVATION AND WASTEWATER FLOW REDUCTION,
Energy Resources Co., Inc., Cambridge, MA.
M. L. Chan, J. Edwards, M. Roberts, R. Stedinger, and L. Wilson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 578, Price codes: A08 in paper copy, A01 in microfiche. Prepared for Office of Water Planning and Standards, Washington, D.C., July 1976, 143 p, 26 tab, 14 fig, 26 ref, 2 append. 68-02-2964.

Descriptors: *Water conservation, *Legal aspects, *Economics, *Model studies, Building codes, Plumbing, Pricing, *Water-saving devices, Flow reduction, Waste water, Consumer benefits, Producer benefits, Replacement strategies, Water demand functions, Cost functions.

This study investigated the cost-effectiveness of water-saving options which would contribute to the reduction of wastewater flows from households. Water-saving options which were analyzed included household water-conserving devices, metering and pricing schemes, and local ordinances and national policies. After reviewing the literature, the report consideres building and plumbing codes from selected areas to see whether or not they provide constraints on the introduction of water-saving devices and considers state laws to see whether they permit pricing schemes which would allow conservation. A computer model is developed, using water demand functions and cost functions from the literature, to determine the costs and benefits to consumers and producers of various pricing schemes. Through the use of a second computer model, benefits are calculated for various replacement strategies in the adoption of water-saving devices. (Zayac-NC)
W78-06782

SOUTHEASTERN NEW ENGLAND STUDY OF WATER AND RELATED LAND RESOURCES-URBAN WATER AND RELATED LAND RESOURCES-URBAN WATERS SPECIAL STUDY.
Skidmore, Owings and Merrill, Boston, MA.
For primary bibliographic entry see Field 6E.
W78-06792

WASHINGTON, D.C.'S VANISHING SPRINGS AND WATERWAYS,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-06937

WATER CONSERVATION DEVICES: RESIDENTIAL WATER CONSERVATION.
Office of Water Research and Technology, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 499, Price codes: A02 in paper copy, A01 in microfiche. Also Available from Sup Doc, U S GPO, Washington, DC., 20402. Water Research Capsule Report, 1977. 9 p.

Descriptors: *Water conservation, *Economics, *Technology transfer, Information exchange, *Water conservation devices, *Consumer information.

A consumer-oriented capsule report highlights findings of research projects funded through the Office of Water Research and Technology which treat the significance, economics, and application of water conservation. Water conservation measures and devices, e.g., plastic bottles, toilet inserts, improved ballcocks, dual flush cycle modifications, water saving toilets, faucet aerators, spray taps, flow control devices, pressure reducing valves, water conserving applications, and landscape irrigation equipment - are briefly described. The economic advantages of water conservation devices are estimated. (Seip-IPA)
W78-06996

3E. Conservation In Industry

FERMENTATION--LESS DEGRADING FOR PROBLEM EFFLUENT TREATMENT,
For primary bibliographic entry see Field 5D.
W78-06705

COAL GASIFICATION AND WATER RESOURCES DEVELOPMENT,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
E. E. Whitlatch, Jr.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. WR2, p 299-314, November 1977. 4 tab, 25 ref. OWRT A-041-OHIO(2).

Descriptors: *Water resources development, *Water consumption(Except consumptive use), *Water resources, *Optimization, *Linear programming, *Economic efficiency, Energy, Environmental engineering, Water requirements, Mathematical models, Equations, Systems analysis, Planning, Natural gas, *Coal gasification, *Economic factors, Cost minimization, Water availability, Industrial plant sites.

A method is developed for determining the location of high and low-Btu coal gasification facilities to minimize the cost of plants, gas transmission, coal supply and transport, solid waste disposal, and water supply. Economic efficiency is achieved in meeting the demand for gas at designated market centers. Linear programming optimization models are developed for this purpose. The method should be useful in planning the joint development of energy and water resources in those regions designated by the Water Resources Council as being constrained by water availability in achieving National energy self-sufficiency. The models can also be used to indicate the tradeoffs between environmental concerns and economic efficiency. It is concluded that the relative availability of water at a potential coal gasification plant site may significantly affect the final price of gas. It is recommended that detailed studies of water use and conservation in both the Lurgi and advanced technology processes be undertaken. (Bell-Cornell)
W78-06740

ECONOMIC IMPACT OF PROPOSED AMENDMENTS TO MERCURY EFFLUENT STANDARDS IN ILLINOIS (R 76-17) (R 76-21),
Southern Illinois Univ. at Carbondale.
For primary bibliographic entry see Field 5G.
W78-06759

A THEORETICAL BASIS FOR EXPLORATION FOR NATIVE COPPER IN NORTHERN WISCONSIN,
Geological Survey, Reston, VA. Geology Div.
For primary bibliographic entry see Field 4B

W78-06938

PLANNING MODELS WITH ALTERNATIVE COOLING SYSTEMS,
Middle East Technical Univ., Ankara (Turkey). Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6A.
W78-07048

AN INVENTORY OF THE FRUIT AND VEGETABLE PROCESSING INDUSTRY IN CANADA,
Stanley Associates Engineering Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 5G.
W78-07177

3F. Conservation In Agriculture

THE USE OF LANDSAT DIGITAL DATA AND COMPUTER-IMPLEMENTED TECHNIQUES FOR AN AGRICULTURAL APPLICATION,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7B.
W78-06767

ESTIMATING LIVESTOCK WATER USE RATES IN RURAL WATER SYSTEMS,
Burns and McDonnell, Kansas City, MO.
R. S. Schulz, and T. A. Austin.
Iowa State University, Ames. Engineering Research Institute. Preprint ERI-75152, June, 1975. 33 p, 14 fig, 2 tab, 12 ref, append. OWRT A-048-IA (1).

Descriptors: *Stock water, Livestock, *Water consumption, *Iowa, *Regression analysis, Mathematical studies, Computer programs, Analytical techniques, *Water utilization, *Use rates, *Livestock water use, Nomographic analysis.

A series of nomographs describing livestock water use in Iowa's Hospers Rural Water System No. 1 is presented. The objective was to predict livestock water use based on average annual weight and average environmental temperature, and to discuss the pattern of water consumption in a rural water system. Water use rates were recorded continuously during the summer of 1974. A computer program utilizing multiple regression analysis was used to regress water use (the dependent variable) on body weight and ambient temperature (the independent variables) for several livestock types: fattening cattle, feeder cattle, lactating dairy cattle, nonlactating dairy cattle, dairy heifers, swine, and laying and nonlaying chickens; nomographs based on predictor equations were drawn for each type. The nomographs predictions for water use ranged from 87% to 263% of the water metered over a 6-week period with an average of 139%. (Seip-IPA)
W78-06820

SICK WELLS REQUIRE WELL DEVELOPED CURE.
For primary bibliographic entry see Field 5G.
W78-06963

COLORADO PUMP TESTS SHOW HOW TO MAKE BIG DOLLAR SAVINGS.
For primary bibliographic entry see Field 8C.
W78-06964

EFFECT OF DRAIN TUBE OPENINGS ON WATER-TABLE DRAWDOWN,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 4A.
W78-07087

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

INFLUENCE OF INFILTRATION ON OVERLAND FLOW,
Missouri Univ., Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06736

SPECTRAL ANALYSIS OF HYDROMETEOROLOGICAL TIME SERIES,
Central and Southern Florida Flood Control District, West Palm Beach. Resource Planning Dept.
For primary bibliographic entry see Field 2B.
W78-06737

AN ITERATIVE ALGORITHM FOR INTERACTIVE MULTIOBJECTIVE PROGRAMMING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6A.
W78-06739

SEASONAL AND STOCHASTIC FACTORS IN WATER PLANNING,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6A.
W78-06741

INCOMMENSURABLES AND TRADEOFFS IN WATER RESOURCES PLANNING,
Florida Univ., Gainesville. Dept. of Food and Resources Economics.
For primary bibliographic entry see Field 6A.
W78-06746

RED RIVER CHLORIDE REMOTE SENSING STUDY: FINAL REPORT.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 7B.
W78-06768

DIGITAL COMPUTER PROCESSING OF LANDSAT DATA FOR NORTH ALABAMA,
Computer Sciences Corp., Huntsville, AL.
For primary bibliographic entry see Field 7C.
W78-06770

MISSOURI RIVER BASIN. STATE AND FEDERAL WATER AND RELATED LAND RESOURCE PROGRAMS, FISCAL YEARS 1978-1982.
Missouri River Basin Commission, Omaha, NE.
For primary bibliographic entry see Field 6E.
W78-06771

AN ANALYSIS OF FEDERAL WATER RESOURCE PLANNING AND EVALUATION PROCEDURES,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 6B.
W78-06772

SHORELINE ECOLOGY OF LAKE POWELL.
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
For primary bibliographic entry see Field 2H.
W78-06773

ECONOMIC AND TECHNICAL CONSIDERATIONS OF REGIONAL WATER SUPPLY.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 6B.
W78-06784

FLOOD HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT.
Colorado Univ., Boulder. Inst. of Behavioral Science.
For primary bibliographic entry see Field 6A.
W78-06786

EVALUATION OF PLANNING FOR FISH AND WILDLIFE: JOHN REDMOND RESERVOIR PROJECT.
Sport Fishing Inst., Washington, DC.
For primary bibliographic entry see Field 6B.
W78-06789

EVALUATION OF PLANNING FOR FISH AND WILDLIFE: LITTLE VILLE RESERVOIR
Sport Fishing Inst., Washington, DC.
For primary bibliographic entry see Field 6B.
W78-06790

RECREATIONAL ADEQUACY OF BEACH ACTIVITY AND COMPARATIVE REGULATING INFLUENCES,
Rhode Island Univ., Kingston. Sea Grant Program; and Rhode Island Univ., Kingston. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W78-06791

SOUTHEASTERN NEW ENGLAND STUDY OF WATER AND RELATED LAND RESOURCES-URBAN WATER AND RELATED LAND RESOURCES-URBAN WATERS SPECIAL STUDY.
Skidmore, Owings and Merrill, Boston, MA.
For primary bibliographic entry see Field 6E.
W78-06792

DESIGN AND METHOD OF THE SOCIOLOGICAL RESEARCH IN THE GRAND CANYON RIVER CONTACT STUDY. PART I.
Human Ecology Research Services, Inc., Boulder, CO.
For primary bibliographic entry see Field 6B.
W78-06793

USE LEVELS AND CROWDING IN THE GRAND CANYON. RIVER CONTACT STUDY. PART III.
Human Ecology Research Services, Inc., Boulder, CO.
For primary bibliographic entry see Field 6B.
W78-06794

FLOOD PLAIN INFORMATION: OHIO RIVER, CABEL COUNTY/WAYNE COUNTY, WEST VIRGINIA.
Army Engineer District, Huntington, WV.
Prepared for West Virginia Department of Natural Resources, Division of Water Resources. May 1973. 38 p, 12 plates, 2 tab.

Descriptors: *West Virginia, *Floodwater, *Flood flow, *Streamflow forecasting, *Flood profiles, *Flood data, Floods, Historic floods, Peak discharge, Flow characteristics, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Control structures, Levee, Floodwalls, Reservoirs, Wayne County(WV), Cabel County(WV), *Ohio River(WV), Intermediate Regional Flood

The study area includes the portions of the Ohio River and its flood plain in Cabel and Wayne Counties, West Virginia. Developments in the flood plain are largely protected by flood walls, earthen levees, and upstream dams. The unprotected portions of the flood plain contain urban, industrial, commercial, and agricultural land uses. Flood data were obtained from topographic maps, historical sources, field studies, and stream gage records. The main flood season occurs in the winter and spring months, and results from heavy general rainfall combined with snowmelt. The worst flood recorded at Old Lock and Dam 28 at Huntington, West Virginia, occurred on January 27, 1937. The flood discharged 654,000 cubic feet per second (cfs) and crested at 559.2 feet mean sea level (msl). At the same location, the Intermediate Regional Flood would crest at 552 feet msl, while the Standard Project Flood would be equivalent in intensity to the 1937 flood. There are no significant obstructions to flood flows in the study area. The levees, floodwalls and pumping station built after the 1937 flood to protect the heavily developed areas, and 37 existing reservoirs plus eight additional reservoirs under construction would in combination, reduce flood heights considerably along the study area. The information in this report in intended for use in land use planning and management in the unprotected portions of the flood plains. (Nessa-NC)
W78-06795

FLOOD PLAIN INFORMATION: LITTLE PAPILLION CREEK AND SOUTH BRANCH, VOLUME II, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
Prepared for Papio Watershed Board, NB, April 1968, 45 p, 2 fig, 11 plates, 6 tab.

Descriptors: *Nebraska, *Floods, *Flood forecasting, *Flood profiles, *Flood data, *Flood stages, Flood flow, Indirect flood measurement, Storms, Historic floods, Peak discharge, Stage-discharge relations, Flood damage, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, *Little Papillion Creek(NB), Omah(NB), *South Branch Papillion Creek(NB), Douglas County(NB), Sarpy County(NB), Intermediate Regional Flood.

The study area includes Little Papillion and South Branch Papillion Creeks and their flood plains in Douglas and Sarpy Counties, in the Omaha, Nebraska Metropolitan Region. Volume I in this series presented information on Big Papillion Creek and West Branch. The Papillion Creek system includes over one-half of the city's land area and nearly all the land available for future expansion. The Little Papllion Creek flood plain is extensively developed with residential and commercial land uses, while the South Branch flood plain is used almost entirely for agricultural purposes. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs during the summer months and results from intense thunderstorms. Rapid springtime snowmelt combined with heavy rainfall may also cause flooding. General characteristics of the basin are presented, as well as detailed descriptions of the study reaches on individual streams, and historic and future flood profiles for the entire study area. The worst flood recorded on Little Papillion Creek occurred on June 3, 1943, discharging 12,500 cubic feet per second (cfs). Higher discharges have been recorded at this location, but damage has been less severe. At the same location, the Intermediate Regional Flood would discharge 17,800 cfs while the Standard Project Flood would discharge 39,000 cfs. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-06796

FLOOD PLAIN INFORMATION: PAPILLION, BIG PAPILLION AND WEST PAPILLION CREEKS, VOLUME I, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
Prepared for Papio Watershed Board, NB, November 1967, 48 p, 3 fig, 20 plates, 9 tab.

Descriptors: *Nebraska, *Floods, *Flood forecasting, *Flood profiles, *Flood data, *Flood stages, Flood flow, Indirect flood measurement, Storms, Historic floods, Peak discharge, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, Omaha(NB), *Papillion Creek(NB), *Big Papillion Creek(NB), *West Branch Papillion Creek(NB), Intermediate Regional Flood.

This report is the first in a series of volumes presenting flood plain information for the Papillion Creek basin streams. The study area covers about 8 stream miles and includes Papillion, Big Papillion, and West Branch Papillion Creeks and their flood plains in the Omaha, Nebraska Metropolitan Area. The developments on the flood plains are similar in extent and composition, consisting of some residential and commercial land uses, and some open space and agricultural land uses. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs during summer months, resulting from intense thunderstorms. Rapid spring snowmelt combined with heavy rainfall may also cause flooding. Some channel straightening and levee work has been undertaken in the study area to reduce the severity of flooding. General characteristics of the basin and detailed descriptions of study reaches on the individual creeks are presented; historic and future flood profiles are provided for the entire study area. The worst flood recorded on al three streams occurred on June 16-17, 1964; on Papillion Creek, this flood discharged 32,300 cubic feet per second (cfs), cresting 17 feet above flood stae at the Fort Crook gage. At the same location, the Intermediate Regional Flood would discharge 44,900 cfs and would crest 20 feet above flood stage, while the Standard Project Flood would discharge 94,000 cfs and would crest 27 feet above flood stage. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-06797

FLOOD PLAIN INFORMATION: THOMAS CREEK, COLE CREEK, HELL CREEK, WEST BRANCH PAPILLION CREEK EXTENSION, BIG PAPILLION CREEK EXTENSION, VOL. III, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
Prepared for Papio Watershed Board, NB, May 1969, 47 p, 19 plates, 9 tab.

Descriptors: *Nebraska, *Floods, *Flood forecasting, *Flood profiles, *Flood data, *Flood stages, Flood flow, Indirect flood measurement, Storms, Historic floods, Peak discharge, Stage-discharge relations, Flood damage, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Land use, Planning, Control structures, Channel improvement, *Thomas Creek(NB), *Cole Creek(NB), *Hell Creek(NB), *West Branch Papillion Creek(NB), *Big Papillion Creek(NB), Omaha(NB), Intermediate Regional Flood.

This report extends the flood plain information on Big Papillion Creek and West Branch covered in Vol. I-Flood Plain Information, Omaha Metropolitan Region. The Papillion Creek system, draining western Omaha, includes over one-half of the city's land area and nearly all the land available for future expansion. The study area covered in this report includes Hell, Cole, and Thomas Creeks, portions of West Branch Papillion and Big Papillion Creeks, and their flood plains in the vicinity of Omaha, Nebraska. Flood plain developments vary from sparse to intensive, and consist of residential, commercial, agricultural and open space land uses. The main flood season occurs during the summer months and results from intense thunderstorms. Rapid springtime snowmelt combined with heavy rainfall may also cause flooding. Channel improvements on most of the basin streams help to reduce flooding, however, serious flooding still occurs. General conditions for each of the streams are described. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. Historic and future flood profiles are provided for each of the streams in the study area. The worst flood recorded on West Branch Papillion Creek near Papillion occurred on June 16-17, 1964, and discharged 40,800 cubic feet per second (cfs). At approximately the same location, the Intermediate Regional Flood will discharge 22,450 cfs while the Standard Project Flood will discharge 37,200 cfs. This study is intended for use in making land use planning and management descisions concerning flood plain utilization. (Nessa-NC)
W78-06798

FLOOD PLAIN INFORMATION: ASHLAND, NEBRASKA, SALT CREEK, WAHOO CREEK.
Army Engineer District, Omaha, NE.
Prepared for City of Ashland and State of Nebraska, July 1976, 44 p, 18 fig, 10 plates, 8 tab.

Descriptors: *Nebraska, *Flood flow, *Streamflow forecasting, *Flood data, Floods, Indirect flood measurement, Flood profiles, Historic floods, Flood frequency, Flood stages, Peak discharge, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structure, Levee, Reservoirs, Ashland(NB), *Wahoo Creek(NB), *Salt Creek(NB), Intermediate Regional Flood.

The study area includes Salt Creek, Wahoo Creek, and their flood plains in the vicinity of Ashland, Nebraska. Residential and commercial land uses on the flood plain would be damaged by serious flooding. A number of flood control structures have been constructed on Salt Creek and tributaries, including levees along Salt Creek and several reservoirs. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs from March through October, and results from heavy general rainfall with or without snowmelt. The worst flood recorded on Salt Creek below its confluence with Wahoo Creek at the downstream study limit occurred on June 25, 1963. It discharged 87,000 cubic feet per second (cfs) and crested at 1061.68 feet mean sea level (msl). At approximately the same location, the Intermediate Regional Flood would discharge 98,000 cfs and would crest at 1067.4 feet msl, while the Standard Project Flood would discharge 180,000 cfs and would crest at 1070.0 feet msl. Several bridges in the study area would interfere with these flood flows, and several highways would be inundated by them. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-06799

FLOOD PLAIN INFORMATION: PLATTE RIVER, WARM SLOUGH, TROUBLE CREEK, CENTRAL CITY, NEBRASKA.
Army Engineer District, Omaha, NE.
Prepared for Central City and Nebraska Natural Resources Commission, September 1975, 55 p, 15 fig, 12 plates, 10 tab.

Descriptors: *Nebraska, *Flood flow, *Streamflow forecasting, *Flood data, Floods, Indirect flood measurement, Flood profiles, Historic floods, Flood frequency, Peak discharge, Stage-discharge relations, Flood plains, Ice jams, Flood

protection, Standard Project Flood, Non-structural alternatives, Flood plain zoning, Flood plain insurance, Warning systems, Land use, Planning, Control structures, Dams, *Platte River(NB), *Warm Slough(NB), *Trouble Creek(NB), Central City(NB), Intermediate Regional Flood.

The study area includes the Platte River, Trouble Creek, Warm Slough, and their flood plains in the vicinity of Central City, Nebraska. The flood plain is mostly agricultural or undeveloped in the rural area. The urban flood plain contains residential, commercial and industrial land uses. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. The main flood season occurs from February through June and results from heavy general rainfall combined with snowmelt. Ice jams may also cause serious flooding. A number of dams in the upper portion of the basin serve to reduce flood damages in the study area; additional flood discharge reduction is achieved by irrigation diversion structures and some channel cleanout and modification within the study reach. The worst flood recorded on the Platte River near the study area occurred on June 24, 1905. It discharged 44,100 cubic feet per second (cfs). At Central City, the Intermediate Regional Flood would discharge 34,000 cfs while the Standard Project flood would discharge 58,000 cfs; at the downstream study limits the IRF would crest at 1684.7 feet mean sea level (msl) and the SPF would crest at 1686.0 feet msl. Flooding on Trouble Creek and Warm Slough would be most damaging, with flood depths rising as high as five feet. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-06800

FLOOD PLAIN INFORMATION: GREAT FALLS, MONTANA, VOLUME I - SUN RIVER.
Army Engineer District, Omaha, NE.
Prepared for City of Great Falls, Montana, February 1973, 28 p, 17 fig, 6 plates, 3 tab.

Descriptors: *Montana, *Flood flow, *Flood forecasting, *Flood data, Floods, Indirect flood measurement, Streamflow forecasting, Flood profiles, Flood stages, Peak discharge, Stage-discharge relations, Flood plains, Standard Project Flood, Flood protection, Non-structural alternatives, Warning systems, Land use, Planning, Control structures, Great Falls(MT), *Sun River(MT), Intermediate Regional Flood.

The study area includes the Sun River and its flood plain in the vicinity of Great Falls, Montana. The flood plain consists primarily of residential land uses, and to a lesser extent, commercial and industrial developments. Flood data were obtained from topographic maps, historical sources, and field studies. Stream gage records for the study area are not available, although gage records kept 13 miles upstream at Vaughn are indicative of the flood situation. The main flood season occurs in May and June and results from rainfall combined with heavy snowmelt. The worst flood recorded at Vaughn occurred on June 9, 1964, discharging 53,500 cubic feet per second (cfs). At the mouth of the Sun River, the Intermediate Regional Flood would discharge 39,000 cfs and would crest at 3317.2 feet mean sea level (msl), while the Standard Project Flood would discharge 65,000 cfs and would crest at 3320.0 feet msl. One bridge in the study area would obstruct these flood flows. Structural flood control measures have been designed but not implemented. Non-structural measures have not been devised. This study is designed for use in making land use planning and management decisions regarding flood plain utilization. Volume II, a similar report, is planned at a later date for the Missouri River flood plain at Great Falls. (Nessa-NC)
W78-06801

SPECIAL FLOOD HAZARD INFORMATION REPORT: GALLATIN RIVER, GALLATIN COUNTY, MONTANA.
Army Engineer District, Omaha, NE.
Prepared for City of Bozeman, County of Gallatin, MT, May 1973, 23 p, 4 fig, 21 plates, 5 tab

Descriptors: *Montana, *Streamflow forecasting, *Flood profiles, *Flood data, Floods, Historic floods, Peak discharge, Stage-discharge relations, Flood plains, Flood protection, Non-structural alternatives, Land use, Planning, Gallatin County(MT), *Gallatin River(MT), 50-year flood, 100-year flood.

The study area includes the portions of Gallatin County, Montana, that are subject to flooding from the Gallatin River. There are no urban areas in the study reach. Flood plain developments are almost exclusively agricultural although scattered residential land uses exist. The Gallatin River area is close to Yellowstone National Park historical and scenic attractions and many opportunities for fishing and big game hunting; many tourists and sportsmen are attracted to the area. There is an abundance of land for development outside of the flood plain, creating an ideal situation for flood plain zoning. Flood data were obtained from topographic maps, field studies, historical sources, and stream gage records. Flooding may occur at any time and results from heavy general rainfall, rapid snowmelt, or both. The worst recent flood recorded at the Logan gage occurred on June 10, 1970. The flood discharged 9,390 cubic feet per second (cfs). At the same location, the 50-year flood would discharge 9,470 cfs and would crest at 4095.8 feet mean sea level (msl), while the Standard Project Flood would discharge 10,300 cfs and would crest at 4096.3 feet msl. Relatively small volumes of water have produced some of the Gallatin's highest crests due to ice jams at bridges. This study is intended for use in making land use planning and management decisions concerning flood plain utilization. (Nessa-NC)
W78-06802

FLOOD PLAIN INFORMATION: BIG THOMPSON RIVER, LOVELAND TO THE LARIMER-WELD COUNTY LINE, COLORADO, LITTLE THOMPSON RIVER, BOULDER AND LARIMER COUNTIES NEAR BERTHOUD, COLORADO.
Army Engineer District, Omaha, NE.
Prepared for Larimer County, Boulder County, Colorado, and Colorado Water Conservation Board, June 1977, 31 p, 11 fig, 28 plates, 8 tab.

Descriptors: *Colorado, *Streamflow forecasting, *Flood forecasting, *Flood data, Floods, Flood flow, Historic floods, Peak discharge, Flow characteristics, Non-structural alternatives, Flood plain zoning, Warning systems, Control structures, Levee, Larimer County(CO), Boulder County(CO), *Big Thompson River(CO), *Little Thompson River(CO), Loveland(CO), 100-year flood, 500-year flood.

The study area involves the portions of Larimer and Boulder Counties, Colorado that are subject to flooding from Big Thompson and Little Thompson Rivers. The flood plain consists primarily of agricultural land that is experiencing development pressure from Denver. Flood data were obtained from topographic maps, historical sources, field studies, and stream gage records. The main flood season occurs from May through July, although annual peak discharges have occurred from March through September. Flooding results from intense local thunderstorms or heavy general rainfall. The worst flood recorded on the Big Thompson River at the U.S. Geological Survey gage near Drake occurred on July 31, 1976. The flood discharged an estimated 31,200 cubic feet per second (cfs). On the Little Thompson River the worst flood was recorded in May 1957, discharging 4,000 cfs. At the upstream study limit of Big Thompson River, the 100-year flood would discharge 19,000 cfs while the 500-year flood would discharge 40,000 cfs. On the Little Thompson River, the figures at the upstream study limit are 8,800 cfs and 17,000 cfs, respectively, for the 100- and 500-year floods. Historic and projected flood data are presented for the entire study area for 10-, 50-, 100- and 500-year floods. This study is intended for use in making land use planning and management decisions regarding utilization of the flood plain. (Nessa-NC)
W78-06803

PUBLIC PARTICIPATION IN WATER RESOURCES PLANNING: A CASE STUDY AND LITERATURE REVIEW,
Massachusetts Univ., Amherst. Water Resources Research Center
For primary bibliographic entry see Field 6B
W78-06809

STUDIES OF PUBLIC PREFERENCES AND GROUP INTERACTIONS TO GUIDE LAND-USE PLANNING AND CONTROL,
Iowa State Univ., Ames. Dept. of Sociology
For primary bibliographic entry see Field 6B
W78-06812

CONSIDERATIONS IN DETERMINING THE PUBLIC INTEREST,
Iowa State Univ., Ames. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6B.
W78-06817

GUIDELINES FOR DEVELOPING STATE AND NATIONAL PUBLIC LAND USE POLICIES,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-06825

ENVIRONMENTAL IMPACT AND RESOURCE MANAGEMENT PROBLEMS CAUSED BY RESERVOIR PROJECTS,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 6G.
W78-06826

COMPARISON OF ANNUAL STREAMFLOW MODELS,
Washington Univ., Seattle. Department of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-06851

U. S. PROGRAMS IN RESEARCH DRAINAGE BASINS--AN INTERIM ASSESSMENT.
National Research Council, Washington, DC.
For primary bibliographic entry see Field 2A.
W78-06873

MEAN ANNUAL RUNOFF IN THE UPPER OHIO RIVER BASIN, 1941-70, AND ITS HISTORICAL VARIATION,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-06932

CONTRIBUTION OF REMOTE SENSING TO HABITAT EVALUATION AND MANAGEMENT IN A HIGHLY ALTERED ECOSYSTEM,
Great Dismal Swamp National Wildlife Refuge, Suffolk, VA.; and Geological Survey, Reston, VA. Water Resources Div.
M. K. Garrett, and V. Carter.
In: Transactions of the 42nd North American Wildlife and Natural Resources Conference, 1977. Published by the Wildlife Management Institute, p 56-65, Washington, D.C., 1977. 2 fig, 13 ref.

Descriptors: *Ecosystems, *Remote sensing, Swamps, *Virginia, *North Carolina, Succession, Environmental effects, Wetlands, Management, Aerial photography, Satellites(Artificial), Hydrology, Vegetation, Wildlife management, National wildlife refuges, *Great Dismal Swamp(Va-NC).

The Great Dismal Swamp National Wildlife Refuge, established in 1973, presently encompasses 53,000 acres of forested wetland within the Great Dismal Swamp of southeastern Virginia and northeastern North Carolina. Approximately 123,000 acres of the total 210,000 acres of swamp have been recommended for public ownership; the remaining acreage has been separated from the main body of the swamp and has been extensively ditched in preparation for agriculture. The U.S. Fish and Wildlife Service has the responsibility for evaluating and developing management priorities for the primary 123,000 acre unit. The refuge cooperates with other Federal, State and city agencies and provides educational opportunities for the general public. The purpose of this paper is (1) to explain why the Great Dismal Swamp is considered a highly altered ecosystem; (2) to illustrate how the formulation of management policy is complicated by the habitat diversity resulting from physical alterations; and (3) to demonstrate how remote sensing has aided in both habitat evaluation and management of the swamp ecosystem. (Woodard-USGS)
W78-06935

PPLICATION OF A MATHEMATICAL IODEL TO ESTIMATE WATER LEVELS,
eological Survey, Reston, VA. Water Resources iv.; and Geological Survey, Boston, MA. Water esources Div.
. D. Tasker, and J. H. Guswa.
round Water, Vol 16, No 1, p 18-21, January-ebruary 1978. 4 fig, 1 tab.

escriptors: *Water levels, *Estimating, Mathematical models, *Observation wells, Massachusetts, Analytical techniques, Regreson analysis, Water table, *Cape Cod(Mass), imonthly measurements.

mathematical model for estimating daily water vels from less than daily observations as used to nalyze an existing water-level observation netork on Cape Cod, Massachusetts. The analysis dicated that for those sites which are not afcted by tidal fluctuations or man-made inuences (such as pumping), six water-level meaurements per year would allow daily water levels be interpolated with a standard error of estimate about 0.06 meters. (Woodard-USGS)
78-06944

EVIEW OF AUSTRALIA'S WATER ESOURCES 1975,
eological Survey, Reston, VA. Water Resources iv.
A. Heindl.
OS, Vol 59, No 1, January 1978. American eophysical Union, p 18 and 21, 1978.

escriptors: *Water resources, *Australia, Publitions, *Reviews, *Available water, Surface aters, Groundwater, Hydrology, Streamflow, unoff, Water management(Applied), atersheds(Basins), Evaluation.

condensed assessment is presented of the publition 'Review of Australia's Water Resources 75,' its first since the initial assessment attempt 1963. In the intervening years the Australian and ate governments expanded their programs of ater data collection, field investigation, and drological research and broadened their apach to water management to include considera-n of socioeconomic and environmental factors. nder these circumstances it was logical to expect 975 review of Australia's water resources to include evaluations of the immeasurable factors and an assessment that would attempt to balance the immeasurable and the measurable. In spite of some excellent pictures and descriptions, the volume is predominantly a straightforward summary of discharges per time per unit area. (Woodard-USGS)
W78-06947

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 1. NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06952

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 2. SOUTH FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06953

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 4. NORTHWEST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06954

INVENTORY OF RIPARIAN HABITATS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AR. Water Resources Div.
D. E. Brown, N. B. Carmony, and R. M. Turner.
In: 'Importance, Preservation and Management of Riparian Habitat: A Symposium'; Tucson, Arizona, July 9, 1977: USDA Forest Service, General Technical Report RM-43, p 10-13, 1977. 8 ref.

Descriptors: *Reviews, *Maps, *Perennial streams, *Wetlands, *Arizona, Riparian plants, Analytical techniques, Evaluation, Riparian waters, Management, Soil-water-plant relationships, Ecosystems, *Riparian habitat inventory.

This paper discusses a recently published map of Arizona's perennial streams and important wetlands. Perennial streams were illustrated rather than riparian vegetation because the steams are of more direct biotic significance and are more readily identifiable. Inventory procedures used in preparing the map were outlined and the categories of streams and wetlands described. The authors of this paper, who also prepared the map 'Drainage Map of Arizona Showing Perennial Streams and Some Important Wetlands, 1977,' believe that their inventory procedures are applicable to other Southwestern States and will prove useful in the delineation of their aquatic, riparian, and wetland biotic resources. (See also W78-03661) (Woodard-USGS)
W78-06955

EFFECTS OF FUNGI AND BACTERIA ON THE DECLINE OF ARTHROPOD-DAMAGED WATERHYACINTH,
Florida Univ., Gainesville. Dept. of Plant Pathology.
R. Charudattan, B. D. Perkins, and R. C. Littell.
Weed Science, Vol. 26, p 101-107, March, 1978. 6 tab, 12 ref. OWRT A-033-FLA(4), 14-34-0001-8010.

Descriptors: *Biocontrol, Plant pathogens, *Aquatic fungi, *Bacteria, *Water hyacinth, *Plant pathology, *Aquatic weed control, Florida, Microorganisms, Arthopods, Weevils, Mites.

A survey of the fungal and bacterial flora of waterhyacinth, infested with Neochetina eichhorniae (weevil) and Orthogalumna terebrantis (mite) was undertaken to determine the role of microorganisms in the decline of this host in Florida. Generally arthropod-infested plants were more diseased, had smaller laminae, lower numbers of live petioles and higher numbers of dead petioles per plant than noninfested plants. Several parasitic fungi, and soft-rot bacteria occurred randomly on anthropod-infested and noninfested plants; in higher numbers on arthropod-infested, than on noninfested plants. Acremonium zonatum a virulent pathogen of waterhyacinth, and other necrotic leaf-spot diseases ('disease B') were predominant on arthropod-damaged plants. Disease B was independent on the arthropods, while A. zonatum incidence on waterhyacinth was related especially to damage by adult mites. The weevil also aided A. zonatum infections by creating ports for its entry into the host. In laboratory, waterhyacinths could be killed by the combined effects of the weevil and A. zonatum. In fields, the combined effects of arthropods and diseases led to reduction in the photosynthetic area of waterhyacinth and to root- and crown-rots. It is recommended that biological control of waterhyacinth in Florida should include pathogens and insects. (Morgan-Florida)
W78-07002

THE ANALYSIS OF MULTIVARIATE TIME SERIES WITH A VIEW TO APPLICATIONS IN HYDROLOGY,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2A.
W78-07016

OPTIMAL FLOOD LEVEE DESIGNS BY DYNAMIC PROGRAMMING,
Water Resources Center, Budapest (Hungary).
For primary bibliographic entry see Field 8B.
W78-07017

MISSOURI RIVER DEVELOPMENT POLICY AND RURAL COMMUNITY DEVELOPMENT,
Nevada Univ., Reno. Renewable Natural Resources Div.
For primary bibliographic entry see Field 6B
W78-07041

WATER RESOURCES MODELING AND OPTIMIZATION BASED ON CONSERVATION AND FLOODING POOLS,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 6A.
W78-07046

MAN-MADE LAKES: ATTITUDE SURVEYS OF THEIR VALUE IN RESIDENTIAL AREAS,
Hydrocomp, Inc., Atlanta, GA.
For primary bibliographic entry see Field 6B.
W78-07050

A SIMPLIFIED HYDROMETEOROLOGIC MODEL AND SOME REGIONAL APPLICATIONS,
Office de la Recherche Scientifique et Technique Outre-Mer, Paris (France).
For primary bibliographic entry see Field 2A.
W78-07056

BASIN-WIDE PLANNING FOR URBAN STORMWATER MANAGEMENT,
Jorden (W. L.) and Co., Inc., Decatur, GA.
For primary bibliographic entry see Field 5G.
W78-07058

EXISTING LEGAL FRAMEWORK FOR MANAGEMENT OF VIRGINIA'S COASTAL WETLANDS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6J.
W78-07075

EFFECT OF DRAIN TUBE OPENINGS ON WATER-TABLE DRAWDOWN,
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.
R. W. Skaggs
Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 104, No. IR1, Proceedings Paper 13606, p 13-21, March 1978. 5 fig, 2 tab, 13 ref, 1 append.

Descriptors: *Tile drainage, *Drawdown, *Model studies, Mathematical models, Drains, Tile drains, Groundwater, Soil water, Soil water movement, Filters, Tiles, Water table, Agriculture, Tile envelopes.

Conventional methods assume that the drain tube is completely open and offers no resistance to the entry of water. An approximate method of determining the effect of drain tube openings on water table drawdown was presented, based on the use of Hooghoudt's equivalent depth to account for convergence near the drain during water table drawdown. Data from the literature were used to define an effective drain tube radius, r sub e, for drains with a finite number of openings. The r sub e value was used then to define the Hooghoudt equivalent depth which was, in turn, used in solutions to the Boussinesq equation for water table drawdown. The use of an envelope wrap material will permit a somewhat wider drain spacing for all cases, with a large increase in spacing for the deeper profile. The allowable increase in spacing for both cases was relatively small, and the total system cost with the envelope wrap was about 6% higher than without the wrap for the shallow profile and about 7% lower for the deep profile. (Sims-ISWS)
W78-07087

A NEW MULTIVARIATE GAMMA DISTRIBUTION AND ITS FITTING TO EMPIRICAL STREAMFLOW DATA,
Technical Univ. of Budapest (Hungary). Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W78-07089

COMPARISON OF THE TWO- AND THREE-PARAMETER LOG NORMAL DISTRIBUTIONS USED IN STREAMFLOW SYNTHESIS,
Stanford Univ., CA. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W78-07093

SECULAR WATER LEVEL FLUCTUATIONS IN THE LARGE NATURAL BODIES OF WATER OF KAZAKHSTAN AND SOVIET CENTRAL ASIA,
For primary bibliographic entry see Field 2H.
W78-07114

METHOD FOR SIMULATING RIVER RUNOFF STATISTICALLY,
For primary bibliographic entry see Field 2A.
W78-07115

CHARACTERISTICS AND CORRELATES OF PUBLIC KNOWLEDGE ABOUT A WATER RESOURCE DEVELOPMENT ISSUE,
Iowa State Univ., Ames. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6B.
W78-07126

APPLICATION OF LANDSAT DATA TO WETLAND STUDY AND LAND USE CLASSIFICATION IN WEST TENNESSEE,
Tennessee Univ. Space Inst., Tullahoma. Remote Sensing Div.
For primary bibliographic entry see Field 7B.
W78-07152

WATERFOWL POPULATIONS AS RELATED TO HABITAT CHANGES IN BOG WETLANDS OF THE MOOSEHORN NATIONAL WILDLIFE REFUGE,
Maine Cooperative Wildlife Research Unit, Orono.
S. I. Lefer
Technical Bulletin 86, Life Sciences and Agriculture Experiment Station, University of Maine at Orono, August, 1977. 16 p, 7 fig, 5 ref.

Descriptors: *Marsh management, *Waterfowl, *Water levels, *Reproduction, Wetlands, Bogs, Marshes, Freshwater marshes, Wildlife management, Black duck, Ring-necked duck, Marsh plants, Water level fluctuations, Animal populations, Maine, *Moosehorn National Wildlife Refuge(Maine).

Fluctuating water levels, advanced plant succession, and an overall decrease in number and distribution of open water areas appear to be at least partly responsible for a general decline in the black duck population on the Refuge. Ring-necked duck numbers have increased on those Refuge wetlands where marsh management favored an increase in floating sedge-bog mat. By contrast, this species decreased on the shrub wetland flowages because of adverse effects on plant succession. It was concluded that maintenance of optimum water levels is the most important of all factors in marsh management on the Refuge. (Steiner-Mass)
W78-07164

HISTORICAL STREAMFLOW SUMMARY, ALBERTA, TO 1976.
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 7C.
W78-07165

IMPLEMENTATION OF THE TRANSFER PROCESS UNDER THE APPROPRIATION DOCTRINE,
For primary bibliographic entry see Field 6E.
W78-07199

4B. Groundwater Management

GEOHYDROLOGICAL ENVIRONMENTAL EFFECTS OF GEOTHERMAL POWER PRODUCTION - PHASE IIA,
Systems, Science and Software, La Jolla, CA.
For primary bibliographic entry see Field 5B.
W78-06701

ENVIRONMENTAL ASPECTS OF WATER SPREADING FOR GROUND WATER RECHARGE,
Agricultural Research Service, Fresno, CA. Water Management Research.
H. J. Nightingale, and W. C. Bianchi.
Available from USDA SEA Information Div., Hyattesville, MD. 20782. Technical Bulletin No. 1568, October, 1977. 21 p, 12 fig, 8 tab, 80 ref.

Descriptors: *Artificial recharge, *Groundwater recharge, *Water spreading, *Ecology, *Ecological distribution, *Aquatic plants, *Aquatic animals, Aquatic life, Aquatic habitat, California, Environmental effects, *Ecological impact, *Leaky Acres Recharge Facility, Fresno(CA).

Field observation data on the changes in the plant and animal communities during the first 5 years of operation of the Leaky Acres Recharge Facility in Fresno, California are presented. The original arid ecosystem has changed to aquatic with each continuous recharge period of 8 to 10 months each year. The nature and magnitude of ecological changes were recorded as the aquatic environment was generated and stabilized. The impact of these changes on recharge and the surrounding urban area is discussed. Canal water quality parameters, soil chemical and physical properties, and geological parameters which are critical to maintaining the facility's infiltration rate of 16-23 cm/day are summarized. After 5 recharge periods, the ecosystem appears fairly stable in relation to the canal water quality, plant nutrients, and biota. Observations show that for the sandy soils the infiltration rate of the basins can be maintained by: (1) minimizing the amount of aquatic plant growth and resulting deposition of organic material that can cause biological clogging of the soil; (2) preventing turbid (greater than 20 FTU) canal water from carrying high loads of silt and clay from entering the basins; (3) preventing intrabasin erosion during filling; and (4) minimizing soil disking and compaction. A table of preconstruction surveys was formulated as a guide to generate information needed to write an intelligent and practical environmental impact report for a proposed basin-type recharge facility and to design and operate a recharge facility. (Seip-IPA)
W78-06764

A CASE OF CONTAMINATION OF KARST WATER-BEARING STRATA BY CHOLERA VIBRIO (IN RUSSIAN),
Nauchno-Issledovatelskii Protivochumnyi Inst., Rostov-na-Donu (USSR).
For primary bibliographic entry see Field 5B.
W78-06821

ESTIMATING TRANSMISSIVITY AND STORAGE COEFFICIENT FROM ABSTRACTION WELL DATA,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-06897

THE APPLICATION OF THE DIGITAL SIMULATION LANGUAGE PDEL TO SUBSURFACE HYDROLOGY PROBLEMS,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 2F.
W78-06923

APPLICATION OF DIGITAL PROFILE MODELING TECHNIQUES TO GROUNDWATER SOLUTE TRANSPORT AT BARSTOW, CALIFORNIA,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06931

A THEORETICAL BASIS FOR EXPLORATION FOR NATIVE COPPER IN NORTHERN WISCONSIN,
Geological Survey, Reston, VA. Geology Div.
W. S. White.
Available from Branch of Distribution, USGS 1200 S. Eads St. Arlington, VA 22202. Geological Survey Circular 769, 1978. 19 p, 5 fig, 36 ref.

Descriptors: *Copper, *Exploration, *Theoretical analysis, *Wisconsin, *Hydrothermal studies, Chemical reactions, Lava, Solubility, Mineralogy, Mining, Evaluation, *Buried groundwater, Deep lava beds(Wis).

Exploration for native copper in the Keweenawan lavas of northern Wisconsin has been concentrated in areas of relatively shallow overburden that have sparse to numerous outcrops. Lack of success of this exploration suggests that if large deposits, comparable to those of northern Michigan, are present, they are more likely to be found in one or more of the large tracts that have few, if any, exposures, away from the 'copper ranges.' A hydrologic model that may explain the mineralization of the classic native-copper district of Michigan could be helpful in suggesting that certain covered tracts are more favorable than others, and in narrowing the targets for physical exploration within these tracts. This model involves updip migration of a hydrothermal fluid of metamorphic origin, formed when ground water contained in the interstices of lava flows and conglomerate beds was carried to great depth along the axis of the Lake Superior syncline. The largest reservoirs of such buried ground water would be expected in the peripheral rather than central parts of the basins in which the lavas originally accumulated because the ratio of porous fragmental flow tops and conglomerate beds to massive basalt should increase towards the margins of a basin. Thus, the areas most promising for copper deposits should be those updip from places where the trough of the later formed Lake Superior syncline crosses the marginal parts of a lava basin. (Woodard-USGS)
W78-06938

GROUND-WATER RESOURCES OF THE NORTH BEACH PENINSULA, PACIFIC COUNTY, WASHINGTON,
Geological Survey, Tacoma, WA. Water Resources Div.
J. V. Tracy.
Open-file report 77-647, 1978. 45 p, 7 fig, 8 tab, 11 ref.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Groundwater availability, *Water quality, *Washington, Hydrogeology, Hydrologic data, Observation wells, Water yield, Water level fluctuations, Groundwater recharge, Groundwater movement, Precipitation(Atmospheric), Water supply, Aquifer management, Well spacing, Projections, Evaluation, *North Beach Peninsula(Wash), Pacific County.

The anticipated water demand of 425 million gallons per year for the North Brach Peninsula, Pacific County, Wash., can be met by properly developing the ground-water supplies of the area's water-table aquifer. Of the approximately 77 inches of annual precipitation on the peninsula, an estimated 23 inches is lost to evapotranspiration, and approximately 36 inches is discharged by the water-table aquifer into the ocean and bay. The remaining water either runs off the surface or is leaked to a deeper aquifer that ultimately discharges to the ocean. At least 12 inches of the water that discharges naturally through the aquifer is available for additional development. This quantity of water is approximately equivalent to 860,000 gallons per day. Wells spaced at least 1,000 feet apart along the major axis of the peninsula and pumped at average rates of no more than 30 gallons per minute could ensure that water-level declines do not exceed 6 feet near the wells and 1 foot at the shoreline, thereby preventing seawater intrusion. Lowering of the water table may be beneficial in reducing waterlogging problems, but care must be taken not to lower the levels near cranberry bogs, which require a shallow water table. Treatment of the otherwise good quality water for iron may be required, as about 75 percent of the well water sampled from the aquifer had iron concentrations in excess of limits recommended by the U.S. Environmental Protection Agency. (Woodard-USGS)
W78-06941

EVALUATION OF HYDROGEOLOGIC ASPECTS OF PROPOSED SALINITY CONTROL PROGRAM IN PARADOX VALLEY, COLORADO,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 5G.
W78-06942

MODEL ANALYSIS OF THE IMPACT ON GROUND-WATER CONDITIONS OF THE MUSKEGON COUNTY WASTEWATER DISPOSAL SYSTEM, MICHIGAN,
Geological Survey, Lansing, MI. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06943

THE USE OF TEMPERATURE LOGS TO TRACE THE MOVEMENT OF INJECTED WATER,
Geological Survey, Denver, CO. Water Resources Div.; and Geological Survey, Anchorage, AL. Water Resources Div.
For primary bibliographic entry see Field 2F.
W78-06945

REVIEW OF AUSTRALIA'S WATER RESOURCES 1975,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06947

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 1. NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06952

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 2. SOUTH FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06953

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 4. NORTHWEST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06954

OVERVIEW OF FEDERAL GROUNDWATER PROTECTION LEGISLATION AIDS ENVIRONMENTALISTS,
Office of Radiation Programs, Washington, DC. Div. of Criteria and Standards.
For primary bibliographic entry see Field 5G.
W78-06956

DEPLETION ALLOWANCE FOR GROUNDWATER MINING: PROS AND CONS,
Texas Dept. of Water Resources, Austin.
T. Knowles, and F. Rayner.
Journal American Water Works Association, Vol. 70, No. 3, p 148-150, March, 1978. 2 fig.

Descriptors: *Taxes, *Texas, *Overdraft, *Groundwater mining, Water table, Irrigation, Withdrawal, Aquifers, Water conservation, Water resources development.

Although Texas is blessed with a vast amount of ground water from several major aquifers (328 million recoverable acre-feet, according to recent estimates), pumpage far exceeds recharge on a statewide basis. Declining water levels of the Ogallala aquifer in the High Plains have been a source of concern for many years. Because the majority of ground water used in the area is for irrigating cotton and feed grains, and because Texas landowners by law own the ground water beneath their acreage, the High Plains Underground Water Conservation District No. 1 has sought, and ultimately obtained, a cost depletion tax allowance for declining water tables. The final court decision which approved the allowance took into account that farmers are paying bonuses for land with proven ground water reserves. Water is thus viewed as a valuable capital item. It was further reasoned that the tax benefits should be a force in bringing the value of ground water resources to the forefront of public awareness. (Eberle-NWWA)
W78-06957

A SURVEY OF PRACTICES AND REGULATIONS FOR REUSE OF WATER BY GROUNDWATER RECHARGE,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5D.
W78-06958

UPDATE ON GEOTHERMAL DRILLING,
For primary bibliographic entry see Field 8C.
W78-06962

SICK WELLS REQUIRE WELL DEVELOPED CURE.
For primary bibliographic entry see Field 5G.
W78-06963

AN INTRODUCTION TO THE TECHNOLOGY OF SUBSURFACE WASTEWATER INJECTION,
Missouri Univ.-Rolla; and National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 5E.
W78-06965

CHARACTERISTICS OF VAPOR FLASHING GEOTHERMAL PLANTS,
Hawaii Univ., Honolulu. Coll. of Engineering.
For primary bibliographic entry see Field 8C.
W78-06966

GEOTHERMAL RESERVOIR AND WELL TEST ANALYSIS: A LITERATURE SURVEY,
Hawaii Univ.-Hilo Coll., Hilo.
For primary bibliographic entry see Field 8B.
W78-06967

A REVIEW OF PROBLEMS ON SCALING AND CORROSION IN GEOTHERMAL PLANTS,
Hawaii Univ., Honolulu. Coll. of Engineering.
For primary bibliographic entry see Field 8G.
W78-06968

REGIONAL GEOLOGY SERIES: PART III, UNGLACIATED APPALACHIAN REGION,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 2F.
W78-06970

APPLICATION OF BOREHOLE GEOPHYSICS TO SELECTION OF POTENTIAL SITES FOR DEEP-WELL DISPOSAL OF LIQUID WASTES,
For primary bibliographic entry see Field 5E.
W78-06972

GROUNDWATER QUALITY AND CORROSION: THE AUSTRALIAN SCENE,
For primary bibliographic entry see Field 5B.
W78-06973

LEGISLATIVE ASPECTS OF GROUNDWATER QUALITY,
For primary bibliographic entry see Field 5G.
W78-06974

MEASURES FOR THE PROTECTION AND REHABILITATION OF AQUIFERS IN THE UNITED KINGDOM,
For primary bibliographic entry see Field 5G.
W78-06975

PUBLIC GROUNDWATER SUPPLIES IN EDWARDS COUNTY,
Illinois State Water Survey, Urbana
D. M. Waller, and E. W. Sanderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 309, Price codes: A02 in paper copy, A01 in microfiche. Bulletin 60-21, 1978. 8 p, 1 fig.

Descriptors: *Water supply, *Illinois, *Groundwater resources, *Well data, Unconsolidated aquifers, Gravels, Sand aquifers, Groundwater, Groundwater availability, Hydrology, Hydrogeology, Water sources, Water quality, Water wells, Municipal water, Water yield, Water properties, Hardness(Water), Chemical properties, Shallow wells, Geology, *Edwards County(Ill), Dissolved minerals, Water bearing formations.

All available information was reported on production wells used for public groundwater supplies in Edwards County. The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. Sand and gravel deposits in the unconsolidated materials above bedrock in Edwards and Wabash Counties are tapped as the source of municipal water supply. There are presently 8 public supply production wells (2 in Edwards and 6 in Wabash), ranging in depth from 42.8 to 91.6 ft, finished in the sand and gravel deposits. Reported yields range from 29.8 to 502 gpm, depending primarily upon the type of well and the permeability, thickness, and areal extent of the sand and gravel deposits tapped by each well. Past and present analyses of water rom the 3 public water supply systems indicated that the iron content ranges from 0.1 to 6.6 mg/l, and the hardness from 277 to 430 mg/l. Individual production wells for each supply were described in the order of their construction. The description for each well included the aquifer tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment, and chemical analyses. (Humphreys-ISWS)
W78-07085

AN APPROXIMATE DIFFERENTIAL EQUATION TO DESCRIBE LEAKY AQUIFER BEHAVIOR DURING INTERMEDIATE AND LARGE VALUES OF TIME,
Universidad Nacional Autonoma de Mexico, Mexico City. Dept. of Ingeniera.
For primary bibliographic entry see Field 2F.
W78-07090

TO MINE OR NOT TO MINE GROUNDWATER,
Illinois State Water Survey, Urbana.
R. T. Sasman, and R. J. Schicht.
Journal of the American Water Works Association, Vol. 70, No. 3, p 156-161, March 1978. 3 fig, 5 tab, 8 ref.

Descriptors: *Groundwater, *Groundwater mining, *Illinois, *Lake Michigan, Water resources, Water supply, Water demand, Water law, Water resources development, Water management(Applied), Aquifers, Pumping, Storage, Recharge, Precipitation(Atmospheric), Costs, Planning, *Chicago metropolitan region(Ill).

Although continued or expanded mining of groundwater is an attractive means of increasing water supply to meet the demands of growing populations in many areas of the US, it also can be a debatable issue. Based on a series of studies by the Illinois State Water Survey, the advantages and disadvantages of groundwater mining in the Chicago metropolitan region were discussed, with emphasis on such yet-to-be-resolved questions as the extent and sources of recharge, impact on water quality, and the availability and cost of alternate sources of supply. (Sims-ISWS)
W78-07102

STATUS OF GROUNDWATER CONTAMINATION IN THE US,
Geraghty and Miller, Inc., Tampa, FL.
For primary bibliographic entry see Field 5B.
W78-07103

THE EFFECTS OF SOLID WASTE LANDFILL LEACHATES ON RECEIVING WATERS,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-07104

A CASE HISTORY TO EVALUATE THE PERFORMANCE OF WATER-SPREADING PROJECTS,
Agricultural Research Service, Fresno, CA. Water Management Research.
W. C. Bianchi, H. I. Nightingale, and R. L. McCormick.
Journal of the American Water Works Association, Vol. 70, No. 3, p 176-180, March 1978. 4 fig, 6 tab, 12 ref.

Descriptors: *Recharge, *Artificial recharge, *California, Groundwater recharge, Pit recharge, Recharge ponds, Performance, Evaluation, Groundwater, Infiltration, Percolation, Evaporation, Costs, Economics, Water management(Applied), Hydrologic properties, Projects, Aquifers, Groundwater, *Water spreading, *Fresno(Calif), *Leaky Acres recharge project(Calif).

Studies on ways to predict the performance, costs, and benefits of artificial groundwater recharge were made for the Fresno, California, Leaky Acres Project. Prediction errors of site recharge rates were as much as 20 times greater than the final operational project rate when soil cores were used, while pilot spreading with proper instrumentation for sublayer perching decreased estimates to within 1.5 times. Recharge costs are difficult to evaluate on a user-benefit basis. Using a zonal response and political boundary approach, 79% of the benefit of recharge benefited city users. The use of the recharge water, however, requires an energy-consuming process, and energy costs soon will equal the operational costs of recharge. (Sims-ISWS)
W78-07105

WATER QUALITY AT A SLUDGE ENTRENCHMENT SITE,
Agricultural Research Service, Beltsville, MD. Soil Nitrogen Lab.
For primary bibliographic entry see Field 5B.
W78-07110

REMOTE SENSING DETECTS GROUNDWATER IN ENGLAND,
Institute of Hydrology, Wallingford (England).
For primary bibliographic entry see Field 7B.
W78-07112

SUBSURFACE WASTE DISPOSAL IN LAMBTON COUNTY, ONTARIO - PIEZOMETRIC HEAD IN THE DISPOSAL FORMATION AND GROUNDWATER CHEMISTRY OF THE SHALLOW AQUIFER,
Department of the Environment, Ottawa (Ontario). Water Resources Branch
For primary bibliographic entry see Field 5E.
W78-07166

AN UNUSUAL PUMP TEST NEAR ESTERHAZY, SASKATCHEWAN,
Department of the Environment, Ottawa (Ontario). Water Resources Branch
For primary bibliographic entry see Field 5G.
W78-07172

4C. Effects On Water Of Man's Non-Water Activities

HIGHWAY OPERATION AND PLANT DAMAGE,
California State Dept. of Transportation, Sacramento. Transportation Lab.
For primary bibliographic entry see Field 5B.
W78-06725

HIGHWAYS IN THE RIVER ENVIRONMENT—HYDRAULIC AND ENVIRONMENTAL DESIGN CONSIDERATIONS (TRAINING AND DESIGN MANUAL),
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-06730

URBAN CHANNEL EROSION: PRELIMINARY ANALYSIS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 4D.
W78-06810

NONSTATIONARY STREAMFLOW FROM URBANIZING WATERSHEDS: A CASE STUDY,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
T. E. Croley, II, R. N. Eli, and K-K. Shih, II.
Report presented at the ASCE Hydraulics Division 23rd Annual Specialty Conference, 'Hydraulic Engineering for Optimal Use of Water Resources,' August 6-8, 1975, Seattle, Washington, 30 p, 5 fig, 9 tab, 5 ref. OWRT A-053-IA (3).

Descriptors: *Flood forecasting, *Urbanization, *Stream flow, *Model studies, *Iowa, Economics, Urban hydrology, Precipitation(Atmospheric), Simulation analysis, *Ralston Creek watershed(Iowa), Non-stationary streamflow, Rural hydrology.

The streamflow record, precipitation record, and characteristics of the Ralston Creek watershed, Iowa City, Iowa, are used to estimate parameters for streamflow simulation models for both non-urban and urban conditions. In preparation for estimating urbanization-induced flood hazards, the models are combined in a data generation approach designed to estimate flood characteristics for both urban and non-urban conditions. Preliminary estimation of the flood hazard impact is presented and economic estimations are made. (Seip-IPA)
W78-06823

CHICAGO AREA PROGRAM: A MAJOR NEW ATMOSPHERIC EFFORT,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-06885

STRESS AND RECOVERY OF AQUATIC ORGANISMS AS RELATED TO HIGHWAY CONSTRUCTION ALONG TURTLE CREEK, BOONE COUNTY, WEST VIRGINIA,
Geological Survey, Charleston, WV. Water Resources Div.
J. L. Chisholm, and S. C. Downs.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $1.60. Water-Supply Paper 2055, 1978. 40 p, 22 fig, 6 tab, 9 ref.

Descriptors: *Ecosystems, *Environmental effects, *Aquatic life, *Road construction, *West Virginia, Streams, Sediment transport, Water quality, Sampling, Benthos, Analytical techniques, Drainage area, Channel morphology, Vegetation regrowth, Evaluation, *Boone County(W Va), Turtle Creek, Organism drift, Total count, Organism recovery.

During and after construction of Appalachian Corridor G, a divided, four-lane highway in West Virginia, five benthic invertebrate samples were collected at each of four sites on Turtle Creek, and, for comparative purposes, three samples were collected at each of two sites on Lick Creek, an adjacent undisturbed stream. Diversity index, generic count, and total cout initially indicated severe depletion or destruction of the benthos of Turtle Creek, but, within 1 year after highway construction was completed, the benthic community of Turtle Creek was similar to that of Lick Creek. The greatest degradation occurred near the headwaters of Turtle Creek because of erratic movement of sediment resulting from high streamflow velocity. Diversity indices ranged from 0 to 3.41 near the headwaters in the original channel, but only from 0.94 to 2.42 farther downstream in a freshly cut channel. The final samples from Turtle Creek, which were similar to those taken from Lick Creek at the same time, had generic counts of 10 at the most upstream site and 16 near the mouth. A total of 147 organisms was found near the headwaters, whereas a total of 668 was found near the mouth of the stream. The total number of organisms collected at each site was proportional to the drainage area upstream from the site. As a result of tributary inflow from unaltered drainage areas and organism drift, rapid repopulation and stabilization of the benthic community occurred. Channel relocation, bank recontouring, and reseeding also accelerated the recovery of the benthic community. (Woodard-USGS)
W78-06933

WASHINGTON, D.C.'S VANISHING SPRINGS AND WATERWAYS,
Geological Survey, Lakewood, CO. Water Resources Div.
G. P. Williams.
Available from Branch of Distribution, USGS 1200 S. Eads St. Arlington, VA 22202. Circular 752, 1977. 19 p, 3 fig, 1 tab, 49 ref.

Descriptors: *History, *District of Columbia, *Streams, *Springs, *Urbanization, Environmental effects, Boats, Canals, Harbors, *Washington(DC).

This paper traces the disappearance or reduction of the many prominent springs and waterways that existed in Washington, D.C., 200 years ago. The best known springs were the Smith Springs (now under the McMillan Reservoir), the Franklin Park Springs (13th and I Streets, NW.), Gibson's Spring (15th and E Streets, NE.), Caffrey's Spring (Ninth and F Streets, NW.), and the City Spring (C Street between Four and One-Half and Sixth Streets, NW.). Tiber Creek, flowing south to the Capitol and thence westward along Consititution Avenue, joined the Potomac River at 17th Street and Constitution Avenue. In the 1800's, the Constitution Avenue reach was made into a canal which was used by scows and steamboats up to about 1850. The canal was changed into a covered sewer in the 1870's, and the only remaining visible surface remnant is the lock-keeper's little stone house at 17th and Constitution Avenue, NW. Because of sedimentation problems and reclamation projects, Rock Creek, the Potomac River, and the Anacostia River are considerably narrower and shallower today than they were in colonial times. For example, the mouth of Rock Creek at one time was a wide, busy ship harbor, which Georgetown used for an extensive foreign trade, and the Potomac River shore originally extended to 17th and Constitution Avenue, NW. (Woodard-USGS)
W78-06937

USE OF A PIECEWISE LINEAR MODEL WITH SPATIAL STRUCTURE AND INPUT FOR EVALUATING AGRICULTURAL TO URBAN HYDROLOGIC IMPACT,
Agricultural Research Service, Athens, GA. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2A.
W78-07061

SOIL DISTRUBANCE CAUSED BY SKYLINE CABLE LOGGING ON STEEP SLOPES IN WEST VIRGINIA,
Northeastern Forest Experiment Station, Parson, WV. Timber and Watershed Lab.
J. H. Patric, and J. L. Gorman.
Journal of Soil and Water Conservation, Vol. 33, No. 1, p 32-35, January-February 1978. 3 fig, 14 ref.

Descriptors: *Soil erosion, *Lumbering, *Forest management, *West Virginia, Forestry, Forest watersheds, Erosion control, Trees, Forests, Hardwood, Soil horizons, Infiltration, On-site investigations, *Skyline cable logging.

A URUS mobile skyline system removed an average volume of 32.6 cu m (4,500 board measure) per hectare of hardwood logs from 16 hectares (40 acres) of steep forest land in West Virginia. Six months after logging, the areas's hydrologic performance was evaluated. There was no evidence of reduced infiltration, increased bulk density, overland flow, or accelerated erosion, except on heavily used skid trails. The soil was severely disturbed (B horizon exposed) on less than 3% of the logged land; more than 90% was undisturbed. (Humphreys-ISWS)
W78-07109

SURVEY OF ALTERNATIVES TO THE USE OF CHLORIDES FOR HIGHWAY DEICING,
Federal Highway Administration, Washington, DC. Materials Div.
J. A. Zenewitz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 110, Price codes: A03 in paper copy, A01 in microfiche. Report No. FHWA-RD-77-52, May, 1977. 23 p, 45 ref.

Descriptors: *Ice, *Melting, *Deicers, *Highway icing, Chemicals, Testing, *Chlorides, Reviews.

The results of a state-of-the-art review of highway deicing techniques are summarized. Information and suggestions for use in planning and initiating research are included. A literature review and a compilation of information from various organizations have promoted selections of and suggestions for promising avenues of research into alternatives to the use of chlorides. These alternatives include: (1) formamide, (2) urea, (3) tetrapotassium pyrophosphate, (4) formamide-urea-water, (5) tripotassium phosphate-formamide, (6) hydrolysates of proteinaceous waste, (7) hydrophobic coatings - such as fatty-quaternary-ammonium compounds, organo-fluorochemical compounds, organo-silicone compounds, polymers (polyethylene, plastics, aminoborane, alkali metal borohydride, alkali metals with borohydrides), (8) pavement heating, (9) mobile thermal deicing, (10) ultrasonic or vibrational techniques, and (11) various types of equipment. Undesirable characteristics are noted with the use of: ammonium acetate, ammonium nitrate, ammonium sulfate, alcohols, glycols, sodium formate, calcium formate, ammonium carbamate, and ammonium salts. (Seip-IPA)
W78-07122

ENVIRONMENTAL IMPACT OF LAND USE ON WATER QUALITY (PROGRESS REPORT), BLACK CREEK PROJECT, ALLEN COUNTY, INDIANA,
Allen County Soil and Water Conservation District, Fort Wayne, IN.
For primary bibliographic entry see Field 6G.
W78-07131

4D. Watershed Protection

EROSION RATES OF COHESIVE SOILS,
Nielsen Engineering and Research Inc., Mountain View, CA.
For primary bibliographic entry see Field 2J.
W78-06720

METHODS OF SOIL STABILIZATION FOR EROSION CONTROL,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
S. Diamond.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 922, Price codes: A04 in paper copy, A01 in microfiche. Report JHRP-75-20, October 1975. 57 p, 7 fig, 9 ref.

Descriptors: *Erosion control, *Rainfall, *Slopes, *Laboratory tests, Cements, Portland cements, Lime, Dusts, Erosion, Storms, Stabilization, Construction, Sediments, Soils, Clays, *Construction soil erosion, Cement plant dusts.

The objective was to investigate the possible application of inexpensive soil stabilization treatments for the purpose of reducing or preventing soil erosion on construction sites and consequent downstream sediment problems. Treatments were evaluated by measuring erosion loss of treated soil specimens exposed to a severe standardized rainfall test sequence. Treatments investigated included modest percentages of portland cement, hydrated lime, or waste cement plant dust incorporated with the soil by mixing and compaction, or by application in slurry form over the surface of previously compacted specimens. It was found that all of the stabilizers used in reasonable amounts (1 to 2.5%) would almost completely eliminate erosion in the test rainstorm sequence. Required curing periods apparently were conditioned by the level of compaction exerted; in favorable cases, only 1-3 days were required, particularly with portland cement treatment. Hydrated lime and cement dust treatments, while eventually equally successful in preventing erosion in the standard test, required longer curing times, especially when the specimens were only lightly compacted. Waste cement dust may be a promising additive in view of its negligible materials cost. (Sims-ISWS)
W78-06724

HIGHWAYS IN THE RIVER ENVIRONMENT--HYDRAULIC AND ENVIRONMENTAL DESIGN CONSIDERATIONS (TRAINING AND DESIGN MANUAL),
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-06730

NEW REQUIREMENTS FOR LOCAL UNITS OF GOVERNMENT IN WATER RESOURCES PLANNING: INSIGHTS FOR IMPLEMENTA-

TION FROM RECENT WATER RESOURCES PLANNING RESEARCH,
Say (E. W.) and Associates, Inc., Chelsea, MI.
For primary bibliographic entry see Field 6E.
W78-06742

SHORELINE ECOLOGY OF LAKE POWELL,
California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics
For primary bibliographic entry see Field 2H
W78-06773

POLITICS OF SHORE EROSION: WESTHAMPTON BEACH,
State Univ of New York at Albany. Graduate School of Public Affairs.
For primary bibliographic entry see Field 6E.
W78-06776

WASHINGTON COUNTY PROJECT WORK PLAN: DEVELOPMENT AND IMPLEMENTATION OF SEDIMENT CONTROL ORDINANCE OR OTHER REGULATORY MECHANISM: INSTITUTIONAL ARRANGEMENTS NECESSARY FOR IMPLEMENTATION OF CONTROL METHODOLOGY ON URBAN AND RURAL LANDS,
Wisconsin Board of Soil and Water Conservation Districts, Madison
T. C. Daniel, and R. H. Klassy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 189, Price codes: A05 in paper copy, A01 in microfiche. Prepared for U.S. Environmental Protection Agency, Office of Great Lakes Coordinator, Chicago, IL, January 1977, 73 p, 7 tab, 16 fig. 6005139.

Descriptors: *Sediment control, *Land use, *Regulation, *Water quality monitoring, *Erosion control, *Wisconsin, Planning, Economics, Management, Institutions, Rural areas, Urbanization, Washington County(WI), Public participation.

The study's purpose was to demonstrate the development of a regulatory mechanism for sediment control in Washington County, Wisconsin, in order to improve water quality. Sediment problems arising from both urbanization--industrial and residential development--and rural land uses were investigated. Of particular interest was the nexus between land control and the improvement of water quality and the institutional arrangements necessary to insure that quality. Recommended was a county-wide management plan that integrated to considerations of both rural and urban land use. Public participation was encouraged along with an effective economic feasibility study of plan implementation. Monitoring sites throughout the county were also selected. (Zayac-NC)
W78-06780

URBAN CHANNEL EROSION: PRELIMINARY ANALYSIS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
W. Whipple, Jr., and T. Pytlar, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 952, Price codes: A02 in paper copy, A01 in microfiche. Partial Completion Report, April 1978. 19 p, 8 fig, 1 tab, 20 ref. OWRT B-067-NJ(1), 14-34-0001-8100.

Descriptors: *Channel morphology, *Erosion control, *Erosion, *Stream stabilization, *Urban runoff, *Urbanization, *Storm runoff, *Culverts, *Environmental effects, Engineering structures, Channels, Bank stability, Urban drainage, Channel erosion, Channel improvement.

Erosional aspects of urban stream were investigated. Analysis of existing stream and drainage basin data and on-site observations of twelve New Jersey streams have been aimed at identifying the variables related to excess urban storm runoff and stream erosion. Preliminary results indicate that measures of land use, stream slope, geology, and drainage basin area are most useful in explaining the degree of channel erosion. In addition, culvert size with respect to storm flow, and artificial drainage via pipes into the streams may play an important role in the process. Bed load transport and other hydraulic relationships will be used to formulate quantitative criteria which can be used by local agencies to manage urban streams so as to avoid channel degradation and the eventual necessity of concrete lining and channelization of the streams in urban settings.
W78-06810

NONSTATIONARY STREAMFLOW FROM URBANIZING WATERSHEDS: A CASE STUDY,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.
For primary bibliographic entry see Field 4C.
W78-06823

UTILIZING CLIMATIC DATA TO APPRAISE POTENTIAL WATER YIELDS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W78-06850

U. S. PROGRAMS IN RESEARCH DRAINAGE BASINS--AN INTERIM ASSESSMENT.
National Research Council, Washington, DC.
For primary bibliographic entry see Field 2A.
W78-06873

A DISTRIBUTED KINEMATIC MODEL OF UPLAND WATERSHEDS,
Colorado State Univ., Fort Collins.
E. W. Rovey, D. A. Woolhiser, and R. E. Smith.
Hydrology Paper No. 93, July 1977. 58 p, 48 fig, 11 tab, 64 ref, 2 append. USDA and Colorado Experiment Station ES114.

Descriptors: *Model studies, *Infiltration, *Storm drains, *Analytical techniques, *Routing, Urban runoff, Watersheds(Basins), Parametric hydrology, Hydrographs, Storms, Computer programs, *Kinematic model, Impervious experimental facility, Spatial variability.

Relationships were developed to compute flows by the kinematic approximation in channels of circular cross section for routing of flow through storm drains. A parametric decay-type infiltration function was incorporated into the surface routing model. The kinematic routing was shown to yield hydrographs comparable to those with the lag method for predicting outflows. The model was used to simulate runoff from 2 urban watersheds. Results from the small, impervious watershed showed good agreement between observed and predicted hydrographs. Results from the large, complex urban watershed were good when the rainfall excess is properly estimated. A computer program of a general kinematic watershed model was presented. The program can be used to predict hydrographs of individual storms for small rural and urban watersheds. (Singh-ISWS)
W78-06876

CONTROL OF TURBIDITY AT CONSTRUCTION SITES.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 5G.
W78-06904

WATER-QUALITY INVESTIGATION OF THE TYRONZA RIVER WATERSHED, ARKANSAS,
Geological Survey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06951

SOIL CHANGES AFTER HAY MEADOW ABANDONMENT IN SOUTHWESTERN WISCONSIN,
North Central Forest Experiment Station, St Paul, MN.
M. D. Knighton.
USDA For. Serv. Res. Pap. NC-146, 1977. 6 p, 3 fig, 1 tab, 14 ref.

Descriptors: *Soil management, *Soil dynamics, *Erosion control, Infiltration, Soil physical properties, Porosity, Bulk density, *Wisconsin, *Driftless area, Typic hapludolf, Fayette silt loam, Organic carbon.

Soil properties were monitored in early spring and late fall for 3 years following hay meadow abandonment. Bulk density decreased, organic carbon increased, total porosity increased in the large pore fraction, and infiltration rate increased 100%. Earthworm activity was considered to be primarily responsible for the improvement. (Forest Service)
W78-06978

PENN STATE RUNOFF MODEL FOR THE ANALYSIS OF TIMING OF SUBWATERSHED RESPONSE TO STORMS,
Weston (Roy F.), Inc., West Chester, PA.
For primary bibliographic entry see Field 5G.
W78-07060

USE OF A PIECEWISE LINEAR MODEL WITH SPATIAL STRUCTURE AND INPUT FOR EVALUATING AGRICULTURAL TO URBAN HYDROLOGIC IMPACT,
Agricultural Research Service, Athens, GA. Southwest Watershed Research Center.
For primary bibliographic entry see Field 2A.
W78-07061

PHYSICAL MANAGEMENT OF COASTAL FLOOD PLAINS: GUIDELINES FOR HAZARDS AND ECOSYSTEMS MANAGEMENT.
Conservation Foundation, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-07077

SOIL DISTRUBANCE CAUSED BY SKYLINE CABLE LOGGING ON STEEP SLOPES IN WEST VIRGINIA,
Northeastern Forest Experiment Station, Parson, WV. Timber and Watershed Lab.
For primary bibliographic entry see Field 4C.
W78-07109

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

CONTENT OF SOME HEAVY METALS IN THE NATURAL WATERS OF THE SOUTHERN PART OF EASTERN TRANSBAYKALIA,
Irkutsk Gosudarstvennyi Univ. (USSR).
For primary bibliographic entry see Field 5B.
W78-06712

URANIUM IN RIVER RUNOFF,
Akademiya Nauk SSSR, Moscow. Inst. Okeanologii.
For primary bibliographic entry see Field 5B.
W78-06713

SHELL GROWTH OF UNFED OYSTERS IN THE LABORATORY: A SUBLETHAL BIOASSAY SYSTEM FOR POLLUTANTS,
Maryland Univ., College Park. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W78-06750

METHYLMERCURY: FORMATION IN PLANT TISSUES,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
D. D. Gay.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 096, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA - 600/3-76-049, May, 1976. 29 p, 2 fig, 6 tab, 102 ref.

Descriptors: *Mercury, *Plant physiology, *Plant tissues, *Adsorption, Tracer elements, Incubation, *Gas chromotography, Analytical techniques, *Pollutant identification, *Peas, *Methylmercury, *Mercury uptake, Plant chemistry, Mercuric nitrate, Phenylmercury, Phenylmercury acetate.

Methylmercury (CH_3Hg) is identified as one of the mercury species present in the tissue of pea plants (Pisum sativum). Methylmercury was formed by the plants (1) when grown in vermiculite and the leaves sprayed with as little as 90 ml of 10 micrograms/gram of mercuric nitrate ($Hg(NO_3)_2$), (2) when grown in soil with mercuric nitrate or phenylmercury added, or (3) when sections of the pea plants were surface-sterilized with 5% Chlorox or Gentamicin added to the incubation medium and incubated 20 hours in 10 micrograms/gram phenylmercury acetate. The age of the peas plays a role in the amount of methylmercury formed; older pea tissues produce less methylmercury than young tissues when these tissues are infiltrated and incubated with 10 micrograms/gram of mercuric nitrate. Samples of 3 species of plants (Bromus rubens, Spharalcea ambigua, and Boraginaceae) were collected around an abandoned mercury mine; all three species showed the presence of methylmercury but the influroescence of Bromus rubens was especially high in methylmercury. (See also W77-03006) (Seip-IPA)
W78-06753

RED RIVER CHLORIDE REMOTE SENSING STUDY: FINAL REPORT.
Army Engineer District, Tulsa, OK.
For primary bibliographic entry see Field 7B.
W78-06768

INTRODUCTION TO INSTRUMENTAL ANALYSIS OF WATER POLLUTANTS: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, OH. Office of Water Program Operations.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 318, Price codes: A08 in paper copy, A01 in microfiche. Report No EPA-430/1-75-011, November, 1976. 161 p, 73 fig, 28 tab, 98 ref.

Descriptors: *Water quality, *Instrumentation, *Water analysis, *Pollutant identification, *Analytical techniques, Design, Operations, Quality control, Dissolved oxygen analyzers, Color reactions, Conductivity, Hydrogen ion concentration, Flame photometry, Spectrometry, Turbidity, Gas chromatography, Training, Atomic absorption spectrophotometry, Total organic carbon, Training manual.

A training manual is presented as an accompaniment to EPA National Training Center Course 107.1, 'Introduction to Instrumental Analysis of Water Pollutants.' It includes the principles utilized, basic design, analytical applications, operational procedures, and quality control aspects for each of the instruments most commonly used in water analysis. The instruments described are: pH meter, conductivity meter, dissolved oxygen probe, colorimeter, flame photometer, infrared spectrophotometer, atomic absorption spectrophotometer, turbidimeter, total organic carbon analyzer, and gas chromatograph. (Seip-IPA)
W78-06769

BENCHMARK ESTABLISHMENT AND WATER QUALITY MONITORING IN THE BRIDGEPORT AND BLACK ROCK HARBOR SYSTEMS,
Higher Education Center for Urban Studies, Bridgeport, CT.
C. J. Verses, R. J. Chriss, and W. T. Gnewuch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 735, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Department of Housing and Urban Development, Washington, D.C., Policy Development and Research, July 1976, 60 p, 31 tab, 6 ref, 3 append. H-2196R.

Descriptors: *Monitoring, *Waste water(Pollution), Waste water disposal, Waste water treatment, Nitrates, Phosphates, Ammonia, Dredging, Sediments, Storm runoff, Water quality, Water sampling, Harbors, *Harbor waters, Fecal coliforms, Bridgeport(CN).

Investigations were undertaken in the summer of 1975 in order to establish a suitable monitoring system for the harbor wters of Bridgeport, Connecticut. Sought were general water quality data and sites for testing and future monitoring. Three of the eight sites selected for future monitoring showed signs of least moderate to severe degradation, study results indicating these areas to have unusually high fecal coliform counts as well as high concentrations of nitrate, ammonia and phosphates. Three recommendations ensued: (1) begin dredging studies to remove bottom sediments; (2) modify the wastewater treatment network to include provisions for handling excess storm runoff; and (3) continue monitoring domestic and industrial wastewater flows. (Zayac-NC)
W78-06787

A TOXONOMIC STUDY OF THE SPONGILLA ALBA, S. CENOTA, S. WAGNERI SPECIES GROUP (PORIFERA: SPONGILLIDAE) WITH ECOLOGICAL OBSERVATIONS OF S. ALBA,
New Orleans Univ., LA. Dept. of Biological Sciences.
M. A. Poirrier.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 154, Price codes: A02 in paper copy, A01 in microfiche. In: Aspects of Sponge Biology, p 203-213, 1976. Academic Press, New York. New York. 3 fig, 1 tab, 23 ref. OWRT A-035-LA(2).

Descriptors: *Water quality, *Systematics, Ecology, Ecological distribution, Environment, Water pollution, Municipal wastes, Water pollution sources, Indicators, Biology, Louisiana, *Bioindicators, Pollutant identification, *Lake Ponchartrain(LA), *Sponges, Spongilla alba.

The taxonomy of the fresh water sponges, Spongilla alba, S. cenota, and S. wagneri was studied, concluding that S. wagneri Potts (1889) is synonymous with S. alba Carter (1849). Ecomorphic variation in S. lacustris was discussed, and its morphology was compared to that of S. alba and S. cenota Penny and Racek (1968). The ecology of S. alba in Lake Pontchartrain, Louisiana, was investigated; findings were: (1) an annual life cycle; (2) gemmules hatched in the spring; (3) growth and sexual reproduction occurring during the summer; (4) gemmules formed in the fall; and (5) gemmules remaining dormant during the winter. Various physicochemical parameters of S. alba's habitat were investigated; it appears to be a good water-qualit indicator species because it once occurred throughout Lake Pontchartrain, but in recent years has been absent from areas affected by storm water discharge from metropolitan New Orleans, Louisiana. The presence of S. alba in oligohaline waters in North America and prior widespread records from similar habitats on other continents indicate that it probably occurs in such habitats in tropical and subtropical environments throughout the world. S. cenota, previously known only from Yucatan, Mexico, was reported from southern Florida. Use of sponges as water quality indicators is discussed. (Wares - IPA)
W78-06805

VIRAL MONITORING OF WASTEWATER AEROSOLS,
Michigan Univ., Ann Arbor, Dept. of Epidemiology.
K. W. Cochran, and K. F. Fannin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 155, Price codes: A03 in paper copy, A01 in microfiche. Project Completion Report, December, 1976. 32 p, 21 tab, 47 ref, 2 append. OWRT A-088-MICH(1). 14-31-0001-6023.

Descriptors: *Viruses, *Coliforms, *E coli, *Aerosols, *Activated sludge, *Trickling filters, *Bioindicators, Indicators, *Air pollution, Waste water treatment, Sewage treatment, Analytical techniques, *Pollutant identification, Airborne animal viruses, *Coliphages, Aerosol emissions, *Spray irrigation, *Sludge land application.

Trickling filter, activated sludge, and spray irrigation wastewater treatment plants were compared for concentrations of airborne animal viruses and coliphages in aerosol emissions. Emissions from a spray irrigation plant and a sludge application to land site are analyzed; the significant results relating to viable aerosol emissions from trickling filter and activated sludge plants and all study procedures are detailed in reprinted journal articles in the appendices. Coliphages were studied to assess the feasibility of estimating animal virus levels which are below the limits of detection of present methodology. Relative concentrations of coliphages and animal viruses were analyzed. Appendix A, 'Airborne Coliphages from Wastewater Treatment Facilities' (K. F. Fannin, et al., Applied and Environmental Microbiology, Vol. 31, No. 5, May 1976, p 705-710), presents a detailed analysis of airborne coliphages that form plaques on E. coli hosts. Coliphages were enumerated using most probable number procedures. Field sampling procedures are described. Appendix B, 'Field Studies on Coliphages and Coliforms as Indicators of Airborne Animal Viral Contamination from Wastewater Treatment Facilities' (K. F. Fannin, et al., Water Research, Vol. 10, 1976, p 1-7), investigates the use of coliforms and coliphages as indicators of animal virus contamination in both trickling filter and an activated sludge treatment plant. Ratios of coliphages to animal viruses indicate that wastewater treatment plants may be a continuous source of low level concentrations of animal viruses. Coliphages are more effective indicators of airborne animal viral contamination than coliforms. (Seip-IPA)
W78-06806

THE APPLICABILITY OF PYROLYSIS-GAS-LIQUID CHROMATOGRAPHY FOR THE QUANTITATIVE IDENTIFICATION OF BACTERIA IN SEWAGE TREATMENT PLANT EFFLUENT,
Catholic Univ. of America, Washington, DC. Dept. of Civil Engineering.
R. A. Symuleski.
Available from University Microfilms International, Ann Arbor, Michigan 48106; Order No. 77-29184. PhD Thesis, 1977, 166 p.

Descriptors: *Pollutant identification, *Chromatography, *Bacteria, Analytical techniques, *Testing procedures, *Chemical analysis, Heterogenity, Homogeneity, Sewage effluent, Sewage treatment, Industrial wastes, Municipal wastes, Waste water treatment.

Pyrolysis-gas-liquid chromatography (PGLC) was evaluated for the identification of bacteria in aqueous sewage effluent. PGLC analysis of bacteria reduced the identification time from the 24-27 hrs necessary for other methods to 1-2 hrs. Analysis at the strain level resulted in unique signatures of bacterial cells using the PGLC technique which could be detected at bacteria levels of bout 80 colony-forming units in 100 ml of liquid. The chemical heterogeneity of the secondary treated waste analyzed resulted in more accurate qualitative results than quantitative. It was determined that PGLC analysis of homogeneous effluent would yield better quantitative results. Bacterial signatures calculated by PGLC were not dependent on the composition of the effluent. The method may also be applicable to the analysis of food, cosmetic, and pharmaceutical industry wastes. Signatures of bacteria detected in the effluent were matched with a data bank of species' signatures included in a computer program designed for the project. (Lisk-FIRL)
W78-06814

GAS-LIQUID-CELL OXYGEN ABSORPTION IN FERMENTATION,
Iowa State Univ., Ames. Engineering Research Inst.
G. T. Tsao, A. Mukerjee, and Y. Y. Lee.
(1974). 13 p, 16 fig, 10 ref. OWRT A-032-IA (11).

Descriptors: *Oxygen, *Absorption, *Aerobic bacteria, *Air-water interfaces, *Diffusion, Mass transfer, Dissolved oxygen, Fermentation, Waste water treatment, Oxygen transfer.

The effect of viable and aerobic microbial cells (present in solution) on oxygen absorption from gas into aqueous solutions was investigated. A theoretical explanation with simple diagrams, experimental results, and a model of gas-liquid-cell absorption is presented. Physical and chemical models are proposed and explicated for oxygen transfer at the liquid-gas interface; an equation for the rate of gas absorption is presented. The effect of sulfite ions present in solution on oxygen consumption is discussed. Since cells consume the oxygen molecules being absorbed at the gas-liquid interface, it is hypothesized that bacteria affect and enhance the oxygen absorption rate. The effect of viable microbial cells on the mass transfer coefficient was investigated by measuring the rate of oxygen absorption into liquids containing different cell concentrations; the effects of reduction and enhancement of dissolved gas concentrations in the liquid bulk and the liquid phase mass transfer coefficient were also studied. Experimental evidence suggests that the particle (or cells(concentration does affect and enhance the liquid film mass transfer coefficient. (See also W76-03321, W73-08120, W72-00085, and W71-08661). (Seip-IPA)
W78-06824

DETERMINATION OF AMMONIUM N AND NITRATE N IN ACID PERMANGANATE SOLUTION USED TO ABSORB AMMONIA, NITRIC OXIDE, AND NITROGEN DIOXIDE EVOLVED FROM SOILS,
Iowa State Univ., Ames. Dept. of Agronomy.
L. G. Bundy, and J. M. Bremner.
Comm. in Soil Science and Plant Analysis, Vol 4, No 3, p 179-184, 1973. 1 tab, 14 ref. OWRT A-041-IA(4).

Descriptors: *Ammonia, *Ammonium compounds, *Nitrates, *Soil analysis, Distillation, Analytical techniques, Nitrogen compounds, *Pollutant identification, *Nitric oxide, *Nitrogen dioxide, Steam distillation, *Acid permanganate, *Nitrogen-15 analysis.

Simple steam distillation methods are described for determination of ammonium N and nitrate N in an acid potassium permanganate solution (0.1M KMn04: 025M H2S04) used to absorb NH3, NO, and NO2 evolved from soils. The methods involve the use of Mgo for distillation of ammonia and the use of FeS04, Ag2S04, and Mg0 for reduction of nitrate to ammonia. These procedures are rapid and precise, and permit nitrogen-15 analysis of NH3-N and (NO + NO2)-N evolved from soils. (Seip-IPA) (See also W76-03141 and W70-01075)
W78-06828

THE USE OF BIOLOGICAL INDICATOR ORGANISMS TO MONITOR TRACE METAL POLLUTION IN MARINE AND ESTUARINE ENVIRONMENTS--A REVIEW,
National Environment Protection Board of Sweden, Upsala. Dept. of Zoology.
D. J. H. Phillips.
Environmental Pollution, Vol 13, No 4, p 281-317, August 1977. 2 fig, 5 tab, 189 ref.

Descriptors: *Bioindicators, *Monitoring, *Water pollution sources, Metals, Ecosystems, Trace elements, Resources development, *Bibliographies, *Reviews, Outer Continental Shelf.

The use of biological indicator organisms to define areas of trace metal pollution appears most attractive, as these organisms not only concentrate metals from water, allowing inexpensive and relatively simple analysis, but they may also represent a moving time-averaged value for the relative biological availability of metals at each site studies. However, the use of indicator organisms introduces biological variables which are not present in physico-chemical studies of water or sediments. These variable merit consideration inas much as they may affect the resluts of indicator surveys for trace metals. In addition, different indicator organisms measure different portions of the total trace metal load on an ecosystem. The present state of knowledge on the use of indicator organisms to study trace metal pollution is reviewed, with particular reference to the use of macroalgae, bivalve molluscs and telosts. It is suggested that the macroalgae and bivalve molluscs are the most efficient and reliable indicators developed to the present time. It is further suggested that the effects of sampling and environmental variables have been largely overlooked, and that further study in the field and in the laboratory is necessary before the results of surveys using biological indicator organsims can be relied upon. (Sinha - OEIS)
W78-06832

RESISTANCE OF DETRITOPHAGES OF BIOFILTERS IN PHENOL POISONING (IN RUSSIAN),
Research Inst. of Chemical Technology and Polymer, Dzerzhinsk (USSR).
For primary bibliographic entry see Field 5C.
W78-06833

TOXICOLOGY OF POLYETHYLENEPOLYAMINE AND SUBSTANTIATION OF ITS MAXIMUM PERMISSIBLE CONCENTRATION IN BODIES OF WATER (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W78-06837

ON THE QUESTION OF O2 REQUIREMENT IN DETERMINING ACUTE TOXICITY IN FISH (IN GERMAN),
Bundesgesundheitsamt, Berlin (West Germany). Inst. fuer Wasser-, Boden- und Lufthygiene.
For primary bibliographic entry see Field 5C.
W78-06838

ISOLATION OF VIBRIO NAG IN WASTE WATER OF THE REGION OF RIJEKA IN 1973 AND 1974 (IN SERBO-CROATIAN),
Zovod Zastitu Zdravlja Rijeka Yugosl Zavod za Zastitu Zdravlja, Rijeka (Yugoslavia)
B. Coric and V. Samanic
Mikrobiologija (Belgr) 13(2), p 217-223, 1976.

Descriptors: *Isolation, Pollutant identification, *Bacteria, Bacteriology, Waste waters, Sampling, *Vibrios, *Cholera(Human), *Yugoslavia

Bacteriological tests of waste water in 1973 and 1974 encompassing 476 samples from the Rijeka region of Yugoslavia indicated that 32 samples (6.7%) contained non-agglutinating (NAG) vibrios. The epidemiological and clinical implication of the NAG vibrios in human cholera are discussed. --Copyright 1978, Biological Abstracts, Inc
W78-06839

THE LEVEL OF PESTICIDES IN RURAL WATER SOURCES (IN RUSSIAN),
Vsesoyuznyi Nauchno-Issledovatelskii Inst Gigieni i Toksikologii Pestitsidov, Kiev (USSR)
K. K. Vrochinskii, V. D. Chmil, V. I. Senchenko, V. F. Shevchenko, and A. I. Korop
Gig Sanit (2), p 97-98, 1977

Descriptors: *Gas-liquid chromatography, *Chromatography, *Pollutant identification, Water supply, Rural water sources, Pesticides, *BHC, *DDD, *DDE, *Hexachlorocyclohexane, *Pesticide residues, Organochlorine pesticides.

Gas-liquid chromotography and TLC analysis of water from above- and ynderground sources in rural agricultural areas of the USSR using organochlorine pesticides revealed traces of DDD, DDE and especially gamma hexachlorocyclohexane. The variety and quantity of pesticides were a function of the intensity of their use in a given region. The traces observed did not exceed maximum permissible levels, but their possible ingestion in the drinking water should be considered in evaluating the danger of their complex and combined action.--Copyright 1978, Biological Abstracts, Inc.
W78-06846

THE LEVELS OF METALS IN DOCK-YARD SEDIMENTS WITH PARTICULAR REFERENCE TO THE CONTRIBUTIONS FROM SHIP-BOTTOM PAINTS,
University of Manchester Inst. of Science and Technology (England). Pollution Research Unit, and Bolton Inst. of Tech. (England).
E. G. Billinger, and B. R. Benham.
Environmental Pollution, Vol 15, No 1, p 71-81, January 1978. 1 fig, 4 tab, 8 ref.

Descriptors: *Paints, *Metals, *Sediments, *Water pollution sources, Antifouling materials, Ships, *Pollutant identification, Outer Continental Shelf, Great Britain, Ship-bottom paint.

Levels of the metals copper, lead, tin and zinc have been detemined in a range of ship-bottom paints by atomic absorption spectrophotometry. Copper, lead and zinc have been similarly determined in concentrated nitric acid digests and 1M ammonium acetate extracts of sediments taken from enclosed dock-basins at Liverpool, Tilbury and Manchester. At each of the dock-yards concentrations of all the metals in nitric acid extracts were elevated in the vicinity of dry-docks. These elevations are believed to be due to the presence of residues from the ship-bottom paints. The amounts of copper and zinc, which are major components of antifoulant paints, in the ammonium acetate extracts correlate closely with the levels in the nitric acid digests lead, which is found mainly in anticorrosive and primer paints, does not. Direct toxic effects of the metals to marine organisms are considered, but are not thought to be important in view of the large dilution and dispersal capacities usually available. The possibility of or-

ganisms developing genetic resistance to heavy metals in enclosed dock-basins in discussed. It is noted that many of the dock-yard organisms are components of the ship-fouling ecosystem, so that the premature exposure to the toxins of antifoulant paints may result in the development of toxin resistance of considerable economic importance. (Sinha - OEIS)
W78-06848

COMBINED TOXICITY EFFECTS OF CHLORINE, AMMONIA, AND TEMPERATURE ON MARINE PLANKTON,
Woods Hole Oceanographic Inst., MA.
For primary bibliographic entry see Field 5C.
W78-06863

THE UTILITY OF SKYLAB PHOTO-INTERPRETED EARTH RESOURCES DATA IN STUDIES OF MARINE GEOLOGY AND COASTAL PROCESSES IN PUERTO RICO AND THE VIRGIN ISLANDS,
Geological Survey, San Juan, PR.
For primary bibliographic entry see Field 5B.
W78-06867

CONTRIBUTION TO THE PROBLEM OF FORECASTING THE MINERAL CONTENT AND CHEMICAL COMPOSITION OF RESERVOIR WATER,
Novocherkassk Inst. of Chemical Hydrology (USSR).
For primary bibliographic entry see Field 2H.
W78-06881

THE BEHAVIOUR OF DISSOLVED ALUMINUM IN ESTUARINE AND COASTAL WATERS,
University of East Anglia, Norwich (England). School of Environmental Science.
For primary bibliographic entry see Field 5B.
W78-06893

A FILTRATION UNIT FOR USE WITH CONTINUOUS AUTOANALYTICAL SYSTEMS APPLIED TO HIGHLY TURBID WATERS,
Institute for Marine Environmental Research, Plymouth (England).
A. W. Morris, R. J. M. Howland, and A. J. Bale.
Estuarine and Coastal Marine Science, Vol. 6, No. 2, p 105-109, February 1978. 2 fig, 1 tab, 4 ref.

Descriptors: *Filtration, *Chemical analysis, *Suspended solids, Filters, Turbidity, Equipment, Instrumentation, Nitrates, Nitrites, Chemicals, Sampling, Water quality, Estuaries, Pollutant identification.

A simple unit for filtration prior to continuous autoanalysis of highly turbid waters was described. Seawater can be supplied at a rate of 10 ml/min. After filtration through a 0.45 micrometer porized membrane filter (47 mm diameter), for at least 45 min from seawater containing 1,000 parts per million of suspended solids. (Sims-ISWS)
W78-06894

THE SOURCES OF DISSOLVED MANGANESE TO CALICO CREEK, NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Curriculum in Marine Sciences.
For primary bibliographic entry see Field 5B.
W78-06895

DETERMINATION OF THE FLUORIDE ION IN THE PUBLIC HEALTH STUDY OF WATER (IN ITALIAN),
Siena Univ. (Italy). Inst. of Hygiene.
M. Zanda.
Riv Ital Ig 35(4-6), p 154-169, 1975.

Descriptors: *Pollutant identification, Fluoride ions, Public health, Dental caries, Fluorosis, Human diseases, Industrial wastes, Photometry, Waste water.

The determination of fluoride ion is an important public health function because excessive dumping of industrial fluorides into waste water which must ultimately be reprocessed for drinking purposes could give rise to fluorosis. At the same time insufficient fluoride in human nutrition is a major factor in dental caries in man. Modern methods for fluoride determination in drinking water are reviewed, with particular reference to photometric comparison methods. The Scott-Sanchis, Lamar, Taylor comparison and Bullock + Schouboe methods are summarized.--Copyright 1978, Biological Abstracts, Inc.
W78-06896

FLUORESCENCE DETERMINATION OF THE CONCENTRATION OF BACTERIA IN LIQUID MEDIA (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
L. F. Osipov, A. I. Sakevich, and L. V. Podgaevskaya.
Gidrobiol Zh 13(1), p 111-114, 1977.

Descriptors: *Bacteria, *Pollutant identification, *Algal culture, *Anabaena-variabilis, Chlorides, *Fluorescence, *Microcystis-aeruginosa, Nostoc-muscorum, *Dyes.

A method for determining the concentration of bacteria in algal culture media containing over 1 million bacterial cells/ml is described. The method is based on changes in the fluorescence of a dye (pseudoisocyano-chloride) adsorbed onto the surface of bacterial cells. Tests on cultures of Microcystis aeruginosa, Nostoc muscorum and Anabaena variabilis indicated that within the limits of the studied concentrations (4.3-59.0 million bacterial/ml), results deviated by no more than + or - 9.8% from those of the direct count method.--Copyright 1978, Biological Abstracts, Inc.
W78-06898

DEVELOPMENT OF METHODS FOR RAPID DETECTION OF TRACE METALS IN SEA WATER,
Institut Rudjer Boskovic, Zagreb (Yugoslavia). Center for Marine Research.
M. Branica.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 114-119, 1 tab, 16 ref.

Descriptors: *Pollutant identification, *Water pollution sources, *Heavy metals, Water pollution, *Trace elements, Sea water, Electrochemical methods, *Trace metals.

In unpolluted natural waters heavy metal ions are present in very low concentrations, about one microgram/liter. Higher concentrations, caused by waste disposal, sometimes surpass permissible toxic levels, causing serious changes in ecophysiological equilibria of organisms in natural aquatic systems (rivers, lakes and seas). Because of their selectiveness, simplicity and high sensitivity, electrochemical methods, especially polarography and related techniques, are promising for determination of trace metals in natural and polluted waters. Applications of advanced techniques of electrochemistry in aquatic chemistry are still in the beginning stage. However, these methods will eventually play an important, or perhaps the key, role in determination, speciation and characterization of metal traces and microconstituents of fresh and sea water. This should contribute greatly to elucidation of mechanisms and biogeochemical pathways of microconstituents (and pollutants) in the aquatic environment. Electrochemical methods are very convenient for determination of concentration of trace metal ions in sea water due to their high sensitivity, simplicity of procedure and relatively cheap instrumentation. The sensitivity limit of the particular method depends on the excitation and measuring technique and the type of working electrode used. In addition to quantitative aspects, it is also possible to characterize the physiocochemical state of ionic species in natural and polluted sea water. (See also W78-06906) (Sinha-OEIS)
W78-06919

BIOASSAYS AS INDICATORS OF POLLUTION EFFECTS,
Environmental Research Lab., Gulf Breeze, FL.
D. L. Coppage.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976, 'Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 133-139, 1 fig, 22 ref.

Descriptors: *Water pollution effects, Water quality, *Bioassay, Aquatic life, Bioindicators, *Pollutant identification, Measured response.

The objective of marine bioassay usually is to determine a pollutant's (a) concentration harmful to organisms, (b) persistence and degradability, (c) rate of accumulation and loss in organisms consumed by other organisms, and (d) mode of action on organisms. These data are used to establish water quality standards. Although it is not practical to study all species that may be affected by a pollutant, a variety of marine or estuarine species may be tested to estimate which taxonomic groups are most sensitive. The bioassays used at the U.S. Environmental Protection Agency, Environmental Research Laboratory, Gulf Breeze, Florida, may be regarded as three interrelated types: macroscopic, microscopic, and metabolic. Some of the bioassays and results are reviewed as examples of their variety and applications. (See also W78-06906) (Sinha-OEIS)
W78-06921

GLOBAL MONITORING OF MARINE POLLUTANTS,
Scripps Institution of Oceanography, La Jolla, CA.
E. D. Goldberg.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 162-165, 6 ref.

Descriptors: *Water pollution sources, *Water pollution effects, *Pollutant identification, *Environmental effects, *Monitoring, *Water quality control, Oil pollution, Food chains, Heavy metals, *Outer Continental Shelf, Petroleum development, Ocean dumping, Ocean outfalls, Human health, Petroleum hydrocarbons, Chlorinated hydrocarbons, Radionuclides.

There are several compelling reasons to initiate a continuing and systematic surveillance of already defined pollutants in coastal marine waters. First, the present exposure levels to marine organisms can be used in principle by ecologists to ascertain whether any organisms or communities of organisms are threatened. Second, environmental concentrations allow an assessment of dangers to public health through the consumption of seafoods. Third, present levels allow predictions of future levels. With knowledge of present and past environmental releases of the pollutant in question and with an estimate of future leakages based upon production and use, data models for pollutant dispersion about the environment can be formulated and future levels may be foretold.

Such information is vital to those responsible for management of marine resources. Where predicted levels are unacceptable on the basis of possible environmental impact, restrictions upon releases can then be imposed. There are four collectives of pollutants that may jeopardize continued use of marine resources: artificial radionuclides; petroleum hydrocarbons; chlorinated hydrocarbons; and heavy metals. (See also W78-06906) (Sinha-OEIS)
W78-06922

USE OF FERROUS HYDROXIDE FOR DETERMINATION OF NITRATE IN SOIL EXTRACTS,
Iowa State Univ., Ames. Dept. of Agronomy
J. M. Bremner, and L. G. Bundy
Journal Paper No J-7544 of the Iowa Agriculture and Home Economics Experiment Station, Ames, (Project No 1835), (1973) 7 p. OWRT A-041-IA(3).

Descriptors: *Nitrates, *Soil analysis, *Soil chemical properties, Distillation, Phosphate, Silicates, Analytical techniques, *Pollutant identification, *Soil extracts, *Steam distillation, Ferrous hydroxide.

A simple steam distillation method of determining nitrate that is not subject to interference by substantial amounts of phosphate or silicate is described. The method was developed for studies requiring determination of the sulfate and nitrate formed by incubation of soils and amended soils for various times; it gives quantitative recovery of nitrate N added to Ca(H2PO4)2 solution containing 500 ppm of P and to extracts obtained by treating soils with this reagent. The methodology is based on the fact that, when a nitrate solution is heated with appropriate amounts of FeSO4 and MgO, the ferrous hydroxide produced reduces the nitrate quantitatively to ammonia. The method is rapid and precise, and tests reported show that it is satisfactory for nitrate analysis of soil extracts. (See also W76-03141 and W70-01075) (Seip-IPA)
W78-06925

RELATION OF BULK PRECIPITATION AND EVAPOTRANSPIRATION TO WATER QUALITY AND WATER RESOURCES, ST. THOMAS, VIRGIN ISLANDS,
Geological Survey, Atlanta, GA. Water Resources Div.; and Geological Survey, Reston, VA. Water Resources Division.
For primary bibliographic entry see Field 2D.
W78-06934

THE KINETICS OF CALCITE DISSOLUTION IN C02-WATER SYSTEMS AT 5 DEG TO 60 DEG C AND 0.0 TO 1.0 ATM C02,
Geological Survey, Reston, VA. Water Resources Div.; and University of East Anglia, Norwich (England).
For primary bibliographic entry see Field 1B.
W78-06936

PROGRAM FOR EVALUATING STREAM QUALITY IN NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06939

GEOCHEMISTRY,
Geological Survey, Reston, VA. Geologic Div.; and Geological Survey, Reston, VA. Water Resource Div.
For primary bibliographic entry see Field 2K.
W78-06946

WATER-QUALITY INVESTIGATION OF THE TYRONZA RIVER WATERSHED, ARKANSAS,
Geological Survey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06951

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 1. NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06952

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 2. SOUTH FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06953

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 4. NORTHWEST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06954

DRINKING WATER AND HUMAN HEALTH: PART II,
National Water Well Association, Worthington, OH.
T. E. Gass.
Water Well Journal, Vol 32, No 4, p 30-32, March, 1978.

Descriptors: *Potable water, *Pollutants, *Public health, Arsenic compounds, Selenium, Flouride, Nitrates, Sodium, Hardness(Water), Inorganic compounds.

Five chemical constituents of drinking water are discussed: (1) asenic--its toxicity is dependent upon its chemical form, and the type, rate, and duration of exposure. Arsines and trivalent inorganic asenic (arsenite) are the most toxic forms. IPDW regulations set a maximum level of 0.05 mg/l for water supplies. (2) selenium--an essential nutrient, though large or chronically high doses may produce toxicity effects. IPDW regulations call for 0.01 mg/l. (3) fluoride--concentrations of 1 mg/l are generally considered to have a beneficial effect. Tooth mottling and skeletal flourosis may occur at higher concentrations. Cancer and other severe health problems claimed to be linked to flouride in water have yet to receive conclusive scientific evidence for such relationships. (4) nitrate--although IPDW regulations list 10 mg/l as a limit, some studies show toxic effects in infants even at this level. (5) sodium--no maximum recommended limit, as food is by far the major contributor of sodium to the human diet. Brief mention is also made of the interrelationsip of water hardness and cardiovascular disease. (See also W78-05195) (Eberle-NWWA)
W78-06971

SATELLITE REMOTE SENSING STUDY OF THE TRANS-BOUNDARY MOVEMENT OF POLLUTANTS,
Environmental Research Inst. of Michigan, Ann Arbor.
C. T. Wezernak, and D. R. Lyzenga.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 069. Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/3-77-056, May 1977. 17 p, 7 fig, 4 ref. R803671.

Descriptors: *Remote sensing, *Monitoring, Eutrophication, Lake Erie, Lake Huron, Suspension, Satellites(Artificial), Water resources, Water quality, Pollutant identification, Path of pollutants, *Detectors, Imagery, Earth Resources Technology Satellite(ERTS).

A limited analysis of ERTS (LANDSAT) data of the western basin of Lake Erie and the southern portion of Lake Huron was performed. The objective was to depict the large-scale movement of water masses, as manifested in terms of suspended solids, and to demonstrate the use of ERTS data in large lakes monitoring. ERTS (LANDSAT) data, as recorded on computer compatible tapes, were processed to display surface circulation features, surface suspended solids distribution, surface chlorophyll distribution, and secchi disc transparency. Results show that high concentrations of suspended solids are typical along the Canadian shore of Southern Lake Huron and throughout the western basin of Lake Erie. In the latter case, high suspended solids concentrations are largely due to loading from the Maumee River, the Detroit River, and resuspension of bottom sediments. Since the four ERTS (LANDSAT) bands offer a water quality potential essentially restricted to suspended solids, turbidity, transparency, and the detection of phytoplankton blooms, it is considered that attempts to correlate LANDSAT data with other substances in aqueous solution or suspension would be difficult to justify. In conclusion, results demonstrate the potential of satellite remote sensing for monitoring of large water bodies, especially in conjunction with ground truth measurements for calibration purposes. (Wares-IPA)
W78-06979

PETROLEUM HYDROCARBONS IN THE NORTHERN PUGET SOUND AREA--A PILOT DESIGN STUDY,
NOAA National Analytical Facility, Seattle, WA.
For primary bibliographic entry see Field 5C.
W78-06981

COMPARISON OF TWO METHODS USED BY DIVERS FOR SAMPLING BENTHIC INVERTEBRATES IN DEEP RIVERS,
Maine Univ. at Orono. Dept. of Entomology.
For primary bibliographic entry see Field 7B.
W78-07025

MICROELEMENTS OF IRON AND COPPER IN LIVER AND MUSCLES OF RAINBOW TROUT (SALMO GAIRDNERI RICHARDSON) FROM DIFFERENT HATCHERIES,
Sarajevo Univ. (Yugoslavia). Bioloski Inst.
N. Guzina, and M. Aganovic.
Ichthyologia, Vol 9, No 1, p 75-84, 1977. 4 fig, 1 tab, 11 ref.

Descriptors: *Iron, *Copper, *Rainbow trout, *Spectrophotometry, *Fish hatcheries, *Fish physiology, *Animal metabolism, Salmonids, Analytical techniques, Chemical analysis, Pollutant identification, Liver, Muscle, Tissue analysis.

The analysis of microelements of iron and copper in liver and muscles of rainbow trout was performed by the method of spectrophotometry in several different hatcheries. Values of iron and copper in liver and muscle tissue varied significantly, depending on the hatchery source. (Deal-EIS)
W78-07026

INFILTRATION-INFLOW SEWER LINE ANALYZER,
P. D. Petroff.
United States Patent 4,070,563. Issued January 24, 1978. Official Gazette of the United States Patent Office, Vol. 966, No. 4, p 1566-1567, January, 1978. 1 fig.

Descriptors: *Pipes, *Computers, *Instrumentation, *Measurement, *Patents, Pressure measuring instruments, Pipelines, Sewerage, Equipment, Design criteria, Waste water treatment, Municipal wastes.

A patented infiltration-inflow sewer line analyzer with computer monitoring is described. Adjustable liquid pressure sensors are mounted at both ends of the sewer pipe. The sensors periodically monitor the sample liquid pressure between the sensors within the pipe and record the values. The recorded pressure values over a selected period of time are converted into liquid flow rates and fed to a computer. The computer is programmed with dry weather and rain flows within the pipe section as supplied by the monitors. Dry and wet weather flow rates monitored at one end of the pipe are compared by the computer with the same time measurements at the other end of the sewer pipe. Rainfall inflow and infiltration rates in the pipe are measured and compared by the computer with previously collected rainfall and dry weather values. (Lisk-FIRL)
W78-07076

ATMOSPHERIC DISPERSION CHARACTERISTICS IN COASTAL ENVIRONMENTS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
S. A. Hsu.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A033 505, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 224, Reprint from Preprints, The 3rd International Ocean Development Conference, August 5-8, 1975, Tokyo, Japan, Vol. 5, p 63-75. 11 fig, 26 ref.

Descriptors: *Coastal structures, *Air pollution, *Power plants, Coastal plains, Air environment, Effluents, Path of pollutants, Radioactive wastes, Smoke, Nuclear powerplants.

Proposed construction of offshore facilities such as nuclear-power plants, airports, and other structures which are potential emitters of pollutants necessitate consideration of atmospheric diffusion and analysis of the feasibility of such structures from the meteorological point of view. The potentially harmful nature of the radioactive materials involved dictates that even small quantities be treated with respect. Special attention must be given to design criteria in locations where hurricanes, storm surges, tsunamis, waterspouts, or other catastrophic meteorological or oceanographic phenomena may occur. Major locational criteria are: (1) Offshore winds should be prevalent during most of the year, particularly during the summer; (2) the upwind coastal region should be relatively flat in order to avoid a mesoscale turbulent vortex; and (3) offshore bottom slope should be gentle and bathymetrically uniform to attenuate storm surges and minimize wave effects. (Steiner-Mass)
W78-07083

MEASUREMENT OF 239 - 240 PU IN THE NORTHWESTERN MEDITERRANEAN,
International Lab. of Marine Radioactivity.
For primary bibliographic entry see Field 2L.
W78-07099

MOLECULAR SPECTRAL INTERFERENCE IN THE DETERMINATION OF ARSENIC BY FURNACE ATOMIC ABSORPTION,
Environmental Research Lab., Duluth, MN.
J. E. Poldoski.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 929, Price codes: A02 in paper copy, A01 in microfiche. Reprint from: Report No. EPA-600/J-77-035, 1977. Atomic Absorption Newsletter, Vol. 16, No. 3, p 70-73, May-June 1977. 4 tab, 9 ref.

Descriptors: *Arsenic compounds, *Water analysis, *Analytical techniques, Silicates, *Pollutant identification, *Atomic absorption, *Spectral interference, Hydrofluoric acid, Arsenic analysis.

Serious molecular spectral interferences, which occur in furnace atomic absorption determinations of arsenic in natural water samples containing relatively low arsenic concentrations and high concentrations of suspended silicate minerals, are reported. In some water samples, arsenic concentrations were erroneously high, by more than a factor of five above the actual concentration. (Results of analyses were confirmed by an alternative analytical method.) The addition of hydrofluoric acid to the sample and the use of a narrow bandpass will help control and identify this problem. Use of the less sensitive 197.2 nm analytical wavelength is an additional alternative method; however, more research is needed to determine the degree and manner of interference by other substances. (Seip-IPA)
W78-07118

REVIEW OF ENVIRONMENTAL ISSUES OF TRANSPORTATION OF ALASKAN NORTH SLOPE CRUDE OIL,
MITRE Corp., McLean, VA. METREK Div.
For primary bibliographic entry see Field 6G.
W78-07121

1977 INTENSIVE WATER QUALITY SAMPLING PROGRAMS IN NORTH CENTRAL TEXAS.
North Central Texas Council of Governments, Arlington.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 915, Price codes: A02 in paper copy, A01 in microfiche. March 1977. 15 p, 5 fig, 1 tab. P-006038-01-0.

Descriptors: *Sampling, *Water analysis, *Water quality, *Monitoring, *Texas, Land use, Floods, Runoff, Storms, Planning, Sediments, Storm runoff.

Each of the intensive water quality sampling programs being conducted by the North Central Texas Council of Governments and participating local agencies is summarized; program objectives and methodologies are outlined. Programs include: an in-depth field study of the impact of land use on water quality in Lake Ray Hubbard; Trinity River continuous automated monitors and water treatment plant sampling during storm events; river bottom sediment analysis; several urban/nonurban runoff sampling activities; and areawide urban stormwater sampling efforts. The sampling programs are designed to address specific data needs of the areawide planning process and to utilize existing intensive and routine monitoring programs to the maximum extent possible. (Seip-IPA)
W78-07127

QUALITY ASSURANCE PRACTICES AND PROCEDURES,
Environmental Protection Agency, Chicago, IL. Central Regional Lab.
B. Fairless.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 895, Price codes: A13 in paper copy, A01 in microfiche. Report No. EPA -905/4-77-004, April, 1977. 293 p, 2 append.

Descriptors: *Quality control, *Analytical techniques, *Water analysis, *Quality assurance, Accuracy, Precision, Environmental analysis.

The Quality Assurance Program used by the Central Regional Laboratory (CRL) is described; these practices provide means of measuring the accuracy and precision of all reported data and of communicating to data users and other offices the quality of any given set of data values. The program includes administrative responsibilities, methods of analyses, critical measurement audits for each method, and control limits for each audit. Reference is made to approximately 200 analytical procedures, used to analyze air, water, sediment, and biological samples for over 100 parameters. (Seip-IPA)
W78-07129

MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, (TEXT AND APPENDIX: ORGANIC ANALYSIS DATA),
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
B. B. Ewing, E. S. K. Chian, J. C. Cook, C. A. Evans, and P. K. Hopke.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 350, Price codes: A14 in paper copy, A01 in microfiche. Report No. EPA-560/6-77-015, July 1977. 75 p, 24 fig, 17 tab, 6 ref. Appendix: Report No. EPA-560/6-77-015A, July 1977. 299 p, 619 tab. EPA 68-01-3234.

Descriptors: *Industrial wastes, *Water quality, *Water pollution, *Water chemistry, *Surface waters, *Pollutant identification, Inorganic compounds, Organic compounds, Analytical techniques, *Industrial pollution.

Samples of surface waters were collected from 204 sites located near heavily industrialized areas across the United States. The samples were analyzed for all contaminants present at concentrations greater than 1 ppb. Each water sample was preconcentrated for analysis of organics in three fractions: volatile organics by nitrogen-gas stripping and the less-volatile organics by extraction with chloroform under both basic and acidic conditions. Organic constituents were identified by gas chromatography/mass spectrometry and quantified by gas-chromatographic techniques. Inorganic constituents were determined by spark-source mass spectrometry, energy-dispersive X-ray fluorescence analysis, and instrumental neutron activation analysis. For comparison with previous data from the same sites, the samples were also analyzed for total chemical oxygen demand, turbidity, conductivity, pH, color, oxidation-reduction potential, suspended solids, and volatile suspended solids. Results of the inorganic analyses were presented in previous quarterly reports. Final results of the organic analyses are presented in the appendix (separate volume). (Seip-IPA)
W78-07130

ENVIRONMENTAL MONITORING NEAR INDUSTRIAL SITES: SAMPLING AND ANALYSIS OF SELECTED TOXIC SUBSTANCES. TASK I - VINYLIDENE CHLORIDE,
Midwest Research Inst., Kansas City, MO.
J. E. Going, and J. L. Spigarelli.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 358, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-560/6-77-026, October, 1977. 137 p, 44 fig, 60 tab, 4 ref. 68-01-4115.

Descriptors: *Industrial wastes, *Potable water, *Polymers, *Water pollution, *Air pollution, Gas chromatography, Mass spectrometry, Wind, Toxins, Waste water(Pollution), Measurement, Testing, *Pollutant identification, *Vinylidene chloride, Product contamination, Wind dispersion.

A sampling and analysis program was conducted to determine the levels of vinylidene chloride (VDC) in air and water around 6 industrial sites, in drinking water from 4 major U.S. cities, and in several types of solid final products made from VDC polymers or co-polymers. Air was collected at perimeters of the industrial sites as 24-hr composite samples using charcoal adsorption tubes. Grab water samples were collected up- and downstream, at the plant discharge and at the municipal water treatment plants. In general, VDC in air was found only at monomer and polymer production facilities. The highest level detected, 51.8 micrograms/cu m (0.014 ppm) was found

down wind of a monomer production plant at the property line. At sites where VDC was found, its distribution correlated with the wind behavior that existed during the sampling period. The highest level of VDC in water (550 ppb) was found in an industrial wastewater canal. Generally, the level was less than 1 ppb and was detectable by gas chromatography/mass spectrometry (GC/MS) only. VDC was detected only in Miami, Florida drinking water at levels of 0.045-0.059 micrograms/l. VDC was found in two samples of Saran Wrap ant 4.9 and 58 ppm. No VDC was detected in PVDC monofilaments, modacrylic fibers or meat packaging film. The air and water samples were analyzed by gas chromatography and results confirmed by GC/MS; identities of other compounds in the samples were also established. (Seip-IPA)
W78-07132

ALTERNATIVE METHODS OF IDENTIFYING ORGANICS IN WATER,
Environmental Research Lab., Athens, GA.
W. T. Donaldson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 255, Price codes: A02 in paper copy, A01 in microfiche. Report No. NIH/NIEH'S-77/028, December 1976. 6 p, 4 ref. 1-R13-ES-01470-01.

Descriptors: *Potable water, *Organic wastes, *Monitoring, *Water quality standards, Water quality, Water pollution, *Pollutant identification, Analytical techniques, *Organic chemicals, *Carcinogens.

Requirements for an effective system of monitoring organics in water are described. The system must be capable of comprehensive analysis for specific organic chemicals. It must be amenable to easy addition of new parameters for analysis; it must detect chemicals at concentrations as low as 1 microgram/l and possibly lower. Water supplies need not be sampled frequently, although composite samples may be necessary. Reliable analysts must be available, and adequate analytical quality control procedures must be implemented. A composite list of hazardous chemicals in drinking water has not yet been developed, but known adverse health effects and potential for getting into water supplies will probably be among the criteria that influence selection of compounds for which maximum concentration levels are set. If specific chemicals must be considered, standards will probably be set for a large number of them eventually; therefore, monitoring techniques will need to be applicable to a wide range of compounds. The concentration that must be detected is one of the most speculative areas of concern, knowledge is limited concerning the levels of chemicals that may cause cancer, birth defects, or mutations. (Seip-IPA)
W78-07133

ENVIRONMENTAL CHEMICALS: HUMAN AND ANIMAL HEALTH, AUGUST 7-11, 1972, FORT COLLINS, COLORADO.
Colorado State Univ., Fort Collins. Inst. of Rural Environmental Health.
For primary bibliographic entry see Field 5B.
W78-07134

MERCURY AS AN ENVIRONMENTAL POLLUTANT,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W78-07136

POLYCHLORINATED BIPHENYLS: AN INDUSTRIAL POLLUTANT,
Colorado State Univ., Fort Collins. Dept. of Entomology.
For primary bibliographic entry see Field 5B.
W78-07141

ECOLOGICAL CARRYING CAPACITY RESEARCH: YOSEMITE NATIONAL PARK. PART IV. SEASONAL AND GEOGRAPHICAL DISTRIBUTION OF INDICATOR BACTERIA IN SUBALPINE AND ALPINE WATERS,
California Univ., Berkeley. Dept. of Plant Pathology.
For primary bibliographic entry see Field 5B
W78-07142

SUBSURFACE WASTE DISPOSAL IN LAMBTON COUNTY, ONTARIO - PIEZOMETRIC HEAD IN THE DISPOSAL FORMATION AND GROUNDWATER CHEMISTRY OF THE SHALLOW AQUIFER,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5E.
W78-07166

WATER QUALITY INTERPRETIVE REPORT, PRINCE EDWARD ISLAND, 1961 - 1973,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
R. N. McNeely, and V. P. Neimanis.
Water Quality Interpretive Report No. 1, 1978, 139 p, 17 fig, 94 tab, 32 ref, 4 append.

Descriptors: *Water quality, *Streams, *Groundwater, Surface waters, Saline water, Freshwater, Domestic water, Industrial water, Estuaries, Discharge measurement, Nutrients, Wastes, Agriculture, Electric power production, Aquatic life, Recreation, *Canada, *Prince Edward Island, *Mill River, *Brudenell River, *Ion chemistry.

The Water Quality Branch, Fisheries and Environment Canada, is endeavouring to involve a wider audience in an appreciation of water quality information by publishing a new report series: Water Quality Interpretive Reports. Report No. 1 deals with the historical water quality data available from NAQUADAT for Prince Edward Island. Approximately 1600 samples, relating to 4 stream stations, 32 groundwater, and 60 estuary sites, were collected by federal and provincial agencies during the 12-year period 1961 to 1973 and analyzed for as many as 50 parameters. The major ion chemistry of Prince Edward Island surface and groundwaters was well defined. The dissolved major ions for surface waters could satisfactorily be estimated for discharge measurements by using site-specific, empirically derived equations, whereas the constituents of environmental concern, such as nutrients and contaminants, could not be adequately assessed by a monthly sampling program. A decline in surface water pH was observed over the 8-year period 1966 to 1973 at the Mill River site. Since there was an inverse relationship between stream pH and discharge at the site, the decreasing pH may have resulted solely from an increase in surface runoff, although the possible enhancement of the pH change by the deposition of acid aerosols into an environmentally sensitive area should be considered in future monitoring programs. (WATDOC)
W78-07176

CHEMICAL COMPOSITION OF RAIN AND BROOK WATER IN BRITTANY (FRANCE), (IN FRENCH),
Rennes Univ. (France). Hydrobiological Lab.
For primary bibliographic entry see Field 2K.
W78-07192

VIRUS DETECTION SYSTEM.
NASA Tech Briefs, Vol. 2, No. 2, p 239-240, Summer, 1977. 2 fig.

Descriptors: *Viruses, *Water reuse, *Disinfection, *Analytical techniques, *Monitoring, Microorganisms, Automation, Electronic equipment, Adsorption, Waste water treatment.

A nonpathogenic marker virus, bacteriophage f 2 is used as a tracer in a water reclamation system to determine if other, possibly more toxic, viruses have survived the treatment process. The virus is first concentrated by adsorption onto cellulose acetate filters in the presence of trivalent cations (AlCl3) at low pH. A passive immune agglutination test, in which an antibody or an antigen is bound to latex beads, is used to detect the marker virus. The waste water detection system includes a reagent pump and metering system, reagent storage containers, a filter concentrator, an incubation/detection system, and an electronic readout and control system. Peristaltic pumping is used to control the flow sequence of the reagents and samples, and transmitted-light photometer is used to measure the degree of agglutination. (Schulz-FIRL)
W78-07200

5B. Sources Of Pollution

GEOHYDROLOGICAL ENVIRONMENTAL EFFECTS OF GEOTHERMAL POWER PRODUCTION - PHASE IIA,
Systems, Science and Software, La Jolla, CA.
J. W. Pritchett, S. K. Garg, D. H. Brownell, Jr., L. F. Rice, and M. H. Rice
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 687, Price codes: A09 in paper copy, A01 in microfiche. Final Report No. SSS-R-77-2998, September, 1976. 176 p, 66 fig, 17 tab, 40 ref, 1 append. AER 75-14492.

Descriptors: *Geothermal studies, *Reservoirs, *Computer programs, *Computer models, *Model studies, *Simulation analysis, Engineering, Environmental effects, Finite element analysis, *Geothermal power, Reservoir engineering, *Geothermal reservoirs, Multiphase flow, QUAGMR, Wairakei geothermal system.

Second-year results of a 3-year research effort are presented. The project involved development and validation of a computational capability whereby field information for a given geothermal reservoir system can be used to predict the behavior of the reservoir and associated subsurface environmental effects resulting from production and reinjection of geothermal fluids. The computer programs can be applied to predict the consequences of alternate production/injection strategies and to evaluate 3 potential environmental hazards: land surface subsidence, induced seismicity, and groundwater pollution resulting from reinjection of spent geothermal brines. The programs are time dependent, 3-dimensional, and treat the transport of mass and energy by single or 2-phase geothermal fluids being driven through a hetergeneous reservoir: thermal and mechanical interactions are treated in the models. Separate codes were developed in Phase I for describing the multiphase multidimensional unsteady flow of stream and water in a heterogeneous geologic setting without rock deformation, and for calculating the response of a multidimensional rock matrix to prescribed pore pressure changes with consideration of fluid flow; these codes have been coupled to produce a fully active geothermal reservoir simulator for simultaneous treatment of fluid flow and ground movement effects. Calculations are presented for a 5-spot production/injection pattern which show the numerical techniques employed to eliminate grid orientation problems. Reservoir calculations simulating pressure drawdown and buildup well tests are presented. Application of the reservoir simulator to a 2-dimensional vertical model of the Wairakei geothermal system has successfully reproduced the fluid production history over 1953 to 1967. (Seip-IPA)
W78-06701

THE ENVIRONMENT OF AMCHITKA ISLAND, ALASKA.
Department of Energy, Washington, DC. Div. of Military Application.
For primary bibliographic entry see Field 6G.
W78-06702

CONTENT OF SOME HEAVY METALS IN THE NATURAL WATERS OF THE SOUTHERN PART OF EASTERN TRANSBAYKALIA,
Irkutsk Gosudarstvennyi Univ. (USSR).
G. M. Shpeyzer, G. R. Filippova, N. A. Vlasov, N. N. Goncharova, and N. F. Aprelkova.
Soviet Hydrology, Selected Papers, Vol 15, No 2, p 145-147, 1976. 1 tab, 7 ref. Translated from Gidrokhimicheskiye Materialy, Vol 62, p 43-48, 1975.

Descriptors: *Heavy metals, *Groundwater, *Surface waters, *Surveys, Sampling, Chemical analysis, Copper, Nickel, Zinc, Manganese, Geochemistry, Water chemistry, Rivers, Streams, Water quality, Pollutants, Water pollution, *Path of pollutants, Distribution, *USSR.

The distribution of trace elements in the biosphere, particularly in natural waters, is of interest to medical geography and of importance for determining the ways and mechanism of migration of trace elements in the crust of the earth. The results of a study of this distribution can be used as a hydrochemical criterion in geological exploration. The content of some trace elements in ground and river waters in the sourhtern part of Eastern Transbaykalia was investigated. The study area embraces the low-hill part of Eastern Transbaykalia, the central part of the Onon-Borzya and the Daur steppes, and the basins of the Ingoda, Brozya, Onona, and Urunguy rivers and their tributaries. The mountain ranges have predominantly a northeast trend and are separated by broad dry depressions or depressions with mineral lakes. The study area includes the Khapcheranga-Lyubavin tin ore deposit, and the Klicha and Akatuyev complex ore deposits. A hydrochemical survey of the area was performed in different years and at different times in the course of three years. The results of copper, cobalt, nickel, zinc, and manganese determinations were presented, including the limiting values of the content of these elements and the average values from all the determinations for ground and river wastes separately. The total number of groundwater samples investigated was 120 and of river waters (including brooks) 30. The occurrence (number of samples in which a given element was found, computed in per cent of the total number of samples analyzed) of copper, nickel, cobalt, zinc, and manganese in the ground waters of the region was 94, 93, 92, 95, and 99%, respectively, and in river waters it was 94, 94, 93, 96, and 98%, i.e., these elements are fairly common. Their content varies within a broad range, especially that of manganese. (Sims-ISWS)
W78-06712

URANIUM IN RIVER RUNOFF,
Akademiya Nauk SSSR, Moscow. Inst. Okeanologii.
G. N. Baturin.
Soviet Hydrology, Selected Papers, Vol 15, No 2, p 148-151, 1976. 1 fig, 1 tab, 30 ref. Translated from Gidrokhimicheskiye Materialy, Vol 62, p 49-54, 1975.

Descriptors: *Rivers, *Mississippi River, *Dissolved solids, *Suspended solids, Runoff, Discharge(Water), Geology, Mineral water, Topography, Climates, Foreign countries, Foreign research, Measurement, Data processing, Reviews, *Uranium, *USSR, *Amazon River, Minerals.

River runoff is the main supplier of dissolved and suspended material to seas and oceans. Therefore, it is urgent to estimate the average content and total amount of chemical elements in river runoff. For example, the natural content of dissolved uranium in rivers varies within extremely broad limits, from 0.01 to 20-30 microgram/liter. It is not surprising, therefore, that the average contents of dissolved uranium in river waters, given by different researchers, differ by a factor of several tens, from 0.03 to 1 microgram/liter. This problem was examined for 32 rivers in the USSR, as well as for the Amazon and Mississippi rivers for which the necessary runoff data are available. The conclusions from this investigation were: (1) The natural content of dissolved uranium in river waters is related directly to the mineral content of these waters and inversely related to the water runoff rate. The average content of uranium in the rivers of the USSR is 0.9 microgram/liter and together with the Amazon and Mississippi it is 0.47 microgram/liter. (2) The content of suspended uranium in river waters is associated directly with the suspended particles concentration of these waters and the runoff rate of suspended substances. The average uranium content in the suspensions of rivers in the USSR is 0.00012%, and together with the Amazon and Mississippi it is 0.00019%. The average content of suspended uranium in river waters is about 0.5 microgram/liter. (3) The average uranium content in the total amount of dissolved and suspended substances of river runoff is 0.00027-0.00032%, i.e., approaches the average content of uranium in the earth's crust. (Sims-ISWS)
W78-06713

WEST ANTARCTIC ICE SHEET AND CO2 GREENHOUSE EFFECT: A THREAT OF DISASTER,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
J. H. Mercer.
Nature, Vol 271, No 5643, p 321-325, January 26, 1978. 3 fig, 55 ref.

Descriptors: *Carbon dioxide, *Heating, *Glaciers, *Antarctic, *Melting, Ice, Melting, Water levels, Disasters, Model studies, Mathematical models, Atmosphere, Clouds, Ice cover, Heat, Heat transfer, Temperature, Latitudinal studies, Radiation, Solar radiation, Climatology, Greenhouse effect.

If the rate of global consumption of fossil fuels continues to grow at its present rate, atmospheric CO2 content will double in about 50 years. Climatic models suggest that the resultant greenhouse-warming effect will be greatly magnified in high latitudes. The computer temperature rise at lat 80 deg S could start rapid deglaciation of West Antarctica, leading to a 5 m rise in sea level. (Sims-ISWS)
W78-06721

REANALYSIS OF THE GREAT LAKES DROGUE STUDIES DATA,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2H.
W78-06723

HIGHWAY OPERATION AND PLANT DAMAGE,
California State Dept. of Transportation, Sacramento. Transportation Lab.
D. I. Nakao, M. M. Hatano, R. B. Howell, and E. C. Shirley.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 612, Price codes: A04 in paper copy, A01 in microfiche. Interim Report CA-DOT-TL-7134-1-76-13, January 1976. 70 p, 53 fig, 4 tab, 19 ref, 1 append. FHWA No F-5-14.

Descriptors: *Salts, *Highways, *Plant pathology, *California, Salt tolerance, Soils, Soil chemistry, On-site investigations, On-site data collections, Vegetation, Runoff, Deicers, Surveys, Transportation, Pollutants, Air pollution, Water pollution, Path of pollutants, Water pollution sources, Deicing salts, Plant damage, Salt concentrations.

A five-year study was undertaken by Caltrans in 1973 to study the effects of deicing salts on terrestrial vegetation and to explore other possible causes of plant damage, both natural and manmade, and to recommend alternative courses of action. The study is divided into two phases: (1) soil chemistry and salt analysis, and (2) vegetation damage assessment and recommendations for mitigation. The Environmental Branch of the Transportation Laboratory is performing phase 1, and the University of California at Davis has contracted to perform that portion of the research dealing with vegetation (phase 2). An interim report was prepared on the first phase of the study for the period of April 1973 - June 1975. Fifteen study sites, in and around the Tahoe Basin, were selected for in-depth study. A total of 2,459 soil samples were analyzed. Generally, salt concentrations in the soil are highest next to the roadway, decreasing with increased distance from the roadway. Concentrations are higher in drainage paths running through the downhill section of a study site. Salt application rates were recorded for possible correlation with soil analysis, topography, and plant damage. Ozone concentration data monitored from August 1974 through July 1975 indicated that the levels are below the Environmental Protection Agency air quality standard of 0.08 PPM (hourly average). (Sims-ISWS)
W78-06725

INFLUENCE OF TIDAL INLETS ON SALINITY IN ESTUARIES,
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
N. J. Shankar.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 101, No WW4, Proceedings Paper 11692, p 369-383, November 1975. 8 fig, 21 ref, 2 append. OWRT C-1158(1591)(5), (68-69)-167, (68-69)-343.

Descriptors: *Mathematical models, *Salinity, *Estuaries, *Inlets(Waterways), *Inflow, *Dispersion, *Texas, Model studies, Saline water, Estuarine environment, Aquatic habitats, Intertidal areas, Saline water-fresh water interfaces, Tidal effects, Mixing, Water circulation, Bays, Hydrodynamics, Numerical analysis, Tidal waters, *Hydrodynamic models, *Salinity transport models, *Gulf coast, *Matagorda Bay(Tex), *Galveston Bay(Tex).

The paper outlined mathematical hydrodynamic and salinity transport models applicable to the analysis of the effects of tidal inlets on shallow irregularly shaped estuaries typical of the Gulf Coast of the United States of America. The practical utility of these models has been developed and demonstrated for the simulation of salinity distributions under well-mixed water conditions for two estuaries on the Gulf Coast. Specifically, Matagorda Bay, Texas, was used to verify the salinity distribution model. Comparison between the computed concentrations and ground truth data was found to be excellent. Galveston Bay, Texas, was used to demonstrate the effects of a tidal inlet on salinity distribution. Comparison with the existing data indicated good qualitative agreement. The effects of tidal inlet were found to be mainly localized for the case considered. (See W75-07030 and W71-01798) (Bender - ISWS)
W78-06733

SOIL TEMPERATURE INCREASES INDUCED BY SUBSURFACE LINE HEAT SOURCES,
Long Island Vegetable Research Farm, Riverhead, NY.
K. A. Rykbost, L. Boersma, and G. D. Jarman.
Agronomy Journal, Vol. 68, No. 1, p 94-99, January-February 1976. 2 fig, 5 tab, 14 ref. OWRT B-039-ORE(6).

Descriptors: Temperature, *Soil temperature, Heat, *Heat transfer, Economics, Energy, Energy conversion, Soil physical properties, *Soil warming.

Generating electricity using the steam cycle produces large quantities of waste heat. Conversion efficiencies range from 32 to 38% which means that for three units of energy input about one unit of electrical energy is produced and two units of waste heat must be disposed of. Circulating the condenser cooling water through a network of underground pipes would result in warming the soil. The present study was initiated to evaluate the effect of increased soil temperatures on crop growth, the energy balance of the proposed system, and the economic feasibility of the system. This report presents results of the energy balance studies. (Skogerboe-Colorado State)
W78-06748

COMBINED EFFECT OF THERMAL AND ORGANIC POLLUTION ON OXYGEN SAG CURVE - PHASE II,
Worcester Polytechnic Inst., MA.
For primary bibliographic entry see Field 5C.
W78-06751

LEACHATE DAMAGE ASSESSMENT: CASE STUDY OF THE SAYVILLE SOLID WASTE DISPOSAL SITE IN ISLIP (LONG ISLAND), NEW YORK,
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Programs.
K. A. Shuster.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 080, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA/530/SW-509, June, 1976. 18 p, 7 fig, 5 tab, append.

Descriptors: *Leachate, *Solid wastes, *Waste dumps, *Ultimate disposal, *Incineration, *Cost analysis, New York, Water pollution sources, *Incineration wastes, *Well contamination, *Land disposal, *Islip(NY), Domestic wells.

The history and type of operation, damages caused by leachate, remedial actions, and associated costs are described for the Sayville solid waste disposal site in Islip, New York. The landfill, initially an open dump receiving all kinds of wastes, was started in a sand and gravel pit in 1933. The disposal site extends from about 20 ft above grade to the water table about 30 ft below grade, and covers approximately 17 acres. Incinerators were built on this site in 1939 and 1968; the former is currently used as a recycling center. The site receives mostly incinerator residue and some individually hauled residential wastes. The leachate plume extends more than 5,000 ft downgradient of the site, 170 ft in depth and up to 1,300 ft in width. About 0.22 sq mi and one billion gal of ground water have been contaminated. From 1968 to 1971, 3 residential wells were placed in the leachate plume near the disposal site because the well developer and homeowners were unaware of the contaminated ground water. All 3 wells were abandoned in 1974 when a public supply line was hooked up to the homes. During the 4 years between well contamination and public hookup, bottled water was used for drinking and filters were placed on the wells so they could be used for laundry and other nonconsumptive uses. Corrective actions were not attempted by th town of Islip. The total direct cost to the residences was about $6,884 ($2,295 per home); however, values of the damaged wells, public water consumption charges cost of bottled water, and other associated costs are not included. (Seip-IPA)
W78-06752

METHYLMERCURY: FORMATION IN PLANT TISSUES,
Environmental Protection Agency, Las Vegas, NV. Office of Research and Development.
For primary bibliographic entry see Field 5A.
W78-06753

LEACHATE DAMAGE ASSESSMENT: CASE STUDY OF THE FOX VALLEY SOLID WASTE DISPOSAL SITE IN AURORA, ILLINOIS,
Environmental Protection Agency, Washington, DC.
K. A. Shuster
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 068, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA/530/SW-514, June, 1976. 34 p, 7 fig, 7 tab, 4 ref, 1 append

Descriptors: *Landfills, *Leachate, *Runoff, *Legal review, *Water quality control, *Illinois, *Cost analysis, Potable water, Pollutant identification, Water pollution sources, *Well contamination, *Groundwater contamination, *Sanitary landfill leachate, Aurora(IL), Fox Valley Disposal Company, Domestic wells, Leachate damage assessment project.

A case study of leachate damages at the Fox Valley solid waste disposal site, Aurora, Illinois, is presented. From 1961, the site was a non-polluting open dump; however, in 1965 Aurora contracted with the Fox Valley Disposal Company to convert the open dump to a sanitary landfill. The site was unsuitable for landfill because it had only a thin layer of protective soil over a creviced bedrock aquifer and domestic wells were located in the aquifer down-gradient of the site; the State and County advised against the site selection. The thin layer of soil was stripped and waste was disposed in the resulting trench, enabling a free channel of leachate to flow to the wells below. Seven domestic wells were polluted beyond use and two others were severely damaged. The State Department of Public Health and the State Geological Survey sampled the wells, investigated the landfill operations, confirmed that landfill waste was the cause of contamination, and made corrective recommendations. In 1966, a lawsuit was initiated against the city and the Fox Valley Disposal Company by the well owners. Damages were settled in the amount of $54,000 which covered the cost of annexing the area to the township of North Aurora, building a water mainline from North Aurora, hookups to homes, and legal expenses. An incomplete tabulation of the damage costs directly attributable to well contamination amounted to $115,000, but did not include administrative nuisance, and inconvenience costs, and the costs of temporary water for 16 months (all of which were unrecoverable by the plaintiffs). The landfill site continued to operate against State regulations until its closing in 1977. (Seip-IPA)
W78-06754

A TOXONOMIC STUDY OF THE SPONGILLA ALBA, S. CENOTA, S. WAGNERI SPECIES GROUP (PORIFERA: SPONGILLIDAE) WITH ECOLOGICAL OBSERVATIONS OF S. ALBA,
New Orleans Univ., LA. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5A.
W78-06805

A CASE OF CONTAMINATION OF KARST WATER-BEARING STRATA BY CHOLERA VIBRIO (IN RUSSIAN),
Nauchno-Issledovatelskii Protivochumnyi Inst., Rostov-na-Donu (USSR).
G. M. Medinskii, I. D. Ladnyi, K. G. Bichul, A. G. Goncharov, and V. I. Kiseleva.
Gig Sanit 12, p 12-15, 1976.

Descriptors: *Karst, Water pollution sources, *Chlera vibrio, *Bacteria, *Groundwater contamination.

An underground strata bearing sulfide waters apparently was infected with chlorea vibrio. Infection occurred due to the absence of a protection zone and intense contamination of the territory above the water-bearing strata. Sources of infection could be carriers of vibrio among numerous tourists visiting this region from various countries, including those affected with chlorea. The ecological condition prevailing in the underground strata with sulfide waters proved to be favorable forlong survival and multiplication of chloera vibrio.--Copyright 1978, Biological Abstracts, Inc
W78-06821

THE USE OF BIOLOGICAL INDICATOR ORGANISMS TO MONITOR TRACE METAL POLLUTION IN MARINE AND ESTUARINE ENVIRONMENTS--A REVIEW,
National Environment Protection Board of Sweden, Upsala Dept of Zoology
For primary bibliographic entry see Field 5A.
W78-06832

BIOAVAILABILITY OF NAPHTHALENES FROM MARINE SEDIMENTS ARTIFICIALLY CONTAMINATED WITH PRUDHOE BAY CRUDE OIL,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
For primary bibliographic entry see Field 5C.
W78-06834

POLYAROMATIC HYDROCARBONS IN OYSTER FROM COASTAL LAGOONS ALONG THE EASTERN COAST OF THE GULF OF MEXICO, MEXICO,
Universidad Nacional Autonoma de Mexico, Mexico City. Inst. de Geofisica; and Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Ciencias del Mar y Limnologia.
For primary bibliographic entry see Field 5C.
W78-06840

DISTRIBUTION OF N-PARAFFINS IN SEAGRASSES, BENTHIC ALGAE, OYSTERS AND RECENT SEDIMENTS FROM TERMINOS LAGOON, CAMPECHE, MEXICO,
Universidad Nacional Autonoma de Mexico, Mexico City, Centro de Ciencias del Mar y Limnologia.
A. V. Botello, and E. F. Mandelli.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 2, p 162-170, February 1978. 2 fig, 2 tab, 8 ref.

Descriptors: *Baseline studies, *Water pollution effects, *Mexico, Algae, Oysters, Sediments, Invertebrates, *Terminos Lagoon(Mex), Sea grass, N-paraffins.

The primary purpose of this study is to establish the distribution of biogenic n-paraffins in marine 'sea-grasses', benthic algae, invertebrates and recent sediments from Terminos Lagoon, Campeche, Mexico. Considering the uncontaminated nature of this coastal region the results of this study will provide a basis for the assessment of future man-induced alterations. (Sinha-OEIS)
W78-06842

NET DRIFT IN AN ATYPICAL ESTUARY, LONG ISLAND SOUND,
Naval Ocean Research and Development Activity, Bay St. Louis, MS.
D. F. Paskausky.
Environmental Management, Vol 1, No 4, p 331-342, 1977. 14 fig, 1 tab, 22 ref.

Descriptors: *Baseline studies, *Water pollution, *Waste disposal, Estuaries, New York, Resources development, *Long Island(NY), *Ocean dumping, New York Bight, *Net drift.

A summary of the descriptive near-shore oceanography of Long Island Sound was prepared to assist in an analysis of the environmental impact from

the dumping, in 1974, of dredge material from New Haven harbor at a site five miles south of the harbor. Long Island Sound is an estuary by definition since it is a semi-enclosed body of water having a free connection with the open ocean. It has a two layered flow at the eastern opening (The Race) and a salinity gradient of about five parts per thousand is maintained between the eastern and western extremes. Tidal currents, wind-driven circulation, and river inflow and freshwater influx are investigated as factors affecting the net drift. Current measurements in eastern Long Island Sound indicate that the tidal circulation features that predominate there do not normally affect the net drift at the New Haven dump site. Drifter returns and a numerical model indicate that seasonal prevailing winds seem to be the primary cause of the net drift in central Long Island Sound. (Sinha-OEIS)
W78-06843

DISTRIBUTION OF TAR BALLS ON BAHAMIAN BEACHES,
Canada Centre for Inland Waters, Burlington (Ontario).
J. P. Coakley.
Shore and Beach, Vol 45, No 2, p 31-35, April 1977. 2 fig, 3 tab, 3 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Environmental effects, Beaches, Resources development, Distribution, Path of pollutants, Outer Continental Shelf, Bahamas, *Tar balls, *Grand Bahama Island.

'Tar balls', or rounded masses of semi-solid petroleum residue, stranded on beaches and coasts, are being recognized as a global phenomenon and as alarming indicators of worldwide pollution of the oceans and coastal waters by petroleum discharged of various types. Their impact on tourist-amenity beaches in the tropical regions is considerable, and with the expected rise in petroleum movements by sea, this impact on shoreline recreational and aesthetic resources will undoubtedly increase. The purpose of this paper is to quantify the phenomenon at one locality, Grand Bahama Island, in the Bahamas archipelago, and to attempt to uncover relationships between various physical beach parameters and the incidence of these tar balls. (Sinha - OEIS)
W78-06845

THE LEVELS OF METALS IN DOCK-YARD SEDIMENTS WITH PARTICULAR REFERENCE TO THE CONTRIBUTIONS FROM SHIP-BOTTOM PAINTS,
University of Manchester Inst. of Science and Technology (England). Pollution Research Unit. and Bolton Inst. of Tech. (England).
For primary bibliographic entry see Field 5A.
W78-06848

HYDROCARBONS IN THE MARINE ENVIRONMENT. II. DISTRIBUTION OF N-ALKANES IN THE FAUNA AND ENVIRONMENT OF THE SUB-ANTARCTIC ISLAND OF SOUTH GEORGIA,
Torry Research Station, Aberdeen (Scotland): and British Antarctic Survey, Cambridge (England).
P. R. Mackie, H. M. Platt, and R. Hardy.
Estuarine and Coastal Marine Science, Vol 6, No 3, p 301-313, March 1978. 6 fig, 3 tab, 26 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Antarctic Ocean, Benthos, Sediments, Resources development, Outer Continental Shelf, *South Georgia Island, Hydrocarbons, *N-alkanes, Sub-Antarctic island.

The concentrations and distributions of alkanes have been determined in samples of sediment, fish, benthos and a land plant mixture from King Edward Cove, South Georgia. The fish muscle and water samples exhibited the relatively smooth envelope typical of this type of material whereas the plants, benthos, fish liver and sediments had a strong odd carbon predominance. No trace of fuel oil from previous spills or leaking storage tanks could be found in any of the samples examined although possible evidence of wastes from the whaling station were found in the deepest sediment layers in the centre of the Cove. (See also W75-07894) (Sinha - OEIS)
W78-06849

ACCUMULATION AND ELIMINATION OF DIELDRIN IN MUSCLE TISSUE OF CHANNEL CATFISH,
Iowa State Univ., Ames.
L. Shannon
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 6, p 637-644, 1977. 2 tab, 12 ref. OWRT A-042-IA(5), 14-31-0001-3515; 3815; and 4015.

Descriptors: *Fish physiology, *Catfishes, *Channel catfish, *Dieldrin, *Chlorinated hydrocarbon pesticides, Metabolism, Organic compounds, Biochemistry, Mode of Action, Path of pollutants, Bioassay, Halogenated pesticides, *Bioaccumulation, Muscle tissue, Tissue analysis, Fish food.

Dieldrin accumulation and elimination in muscle tissue of channel catfish (Ictalurus punctatus) from water and food was determined in the laboratory. Twenty-eight-day exposure of fish 150-225 mm and 350-400 mm long to 75 parts per trillion (ng/liter) dieldrin resulted in the larger catfish consistently accumulating more dieldrin than the smaller fish. After 28 days of elimination, dieldrin levels in both size groups were nearly equal. Catfish exposed to 2 ppm (mg/kg) dieldrin through their diets accumulated significantly more dieldrin in muscle than did fish exposed to 74 pptr in water. When fish were exposed to dieldrin both in food and water, dieldrin from both sources contributed to the total dieldrin load. (Katz)
W78-06853

THE RELATIONSHIP BETWEEN LIGHT AND PHOTOSYNTHETIC RATE IN A RIVER COMMUNITY AND IMPLICATIONS FOR WATER QUALITY MODELING,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5C.
W78-06854

CONTAMINANT INPUTS TO THE NEW YORK BIGHT,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
J. A. Mueller, J. S. Jeris, A. R. Anderson, and C. F. Hughes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 063, Price codes: A16 in paper copy, A01 in microfiche. NOAA Technical Memorandum ERL MESA-6, April 1976. 358 p, 30 fig, 41 tab, 15 append.

Descriptors: *Water pollution sources, *Waste disposal, New York, Sewage, Municipal wastes, Industrial wastes, Heavy metals, Outer Continental Shelf, *New York Bight, Ocean dumping.

An estimate of the location and magnitude of contaminant inputs into the New York Bight is presented, their relative importance indicated, and data gaps identified. Four sources of contaminant inputs were evaluated in the study: barge dumps and atmospheric fallout as direct bight inputs, and wastewater and runoff as coastal inputs to waters ultimately draining to the bight. The sources were further subdivided into their various constituents: dredge spoils, sewage sludge, acid wastes, chemical wastes and rubble for the barge dumps; gaged stream flow, urban runoff, and groundwater outflow for the runoff, and municipal and industrial wastewater inputs. The wastewater inputs were evaluated only downstream of the gaged stream stations because all inputs above these points are reflected in the gaged runoff values. In addition to flow or volume for each source, 23 separate contaminants were investigated to estimate the inputs of solids, organic matter, nutrients, heavy metals, and microbes. Because of their usefulness in water quality modeling, the raw dredge spoil, wastewater discharge, and gaged runoff data for each source are included as appendixes in this report. (Sinha-OEIS)
W78-06858

OIL SPILL: DECISIONS FOR DEBRIS DISPOSAL. VOL I: PROCEDURES MANUAL,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5G.
W78-06859

OIL SPILL: DECISIONS FOR DEBRIS DISPOSAL. VOL II, LITERATURE REVIEW AND CASE STUDY REPORTS,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5G.
W78-06860

OIL SPILL AND OIL POLLUTION REPORTS, FEBRUARY-1977 -APRIL 1977,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06861

THE METULA OIL SPILL,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Lab.
C. G. Gunnerson, and G. Peter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 418, Price codes: A15 in paper copy, A01 in microfiche. NOAA Special Report, September 1976. 336 p, 2 append.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, Environmental effects, Water pollution effects, South America, *Outer Continental Shelf, Tanker ships, Oil transport, *METULA oil spill, Crude oil, *Strait of Magellan.

In August 1974 the supertanker METULA ran aground in the Strait of Magellan and spilled over 50,000 tons of light Arabian crude oil. The spill was not contained and the oil was carried over large segments of beaches and tidal marshes of Tierra del Fuego, and deep into the estuaries of the area. Findings of a team of scientists from the United States and Chile, who investigated the environmental damage in August 1974 and again in January 1975, and of others who discussed the spill at a workshop, are summarized. Included are the background of the accident, the physical environment, the reasons why cleanup measures were not attempted, and the most important follow-up research needs. The research results will be used to identify critical environmental information that can be transferred for use in palnning and for predicting environmental impacts in the other similar areas of the world. (Sinha-OEIS)
W78-06862

POTENTIAL MARICULTURE YIELD OF FLOATING SEA THERMAL POWER PLANTS. PART I--GENERAL STATEMENT,
Lamont-Doherty Geological Observatory, Palisades, NY.; and City Univ. of New York. Inst. of Marine and Atmospheric Science.
For primary bibliographic entry see Field 5C.
W78-06864

COPPER IN THE SEA - A BIBLIOGRAPHY,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W78-06865

THE UTILITY OF SKYLAB PHOTO-INTERPRETED EARTH RESOURCES DATA IN STUDIES OF MARINE GEOLOGY AND COASTAL PROCESSES IN PUERTO RICO AND THE VIRGIN ISLANDS,
Geological Survey, San Juan, PR.
J. V. A. Trumbull.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-27631, Price codes: A07 in paper copy, A01 in microfiche. Final Report on Investigation of SKYLAB EREP Data, 1975. 143 p, 19 fig, 4 append.

Descriptors: Water resources, *Baseline studies, *Photography, *Sediment transport, *Waste disposal, *Oil spills, Pollutant identification, Water pollution sources, Estuaries, Coasts, Effluents, Benthos, Outer Continental Shelf, *SKYLAB photography, Pollutant transport, Earth resources data, Environmental conditions, Coastal processes.

Three SKYLAB earth-resources passes over Puerto Rico and St. Croix on 6 June and 30 November 1973 and 18 January 1974 resulted in color photography (Earth Terrain Camera) and multispectral photography and scanner imagery that contains a wealth of data useful in a number of fields of study. Bathymetric detail to a limiting depth of 84 feet (26 meters) is well-shown in clear-water areas and could be used to make contoured charts by means of image-enhancement techniques and some field control. Bathymetric and turbid-water features are differentiable by use of the multispectral data. The photography allows mapping of coral reefs, offshore sand deposits, areas of coastal erosion, and patterns of sediment transport. Patterns of bottom-dwelling biologic communities are well portrayed but are difficult to differentiate from bathymetric detail. Much detailed information on patterns of coastal surface water currents can be readily extracted from images taken at times of high water turbidity. Anomalous large-scale offshore-oriented plumes undetected by other means appear on the photography. Effluent discharges and oil slicks are readily detected and are differentiated from other phenomena by the persistence of their images into the longer-wavelength multispectral bands. The SKYLAB data make up a valuable benchmark inventory of a variety of coastal conditions that will be of great future value in the study of slowly time-variant phenomena. (Sinha-OEIS)
W78-06867

A REVIEW OF OIL POLLUTING INCIDENTS IN AND AROUND NEW ENGLAND,
Environmental Research Lab., Narragansett, RI.
J. L. Hyland.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 698, Price codes: A03 in paper copy, A01 in microfiche. EPA Office of Research and Development, Ecological Research Series No EPA-600/3-77-064, June 1977. 41 p, 6 tab, 39 ref.

Descriptors: *Oil pollution, *Oil spills, Water pollution sources, *New England, *Outer Continental Shelf.

A comprehensive review of oil pollution incidents in and around New England waters is offered. The first section of the report presents an analysis of all oil discharge data maintained by the U.S. Coast Guard for years 1973 through 1975. The data are analyzed categorically to reveal where most spills occur in New England waters, where the greatest quantities are spilled, what types of oil are most frequently spilled, what types are spilled in the greatest quantities (in gallons), what the most significant sources and causes of spills are, and within which size range (in gallons) most spills occur. The second section offers synopses of the more publicly recognized spills which have occurred within the last twenty-five years. The management of oil discharges and areas in which additional research is required are discussed in a concluding section. (Sinha-OEIS)
W78-06868

COPPER.
National Research Council, Washington, DC Committee on Medical and Biologic Effects of Environmental Pollutants.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 425, Price codes: A09 in paper copy, A01 in microfiche. Report No. EPA-600/1-77-003, Jan 1977. 6 tab, 638 ref, 1 append. EPA, Research Triangle Park, NC. Health Effects Research Laboratory Office of Research and Development. EPA 68-02-1226.

Descriptors: *Copper, *Public health, *Copper compounds, *Toxicity, *Environment, Air pollution effects, Inorganic compounds, Diets, Human pathology, Poisons, Air pollution, Trace elements, Pollutants, Chemical properties, Ecology, Water quality, Toxins.

This report was a review of current knowledge of the distribution of copper in the environment and living things. Metabolism and the effects of copper in the biosphere also were considered. Copper compounds are common and widely distributed in nature. They also are mined, processed, and redistributed extensively by man. Copper is an essential element in plant and animal nutrition. It is related closely to iron, sulfur, and molybdenum in animal metabolism. Requirements differ in relation to the nutritional state of these other elements. In plants, copper toxicity is infrequent and usually results from soil contamination due to human activities. Deficiency in plants is fairly common and may require supplementation for crops. In animals, both deficiency and toxicity are infrequent, except in ruminants. Human copper poisoning occurs rarely in industry as a cause of food poisoning, resulting from some medical treatments and from genetic defects in metabolism. Copper levels found in food, water, and air have not been found to be injurious. (Henley-ISWS)
W78-06872

SALT REGIME OF RESERVOIRS, CHAPTER 6: ELEMENTARY HYDROBIOLOGICAL PROGNOSIS,
For primary bibliographic entry see Field 5C.
W78-06880

THE BEHAVIOUR OF DISSOLVED ALUMINUM IN ESTUARINE AND COASTAL WATERS,
University of East Anglia, Norwich (England). School of Environmental Science.
D. J. Hydes, and P. S. Liss.
Estuarine and Coastal Marine Science, Vol. 5, No. 6, p 755-769, November 1977. 9 fig, 5 tab, 25 ref.

Descriptors: Aluminum, *Estuarine environment, *Adsorption, *Solubility, *Estuaries, Water chemistry, Clays, Analytical techniques, Chemical properties, Coasts, Water analysis, Mixing, Salinity, Physical properties, Saturation, Water quality, *Aluminum solubility, Coastal waters, *Aluminum compounds, Aluminum species, British Isles, *North Sea, Estuarine mixing, Chlorosity, Dissolved aluminum.

The average concentration of dissolved aluminum found in surface waters of the North Sea with salinities greater than 34 parts/thousand was 1.5 micrograms/l, with a range of from 5.5 to 0.5 micrograms/l. The distribution appeared to be a function of the amounts of aluminum in, and the distribution of, the freshwater inputs. Values decreased away from coastal regions and suggest an oceanic value for dissolved aluminum of 1.0 micrograms/l, or less. Freshwaters from the Rivers Great Ouse an Yare in East Anglia are basic (pH about 8.0) and contain 2-5 microgram al/l. Samples of freshwater (pH 6.5-7.9) collected from the drainage basin of the River Conway (North Wales) contain from 4 to 98 microgram al/l. Approximately 30% of the dissolved aluminum entering the Conway Estuary in freshwater appears to be removed during mixing with seawater in the estuary. Removal occurs during the early stages of mixing, being essentially complete by the time the water has reached a salinity of 8 parts/thousand. The most probable explanation for the effect is one involving trapping of aluminum adsorbed on the surface of very fine clay particles entering with the freshwater as the particles are irreversibly coagulated on mixing with saline water in the estuary. (Henley-ISWS)
W78-06893

THE SOURCES OF DISSOLVED MANGANESE TO CALICO CREEK, NORTH CAROLINA,
North Carolina Univ. at Chapel Hill. Curriculum in Marine Sciences
J. G. Sanders
Estuarine and Coastal Marine Science, Vol. 6, No. 2, p 231-238, February 1978. 5 fig, 1 tab, 23 ref.

Descriptors: *Manganese, *Dissolved solids, *Tidal streams, *Water pollution sources, *North Carolina, Tidal waters, Coasts, Sediments, Salinity, Hydrogen ion concentration, Dissolved oxygen, Sampling, Data processing, Rainfall, Runoff, Sewage effluents, Pollutants, Path of pollutants, Estuaries, *Calico Creek(NC).

A small tidal creek in North Carolina, during the spring and summer months, has dissolved Mn concentrations in excess of concentrations predicted by simple mixing with the nearby Newport River. The majority, approximately 80%, of the Mn excess is derived from pore waters upon resuspension of the sediments by storms, and perhaps by tidal scouring and bioturbation. Sewage effluent is the only source other than the sediments that releases a significant amount (15%) of the Mn excess to the creek. Molecular diffusion of Mn across the sediment-water interface is not an important process. Rainfall, runoff from the watershed, atmospheric fallout, and the biota are all unimportant sources. (Sims-ISWS)
W78-06895

OVERVIEW OF MARINE POLLUTION RESEARCH IN EGYPT,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
For primary bibliographic entry see Field 5G.
W78-06911

OVERVIEW ON POLLUTION IN THE COASTAL ENVIRONMENT OF PAKISTAN AND ITS POSSIBLE IMPLICATION FOR THE MARINE ECOSYSTEM,
Karachi Univ. (Pakistan). Inst. of Marine Biology.
For primary bibliographic entry see Field 5G.
W78-06912

OVERVIEWS ON MARINE POLLUTION IN INDIA,
University of West Florida, Pensacola. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W78-06913

HYDROLOGICAL, CHEMICAL AND PHYSICAL PROCESSES AFFECTING POLLUTION OF THE BALTIC SEA,
Institute of Meteorology and Water Management, Gdynia (Poland).
A. Trzosinska.

In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 69-79, 11 fig, 2 ref.

Descriptors: *Water pollution, *Water properties, *Resources development, Industrial wastes, Heavy metals, Chlorinated hydrocarbons, Hydrology, *Baltic Sea, Gdansk Basin.

The Maritime Branch of the Institute of Meteorology and Water Management in 1974 undertook a research project on 'Hydrological, Chemical and Physical Processes Affecting Pollution of the Baltic Sea,' sponsored by the U.S. Environmental Protection Agency. The Gdansk Basin was chosen as the principal study area. Cities at the Gulf of Gdansk have about one million population; these are the 'Three-Towns' of Gdansk, Gdynia and Sopot, with a population of 700,000. A complex of shipbuilding, metal and electrical engineering, oil refinery, chemical and food industries exists, all being developed intensively. The objectives of the Gdansk Basin study program involve two types of water constituents: compounds closely related to the eutrophication process, such as nutrients, organic phosphorus, organic nitrogen and oxygen; and noxious substances, such as chlorinated hydrocarbons and heavy metals. The investigations covered by the current program emphasize the primary sources of marine pollution, with river discharges and the atmosphere, including water dynamics, being the decisive factor for the spreading of pollutants at sea. In this respect an attempt was made to obtain a provisional balance of selected pollutants. (See also W78-06906) (Sinha-OEIS)
W78-06915

GLOBAL MONITORING OF MARINE POLLUTANTS,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5A.
W78-06922

APPLICATION OF DIGITAL PROFILE MODELING TECHNIQUES TO GROUNDWATER SOLUTE TRANSPORT AT BARSTOW, CALIFORNIA,
Geological Survey, Lakewood, CO. Water Resources Div.
S. G. Robson.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price $1.90. Geological Survey Water-Supply Paper 2050, 1978. 28 p, 9 fig, 1 plate, 31 ref.

Descriptors: *Groundwater movement, *Solutes, *Dissolved solids, *Path of pollutants, *Model studies, Water pollution control, Aquifers, Analytical techniques, Sewage effluents, *Digital profile modeling, *Barstow(Calif).

A two-dimensional profile-oriented water-quality model was used for the simulation of head and water-quality changes through the saturated thickeness of an aquifer. The profile model is able to simulate confined or unconfined aquifers with nonhomogeneous anisotropic hydraulic conductivity, nonhomogeneous specific storage and porosity, and nonuniform saturated thickness. An aquifer may be simulated under either steady or nonsteady flow conditions. Although the profile model has the advantage of being able to simulate vertical flow and water-quality changes in a single- or multiple-aquifer system, the types of problems to which it can be applied is limited by the requirements that (1) the ground-water flow path remain oriented along the longitudinal axis of the model and (2) any subsequent hydrologic factors to be evaluated using the model must be located along the land-surface trace of the model. Simulations of the movement and dissolved-solids concentration of a zone of degraded ground-water quality near Barstow, Calif., indicate that halting subsurface disposal of treated sewage effluent in conjunction with pumping a line of fully penetrating wells would be an effective means of controlling the movement of degraded ground water. (Woodard-USGS)
W78-06931

PROGRAM FOR EVALUATING STREAM QUALITY IN NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.
H. B. Wilder, and C. E. Simmons.
Available from Branch of Distribution, USGS 1200 S. Eads St. Arlington, VA 22202. Circular 764, 1978. 16 p, 13 fig, 3 tab, 16 ref.

Descriptors: *Water quality, *North Carolina, *Streams, *Evaluation, Analytical techniques, Water analysis, Natural streams, Water pollution sources, Streamflow, Flow rates, High flow, Low flow, Hydrograph analysis, Environmental effects, Estimating, Constituent loads, Water quality trends, Natural water quality, Pollution loads.

The design and objectives of the program for evaluating stream quality in North Carolina are described. Using water-quality and streamflow data collected since the 1940's, a study is underway to define certain variations in water quality, to quantify the effects of man's activities on water quality, and to determine long-term trends at key locations on the State's major river. Data collected from 47 unpolluted stream sites were used to estimate average concentrations for naturally occurring constituents during periods of high and low flow. Methods are described for estimating constituent loads derived from both natural sources and sources of pollution. (Woodard-USGS)
W78-06939

EVALUATION OF HYDROGEOLOGIC ASPECTS OF PROPOSED SALINITY CONTROL PROGRAM IN PARADOX VALLEY, COLORADO,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 5G.
W78-06942

MODEL ANALYSIS OF THE IMPACT ON GROUND-WATER CONDITIONS OF THE MUSKEGON COUNTY WASTEWATER DISPOSAL SYSTEM, MICHIGAN,
Geological Survey, Lansing, MI. Water Resources Div.
M. G. McDonald, and W. B. Fleck.
Open-file report 78-99, January 1978. 63 p, 17 fig, 1 tab, 14 ref.

Descriptors: *Groundwater movement, *Computer models, *Waste water disposal, *Drainage systems, *Michigan, Tiles, Sprinkler irrigation, Lagoons, Aquifer characteristics, Aquitards, Groundwater recharge, Hydrogeology, Numerical analysis, Evaluation, *Muskegon County(Mich).

A digital model was developed to study the impact on ground-water conditions of the Muskegon County, Mich., wastewater disposal system. At the disposal site, wastewater is stored in two 850-acre lagoons and then spray-irrigated on crop land. About 70 miles of drainage tile, which underlies the irrigated land, has caused the water table to be lowered substantially. The decline in water levels has been partially offset by irrigation and leakage from the lagoons; at some places the water table is higher than it was prior to construction. Predictive simulations by the model were used to study the effects of varying tile drainage, amount of irrigation water applied, lagoon leakage, and natural ground-water recharge. If the effectiveness of the tile to collect drainage is reduced by 75 percent, large areas within the wastewater site would become waterlogged. However, the effect outside of the wastewater site would be negligible. (Woodard-USGS)
W78-06943

WATER-QUALITY INVESTIGATION OF THE TYRONZA RIVER WATERSHED, ARKANSAS,
Geological Survey, Little Rock, AR. Water Resources Div.
T. E. Lamb.
Geological Survey open-file report 78-175, 1978. 32 p, 4 fig, 8 tab, 9 ref.

Descriptors: *Water quality, *Baseline studies, *Surface waters, *Agricultural watersheds, *Arkansas, Aquifers, Potentiometric level, Topography, Geology, Water analysis, Sampling, Chemical analysis, Physical properties, Chemical properties, Bottom sediments, Pesticides, *Tyronza River basin(Ark), *Pre-soil conservation programs.

The results of a 1-year study of surface-water quality in the Tyronza River Watershed, Arkansas, are presented to document conditions before implementation of Soil Conservation Service Programs. The report includes a general description of the watershed's topography, geology, and aquifers, and the results of monthly measurements of discharge at five sites, and several physical and chemical parameters, plus quarterly analyses for several ions and semiannual analyses of bottom material for various pesticides. The results indicate that the quality of the water in the streams and ditches samples is normal for an intensely farmed area such as this watershed. (Woodard-USGS)
W78-06951

GROUNDWATER QUALITY AND CORROSION: THE AUSTRALIAN SCENE,
G. J. Kelly.
In: Groundwater Quality--Measurement, Prediction and Protection. Proc. of the Water Research Centre Conference, September 6-8, 1976, Univ. of Reading, Berks., England, p 470-485. (1976) 1 fig, 2 tab, 14 ref.

Descriptors: *Groundwater, *Australia, *Corrosion control, *Pumps, Iron, Steel, Stainless steel, Water quality, Dissolved oxygen, Carbon dioxide, Electrolysis, Water analysis, Sampling, Acidity.

The general aridity of the Australian continent make its ground water resources especially valuable and heavily-used for water supply. Increasing concern by pump owners about unsatisfactory and unpredictable performance due to corrosion has highlighted the need for more accurate characterization of ground water quality, particularly with respect to 'unstable' variables which are primarily dependent on the partial pressure of oxygen and carbon dioxide. In addition, Australian ground waters are generally dominated by sodium and chloride, or sodium and bicarbonate, so that for the same conductivity and pH, they are more corrosive than the ground waters of Europe and North America for which rules-of-thumb for pump materials selection have been developed. Use of alternatives to cast iron and steel for various pump components could prove to be a major cost-saving tactic in the long run; austenitic stainless steel is highly promising despite considerable initial cost. Pump column corrosion appears to be as much a design problem as anything else. Some form of cathodic protection may ultimately be the best solution for such difficulty. (Eberle-NWWA)
W78-06973

LEGISLATIVE ASPECTS OF GROUNDWATER QUALITY,
For primary bibliographic entry see Field 5G.
W78-06974

MEASURES FOR THE PROTECTION AND REHABILITATION OF AQUIFERS IN THE UNITED KINGDOM,
For primary bibliographic entry see Field 5G.
W78-06975

SATELLITE REMOTE SENSING STUDY OF THE TRANS-BOUNDARY MOVEMENT OF POLLUTANTS,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 5A.
W78-06979

OIL SPILL AND OIL POLLUTION REPORTS, MAY 1977 - JULY 1977,
California Univ., Santa Barbara. Marine Science Inst.
For primary bibliographic entry see Field 5G.
W78-06980

HYDROCARBONS IN SEDIMENTS AND BENTHIC ORGANISMS FROM A DREDGE SPOIL DISPOSAL SITE IN RHODE ISLAND SOUND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
P. D. Boehm, and J. G. Quinn.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 732, Price codes: A03 in paper copy, A01 in microfiche. U.S. Environmental Protection Agency, Office of Research and Development, Ecological Research Series No EPA-600/3-77-092, November 1977. 46 p, 7 fig, 6 tab, 34 ref. Grant No R803415.

Descriptors: *Oil pollution, *Water pollution sources, Rhode Island, Sediments, *Outer Continental shelf, *Hydrocarbons, *Ocean dumping, Quahog, Acartia islandica.

A three-year study to investigate the spatial distribution of hydrocarbons both in surface sediments from upper Rhode Island Sound and in a commercially important shellfish from the area, the ocean quahog (Acartia islandica) is described. An attempt is made to distinguish the regular hydrocarbon geochemistry of Rhode Island Sound, defined by background hydrocarbon distributions and inputs from Narragansett Bay and adjacent coastal areas, from the input due to mobilization of hydrocarbons from a deposited dredge spoil during the five years since the disposal activity has ceased. (Sinha-OEIS)
W78-06982

OFFSHORE OIL AND GAS EXTRACTION: AN ENVIRONMENTAL REVIEW,
Battelle Columbus Lab., OH.
N. A. Frazier, D. L. Maase, and R. Clark.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 242, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Research and Development, Interagency Energy-Environment Research and Development Series No EPA-600/7-77-080, July 1977. 69 p, 1 fig, 25 tab, 42 ref. EPA-68-02-1323.

Descriptors: *Water pollution sources, *Environmental effects, *Oil spills, *Oil pollution, *Metals, Air pollution, Resources development, Exploitation, *Outer Continental shelf, Offshore drilling.

The results of an environmental review of emission sources and emissions associated with U.S. offshore oil and gas exploration, drilling, and production are reported. The purpose of the review was to rank technological problems of controlling these emissions. Existing or proposed effluent limitations reflect BPTCA and BATEA technologies for controlling oil in effluents to near and offshore waters. No firm basis could be developed for ranking technological problems of controlling other possible emission to the environment. Conclusions of the small study are that additional information is needed on the fate and effect of other possible pollutants, mainly metals, that might be in discharges to offshore waters and on quantitative evaluations of air emission sources. In the information reviewed, greatest environmental concern was with accidental spills of oil that can occur during drilling and production. Little or no environmental concern with air emission sources was noted in the information reviewed. (Sinha-OEIS)
W78-06983

EVALUATION OF FACTORS PROMOTING THE PRESERVATION OF AQUATIC ECOSYSTEMS IN RECLAIMED STRIP MINE AREAS,
Grover City Coll., PA. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W78-06998

MOVEMENT OF PESTICIDES IN THE SOIL WATER FERTILIZER SYSTEM,
Arkansas Univ., Fayetteville. Dept. of Agronomy
H. D. Scott.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 498, Price codes: A06 in paper copy, A01 in microfiche. Arkansas Water Resources Research Center, Publication No. 35, July 1975. 101 p, 36 fig, 18 tab, 43 ref, append. OWRT A-021-ARK(1), 14-31-0001-3804.

Descriptors: *Path of pollutants, Herbicides, *Captina silt loam, *Metribuzin, *Chlorides, Soil profiles, Water pollution sources, *Microbial degradation, Soil treatment, Arkansas, *Pesticide residues.

A theoretical and experimental study of the transport of pesticides was conducted in several Arkansas soils with metribuzin, a herbicide. In a field study, chloride and metribuzin were applied to a Captina silt loam under maximum leaching conditions and their redistribution was compared with that of soil water. Metribuzin was found in significantly detectable quantities to a depth of 61 cm; the largest concentrations were detected in the surface 23 cm and particularly in the 0-5 cm increment. Two days after application 72.6 and 33.6% could be detected in the vegetation and no-vegetation plots. The metribuzin half life was 7.88 and 5.13 days in the no-vegetation and vegetation plots, respectively. Chloride was found throughout the profile Metribuzin and chloride generally were observed to move in the same direction as soil water, but at a considerably slower rate. Persistence of metribuzin within the soil was influenced greatly by microbial degradation. The laboratory studies centered on further quantifying the transport and adsorption-desorption parameters of metribuzin under controlled environmental conditions. Diffusion coefficients of 14C-metribuzin, 36Cl, and 3HOH were shown to be influenced by soil type, soil water content, and soil temperature. The magnitude of the diffusivities were in the order 3HOH>36Cl>14C-metribuzin; however, the ratios varied. The rates of adsorption of metribuzin were found to be dependent on shaking time and soil type. For the most part linear adsorption isotherms were observed. Desorption rates were found to be influenced by solution concentration, shaking time and soil type.
W78-06999

PO210 AND PB210 IN ZOOPLANKTON FECAL PELLETS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum.
T. M. Beasley, M. Heyraud, J. J. W. Higgo, R. D. Cherry, and S. W. Fowler.
Marine Biology, Vol. 44, p 325-328, 1978. 1 tab, 21 ref.

Descriptors: *Lead, *Zooplankton, *Suspended solids, *Radium radioisotopes, *Lead radioisotopes, *Radioisotopes, *Isotope studies, *Path of pollutants, Water pollution sources, Sea water, *Polonium, *Meganyctiphanes.

210Po and 210Pb concentration in fecal pellets from the zooplankton euphausiid Meganyctiphanes norvegica are reported. The 210Po/210Pb activity ratio is 2.2 + or - 0.3, a value in good agreement with that found in suspended particulate matter in surface seawater. Estimates of 210Po and 210Pb removal times from the mixed layer by fecal pellets alone yield values which are of the same order of magnitude as the removal time for these nuclides by all routes. It is suggested that there is a high probability that zooplanktonic fecal pellets play a significant role in the removal of both these nuclides from the surface layers of the ocean. (Deal-EIS)
W78-07018

OIL SPILL DISPERSANTS CAUSE BRADYCARDIA IN A MARINE FISH,
Fisheries and Marine Service, Saint John's (Newfoundland).
For primary bibliographic entry see Field 5C.
W78-07019

SIZE-SELECTIVE MORTALITIES OF CLAMS IN AN OIL SPILL SITE,
Maine State Dept. of Marine Resources, Augusta.
For primary bibliographic entry see Field 5C.
W78-07020

REQUIEM FOR A RIVER. POLLUTION OF THE MOISIE AND PEKANS RIVER,
For primary bibliographic entry see Field 5C.
W78-07022

MAN-MADE DEBRIS ON THE BERING SEA FLOOR,
Alaska Univ., College. Inst. of Marine Science.
H. M. Feder, S. C. Jewett, and J. R. Hilsinger.
Marine Pollution Bulletin, Vol 9 No 2, p 52-53, 1978. 1 fig, 1 tab, 1 ref.

Descriptors: *Oil industry, *Exploration, *Drilling, Surveys, Trawling, *Benthic fauna, Wastes, *Waste identification, International waters, Invertebrates, On-site investigation, Commercial fishing, Waste disposal, *Bering Sea, *Debris(Sea floor).

Proposed oil development in the Bering Sea has led to intensive biological assessment surveys there. A benthic trawl, used to collect bottom invertebrates and fishes in these surveys also brings up any man-made debris in its path. A description of this debris, its distribution, and frequency of occurrence are given for the southeastern Bering Sea in 1975 and 1976. (Deal - EIS)
W78-07033

PLANNING DIFFUSE POLLUTION CONTROL: AN ANALYTICAL FRAMEWORK,
Williams Coll., Williamstown, MA. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-07042

A MANUAL OF MARSH AND AQUATIC VASCULAR PLANTS OF NORTH CAROLINA WITH HABITAT DATA,
North Carolina Agricultural Experiment Station, Raleigh.
For primary bibliographic entry see Field 2I.
W78-07062

SEASONAL GROWTH AND FOLIAR NUTRIENTS OF LARIX LARICINA IN THREE WETLAND ECOSYSTEMS,
Michigan Univ., Ann Arbor. Wetlands Ecosystem Research Group.
For primary bibliographic entry see Field 2I.
W78-07065

ATMOSPHERIC DISPERSION CHARACTERISTICS IN COASTAL ENVIRONMENTS,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 5A.
W78-07083

TIDAL RESUSPENSION IN BUZZARDS BAY, MASSACHUSETTS, I. SEASONAL CHANGES IN THE RESUSPENSION OR ORGANIC CARBON AND CHLOROPHYLL A,
New Hampshire Univ., Durham. Dept. of Zoology.
M. R. Roman, and K. R. Tenore.
Estuarine and Coastal Marine Science, Vol. 6, No. 1, p 37-46, January 1978. 6 fig, 23 ref. NSF DES75-10025, GA-39911.

Descriptors: *Tides, *Chlorophyll, *Organic matter, *Massachusetts, Tidal waters, Coasts, Suspended solids, Currents(Water), Tidal effects, Seasonal, Annual, Cycles, Primary productivity, Sampling, Benthic fauna, Zooplankton, Phytoplankton, Marine biology, Estuaries, *Organic carbon, *Buzzard's Bay(Mass).

Greater than 50% increases in the amount of particulate organic carbon and chlorophyll a per square meter occurred in a 13-m water column of Buzzards Bay during tidal cycles. The composition and quantity of the resuspended material varied seasonally. Greater percentages of the carbon in the water column were resuspended during the summer and winter months, while more resuspension of chlorophyll a occurred during spring and summer. Increases in the amount of primary production in the water column occurred with the resuspension of chlorophyll am indicating that the resuspended cells were viable. The contribution of this resuspended phytoplankton to the total yearly primary productivity can be significant. The tidal resuspension of phytoplankton and detritus from the mud bottom of Buzzards Bay, if utilized by the zooplankton community, could provide significant food resources for secondary production. (See also W78-07096) (Sims-ISWS)
W78-07095

TIDAL RESUSPENSION IN BUZZARDS BAY, MASSACHUSETTS, II. SEASONAL CHANGES IN THE SIZE DISTRIBUTION OF CHOROPHYLL, PARTICLE CONCENTRATION, CARBON AND NITROGEN IN RESUSPENDED PARTICLE MATTER,
New Hampshire Univ., Durham. Dept. of Zoology.
M. R. Roman.
Estuarine and Coastal Marine Science, Vol. 6, No. 1, p 47-53, January 1978. 4 fig, 1 tab, 25 ref. NSF DES75-10025, GA-39911.

Descriptors: *Suspended solids, *Particle size, *Plankton, *Massachusetts, *Organic matter, *Chlorophyll, Sampling, Nutrients, Variability, Seasonal, Tides, Tidal waters, Tidal effects, Phytoplankton, Zooplankton, Biomass, Marine biology, Estuaries, Organic carbon, *Buzzards Bay(Mass).

Seasonal changes in the particle size spectrum of suspended matter in near bottom water of Buzzards Bay was studied by fractional filtration. The greatest fraction of the total particulate organic carbon and particulate organic nitrogen throughout the year was less than 20 micrometers. The relative indepedence of the seasonal size distribution of particulate carbon to changes in the chlorophyll, as well as high carbon:nitrogen ratios during winter, suggest that large amounts of detritus are present in Buzzards Bay. Chlorophyll distribution was dominated by nanoplankton grazers abundant. The winter and fall phytoplankton blooms were dominated by individual and chain-forming diatoms greater than 53 micrometers. The dominance of a nanoplankton and nanodetritus (less than 20 micrometers) in the suspended matter of Buzzards Bay suggests that the major source of nutrition for filter feeding zooplankton are small particles. (See also W78-07095) (Sims-ISWS)
W78-07096

STATUS OF GROUNDWATER CONTAMINATION IN THE US,
Geraghty and Miller, Inc., Tampa, FL.
J. J. Geraghty, and D. W. Miller.
Journal of the American Water Works Association, Vol. 70, No. 3, p 162-167, March 1978. 11 fig.

Descriptors: *Groundwater, *Water pollution, *Water pollution sources, Pollutants, Path of pollutants, Industries, Industrial wastes, Solid wastes, Waste disposal, Waste disposal wells, Waste water disposal, Sludge disposal, Septic tanks, Cesspools, Oil wastes, Mine water, Feed lots, Groundwater contamination.

There are different types of aquifers and still more methods for polluting them. Some sources of pollution, such as septic systems, are obvious, others are less so. Major problems today are being caused by water table depletion and water reinjection into earth cavities created by removal of oil and gas. Potential groundwater contaminants also exist in the form of industrial-waste lagoon systems. The author cited existing data to explain the relative seriousness of each of the problems, and he explained what is being done to overcome the situations. (Sims-ISWS)
W78-07103

THE EFFECTS OF SOLID WASTE LANDFILL LEACHATES ON RECEIVING WATERS,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
R. D. Cameron.
Journal of the American Water Works Association, Vol. 70, No. 3, p 173-176, March 1978. 1 fig, 5 tab.

Descriptors: *Landfills, *Leachate, *Solid wastes, Water pollution, Water pollution effects, Surface waters, Groundwater, Pollutants, Path of pollutants, Leaching, Chemicals, Chemical analysis, Precipitation(Atmospheric), Runoff, Infiltration, Soil water movement.

Leachate from solid waste landfills may contain contaminants that can reach surface and groundwaters. The types and sources of contaminants were discussed, and the factors that influence their entry to ground and surface waters were explored. The author described the potential problems of leachate contaminants and stressed that solid waste landfills can be designed and operated to minimize these problems. (Sims-ISWS)
W78-07104

NORTHEASTWARD DRIFT IN THE NORTHERN MID-ATLANTIC BIGHT DURING LATE SPRING AND SUMMER 1976,
National Ocean Survey, Rockville, MD.
For primary bibliographic entry see Field 2L.
W78-07108

WATER QUALITY AT A SLUDGE ENTRENCHMENT SITE,
Agricultural Research Service, Beltsville, MD. Soil Nitrogen Lab.
L. J. Sikora, C. M. Murray, N. H. Frankos, and J. M. Walker.
Ground Water, Vol. 16, No. 2, p 96-104, March-April 1978. 4 fig, 4 tab, 10 ref.

Descriptors: *Water quality, *Sludge disposal, *Sewage sludge, On-site investigations, Observation wells, Tile drainage, Leachate, Nitrogen, Nitrogen compounds, Nitrates, Chlorides, Pollutants, Water pollution, Path of pollutants, Groundwater, Drainage.

Surface water and groundwater quality were evaluated at a site before and for four years after the area was used for entrenchment of sewage sludge. The soils in the area are sandy and are underlain by a clay barrier. Depth of the water table which in most instances is above the clay barrier is from 1.0 to 13.0 m. Water samples taken from monitoring wells, two drainage tiles located along the perimeter of the sludge trenches, a catchment pond, and a nearby stream were analyzed for NO3(-)-N,NH4(+)-N, and Cl(-). Increases in Cl(-) concentrations were detected in shallow wells within the trench site perimeter 12 months after sludge entrenchment. Chloride levels peaked approximately 18 months after entrenchment and levels declined but not to background levels four years after entrenchment. Nitrate levels increased in shallow wells located within or near the trench site perimeter at 18 months after entrenchment and peaked at 30 months. Decreases in NO3(-)-N occurred thereafter but had not reached background levels in some wells. Ammonium increases also wer detected in wells recording Cl(-) and O3(-)-N increases, but NH4(+)-N increases were inconsistent. Increases in Cl(-) and NO3(-)-N levels were recorede for wells within the trench site perimeter. The data from this study indicated that contamination of groundwater by leachate from sludge trenches was within the trench site perimeter with a lesser degree of contamination recorded in wells below the trench site. The drainage tiles and clay barrier may have had a significant effect on the resulting groundwater data, and caution is advised in extrapolating these results to other locations. (Sims-ISWS)
W78-07110

REVIEW OF ENVIRONMENTAL ISSUES OF TRANSPORTATION OF ALASKAN NORTH SLOPE CRUDE OIL,
MITRE Corp., McLean, VA. METREK Div.
For primary bibliographic entry see Field 6G.
W78-07121

SURVEY OF ALTERNATIVES TO THE USE OF CHLORIDES FOR HIGHWAY DEICING,
Federal Highway Administration, Washington, DC. Materials Div.
For primary bibliographic entry see Field 4C
W78-07122

MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, (TEXT AND APPENDIX: ORGANIC ANALYSIS DATA),
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5A.
W78-07130

ENVIRONMENTAL MONITORING NEAR INDUSTRIAL SITES: SAMPLING AND ANALYSIS OF SELECTED TOXIC SUBSTANCES, TASK 1 - VINYLIDENE CHLORIDE,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5A.
W78-07132

ENVIRONMENTAL CHEMICALS: HUMAN AND ANIMAL HEALTH, AUGUST 7-11, 1972, FORT COLLINS, COLORADO.
Colorado State Univ., Fort Collins. Inst. of Rural Environmental Health

Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 648, Price codes: A11 in paper copy, A01 in microfiche. Report No. EPA-540/9-72-015, 1972. 246 p, 20 fig, 58 tab, 328 ref.

Descriptors: *Conferences, *Publications, *Chemicals, *Public health, Human pathology, Environment, Toxicity, Pesticides, Heavy metals, Polychlorinated biphenyls, Carbon monoxide, Air pollution, Water pollution, Toxins, Pollutant identification.

Twenty-six conference papers, presented at the first annual short course on environmental chemicals held at Colorado State University, Fort Collins, Colorado August 7-11, 1972, are compiled. Primarily, the issues are the relationships and interactions of chemicals in the environment and their effects on human and animal health. Topics include: (1) trace elements in water, (2) mercury as an environmental pollutant, (3) molybdenum as an environmental pollutant, (4) lead in soils and plants, (5) heavy metal poisoning in animals, (6) adverse health effects of trace materials in the environment, (7) environmental chemicals and carcinogenesis, (8) chemical interactions, (9) exposure measurement, (10) polychlorinated biphenyls (PCB's) in humans, (11) epidemiology of poisoning by chemicals, (12) monitoring of environmental toxicants, (13) the analytical laboratory, (14) PCB's in silage and human milk in rural Colorado, (15) interaction of PCB's and other organochlorines with duck hepatitis virus, (16) carbon monoxide as a national problem, (17) carbon monoxide poisonings at high altitudes, (18) the impact of environmental chemicals in water in the Rocky Mountain area, (19) nitrates and water quality, (20) air and human health, (21) teratogenesis and mutagenesis of environmental chemicals, (22) pesticides in air, (23) USDA-APHS environmental statement, (24) PCBs: an industrial pollutant, (25) epidemiology of animal poisonings other than heavy metal, and (26) environmental geochemistry in Missouir. (See W78-07135 thru W78-07141) (Seip-IPA)
W78-07134

TRACE ELEMENTS IN WATER,
Environmental Protection Agency, Denver, CO.
A. V. Soukup.
In: Environmental Chemicals: Human and Animal Health (Proceedings), August 7-11, 1972, Fort Collins, Colorado, Report No. EPA-540/9-72-015. p 11-21. 1972. 4 tab, 7 ref.

Descriptors: *Potable water, *Trace elements, *Public health, *Human pathology, Toxicity, Arsenic, Lead, Cadmium, Dyes, Pesticides, Pesticide residues, Human physiology.

A discussion of potential health hazards resulting from trace elements in drinking water treats sources, means of ingestion, hazards, and maximum allowable concentrations (MAC) for arsenic, lead, and cadmium. Arsenic is a highly toxic chemical: potential sources include industrial wastes which may be dumped directly into streams (from which arsenic may percolate into groundwater), geologic formations, and deliberate placement. Arsenic poisoning symptoms include languor, anorexia, nausea, diarrhea, jaundice, edema, conjunctival congestion and catarrhal inflammation of the upper respiratory tract. Arsenic MAC was set by the U.S. Public Health Service at 0.01 mg/l in drinking water. Cumulative lead poisoning is of three types: gastrointestinal, neuromuscular, and central nervous system. Water contamination may result from storage in tanks painted with oil-base paint or transport through lead pipes. Lead MAC has been set at 0.05 mg/l. Cadmium poisoning may result from use of insecticides and antihelminthics, metallurgical processes wastes, and ingestion of food and liquid prepared and left in cadmium-plated containers. Cadmium poisoning symptoms include cramps, nausea, vomiting and diarrhea; cadmium tends to concentrate and remain in the liver, kidneys, pancreas, and thyroid. Cadmium MAC is set at 0.01 mg/l in drinking water. Toxic levels of many potentially hazardous dyestuffs have not been set; hydrophilic, nonpolar, breakdown-resistant dyes are most likely to reach drinking water supplies. Pesticides reach ground, surface, and drinking water through direct application, percolation, runoff, and drift. Poisoning, symptoms, toxic levels and synergistic potential are species-specific. (See also W78-07134) (Seip-IPA)
W78-07135

MERCURY AS AN ENVIRONMENTAL POLLUTANT,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
M. G. Petit.
In: Environmental Chemicals: Human and Animal Health (Proceedings), August 7-11, 1972, Fort Collins, Colorado, Report No. EPA-540/9-72-015. p 23-27, 1972. 2 fig, 6 ref.

Descriptors: *Mercury, *Air pollution, *Caves, *Digestion, *Copper, *Mining, *Arizona, Analytical techniques, Food chains, Pollutant identification, *Bats, *Bat guano, *Pollution assessment.

A 16-year chronological record of mercury concentrations, found in guano deposits of the Mexican free-tailed bat (Tadarida brasiliensis), recovered from the dry cave in Eagle Creek Canyon, Greenlee County, Arizona, was kept in order to determine the extent of mercury pollution in the area. Annual mercury concentrations in the guano were compared to the annual copper production of a smelter located 5.5 airmiles from the bat cave at Eagle Creek. Copper production decreased in the years 1957, 1958, 1959, and 1967. Guano mercury concentrations reached a relative maximum in 1957, showed a large decrease in 1958 and 1959 and, in subsequent years, did not return to the high levels observed in 1957 until 1971; the decrease in concentration was particularly acute in 1968. The 1-year delay observed between the decrease in copper production and the decrease in mercury in the flood chain of the free-tailed bat implies an indirect route of entry into this mammal's food chain; this delay suggests that the mercury is taken up from the atmosphere either directly or from precipitation at a lower level on the food chain. It is hypothesized that moth larvae or the vegetation they feed on is the port of entry into the bat's food chain. Analysis of guano deposits in dry caves is a useful tool for assessing the effectiveness of cleanup or pollution abatement procedures, geological phenomena, and soil tillage (an earth surface-altering activity which may release mercury held in the earth's crust and upper mantle). (See also W78-07134) (Seip-IPA)
W78-07136

MOLYBDENUM AS AN ENVIRONMENTAL POLLUTANT,
Colorado State Univ., Fort Collins. Dept. of Animal Science.
G. M. Ward.
In: Environmental Chemicals: Human and Animal Health (Proceedings), August 7-11, 1972, Fort Collins, Colorado, Report No. EPA-540/9-72-015. p 29-31, 1972.

Descriptors: *Molybdenum, *Environmental effects, *Toxicity, *Toxins, *Mining, *Water pollution, *Potable water, Animal pathology, Colorado, Rocky Mountain region, Mining impacts.

A project, entitled 'An Interdisciplinary Study of the Transport and Biological Effect of Molybdenum in the Environment' investigated the sources, transport, and availability of molybdenum to man on the Eastern Slope of the Rocky Mountains in Colorado. The principal source of molybdenum in Colorado waterways is the Climax molybdenum mine. The drainage from this mine is through the Ten Mile Creek to Dillion Reservoir and ultimately to the South Platte River which flows through Denver there it is tapped for urban water supply and into farming areas around Brighton and Platteville, where it furnishes irrigation water. Another source of molybdenum in Denver is Clear Creek, which drains the area of another mine near Empire. The relation between mining activity and the concentration of molybdenum is supported by data comparing molybdenum concentrations in water from various sources in Colorado and by the fact that streams draining an undisturbed area of known molybdenum deposits have normal molybdenum levels. Molybdenum poisoning is particularly severe in ruminating animals and is linked to a copper deficiency and an enzyme inactivation. A research plan is detailed in which flora and fauna, irrigation water, soil samples, milk, food chain and Dillion Reservoir biota were analyzed for molybdenum levels. Metabolic studies are underway to evaluate the effects of low level chronic intakes of molybdenum by rats. The chemical properties of molybdenum are also being investigated extensively. (See also W78-07134) (Seip-IPA)
W78-07137

LEAD IN SOILS AND PLANTS,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
R. L. Zimdahl, and J. H. Arvik.
In: Environmental Chemicals: Human and Animal Health (Proceedings), August 7-11, 1972, Fort Collins, Colorado, Report No. EPA-540/9 72-015. p 33-40. 1972. 2 fig, 1 tab.

Descriptors: *Lead, *Vegetation, *Plant grouse, *Absorption, *Soil contamination, Analytical techniques, Pollutant identification, Environmental effects, *Automobile emissions, Lead uptake.

The transport of lead through soil and its uptake by and effect on plants was investigated in a research project entitled 'Impact on Man of Environmental Contamination Caused by Lead', now underway at Colorado State University. A truck-mounted hydraulic probe was used to sample the soil in 6-in vertical increments to a depth of 3 ft, and in horizontal increments to approximately 500 ft in order to determine the effects of lead in automobile exhaust emissions on lead uptake in soils. Results confirmed previous observations: lead content in soil decreases with increasing depth and distance from the highway. Factors such as wind and load conditions on the automobiles (affecting the amount of gasoline burned, and hence the emission and lead deposition rates) affect the areal distribution and depth of lead in soils. Studies of seven soil types indicate that the cation exchange capacity (CEC) is a primary determinant of the soil's ability to sorb lead; CEC is attentuated by pH to the degree that less lead is sorbed in soils of low pH, and hence may be more available to plants. Studies of lead uptake in plants indicate that uptake is directly related to lead concentration in solution. In general, lead remains concentrated in the root with limited translocation to the shoot. The ratio of the amount of lead in the root to that in the shoot decreased with increasing solution concentrations. Data indicate limited translocation under most conditions and limited root-capacity to bind and hold lead. The site of lead uptake by a plant is in the root rather than in the shoot. Foliar, stomatal, and cuticular penetration are currently under study, but data indicate that penetration is minimal for each type. Analytical procedures are detailed. (See also W78-05134) (Seip-IPA)
W78-07138

CHEMICALS IN THE WATERS OF THE ROCKY MOUNTAIN REGION,
Colorado State Univ., Fort Collins. Dept. of Zoology.
C. G. Wilber.
In: Environmental Chemicals: Human and Animal Health (Proceedings), August 7-11, 1972, Fort Collins, Colorado, Report No. EPA-540/9-72-015. p 135-149, 1972. 5 tab, 18 ref.

Descriptors: *Chemicals, *Chemical reactions, *Rocky Mountain Region, *Trace elements, *Aquatic environment, *Aquatic life, Diversion, Rivers, Streams, Copper, Zinc, Aluminum, Lead, Dissolved oxygen, Chromium, Mercury, Alterations of flow, *Synergism, Antagonism, *Trace metals, Aluminum salts.

A general overview of the chemical nature of Rocky Mountain natural water hydrology is presented with particular emphasis on trace metal levels, contamination, and impact. An assortment of chemicals in unusual concentrations in water can drastically modify the biology of a species without directly killing it. Synergism and antagonism are involved in the final overall biological action of the effluent. The synergistic interaction of zinc and copper and its effect on rainbow trout and Atlantic salmon is detailed. The streamflow of Rocky Mountain rivers is extremely variable and causes dramatically fluctuating chemical characteristics. Transmountain diversion of water is extremely common and significantly impacts the hydrology of the area; it is projected that future manipulations of rivers by man will stabilize the stream flow. The function in animal life and can act synergistically with other substances to increase toxicity. Results of water analyses for mercury, aluminum salts, lead, and dissolved oxygen are reported. Dissolved oxygen requirements are estimated and detailed. (See also W78-07134)
W78-07139

NITRATES: HUMAN AND ANIMAL HEALTH,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
J. Osteryoung.
In: Environmental Chemicals: Human and Animal Health (Proceedings), August 7-11, 1972, Fort Collins, Colorado. Report No. EPA-540/9-72-015. p 151-172, 1972. 2 fig, 5 tab, 79 ref.

Descriptors: *Nitrates, *Nitrogen compounds, *Nitrites, *Public health, *Potable water, Toxicity, Toxins, Foods, Standards, *Carcinogens, *Methemoglobinemia, Nitrosamines, Sudden death syndrome.

The hazards associated with ingestion of nitrates are reviewed. The nitrate content of foods (which occurs naturally and as a result of additives) and the mechanism of nitrate toxicity are detailed. Methemoglobinemia is a serious and often fatal result of nitrate exposure. Evidence indicates that some people are indirectly exposed to carcinogenic nitrosamines through nitrate and nitrite exposure. Chronic effects of nitrate exposure are unknown but may include hypertension and atheroschlerotic disease. There is some possibility of involvement of nitrate exposure with sudden death in infants and adults. Drinking water standards have been set at 45 mg/l nitrate (10 mg/l nitrogen) by the U.S. Public Health Service; significant evidence exists that such a level is too high, particularly for infant consumption. Toxic levels are highly dependent on individual variation (in body weight, consumption, and age) and climate. Epidemological and physiological studies are imperative, as are public education programs and revision of maximum allowable concentration. (See also W78-07134) (Seip-IPA)
W78-07140

POLYCHLORINATED BIPHENYLS: AN INDUSTRIAL POLLUTANT,
Colorado State Univ., Fort Collins. Dept. of Entomology.
R. E. Johnsen.
In: Environmental Chemicals: Human and Animal Health (Proceedings), August 7-11, 1972, Fort Collins, Colorado. Report No. EPA-540/9-72-015. p 213-220, 1972. 4 fig, 4 tab, 2 ref.

Descriptors: *Polychlorinated biphenyls, *Chemical properties, *Environmental effects, *Pollutant identification, DDT, Industrial wastes, Industrial production.

The widespread use of polychlorinated biphenyls (PCB's) in industrial processes has resulted in a severe environmental pollution problem. PCB's manufactured by the direct chlorination of biphenyls exist in about 100 forms, depending on the degree of chlorination and the position of chlorine on the rings. Recent advances in analytical instrumentation have facilitated the positive identification of PCB's in the environment; the environment incidence of PCB's worldwide indicated that they are most abundant in industrialized nations. In the U.S., PCB's have been found in human hair and adipose tissues, bald eagles, sewerage, birds, fish, human milk, and river and stream water. The physical properties which insure the environmental persistence of PCB's incude: (1) low vapor pressure and water solubility, (2) high boiling point, lipid solubility, dielectric constant, and thermal stability; (3) high resistance to acids, alkalies, and corrosive chemicals; and (4) high resistance to oxidation and environmental breakdown. Because of their chemical structure, PCB's are considerably more resistant to breakdown than is DDT. Possible routes of PCB's into the environment include: (1) incineration of waste materials; (2) accidental leaks of equipment such as heat transfer systems; (3) weathering or friction-wearing of the action with food products in their uses as an ingredient in substances such as plastics and paint. PCB's are readily absorbed into the root systems of certain plants. (See also W78-07134) (Seip-IPA)
W78-07141

ECOLOGICAL CARRYING CAPACITY RESEARCH: YOSEMITE NATIONAL PARK, PART IV. SEASONAL AND GEOGRAPHICAL DISTRIBUTION OF INDICATOR BACTERIA IN SUBALPINE AND ALPINE WATERS,
California Univ., Berkeley. Dept. of Plant Pathology.
J. E. Holmes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 958. Price codes: A08 in paper copy, A01 in microfiche. Report No. NPS - YOSE-WR-004, September 8, 1976. 162 p, 60 fig, 33 ref. CX 8000-4-0026.

Descriptors: *Coliforms, *Enteric bacteria, *Sewage bacteria, *Aquatic bacteria, *Pollutant identification, *Fluctuations, *Seasonal, *Microenvironment, Lakes, Streams, Groundwater, Snowmelt, California, National Parks, *Yosemite National Park, *Fecal coliforms, *Fecal streptococci, *Subalpine ecology, Flushing.

Research in the vicinity of Tuolumne meadows, Nelson and Matthes Lakes in Yosemite National Park, was undertaken in 1974 to assess the nature and extent of user damage (impact) to the ecology of this subalpine area. Limnological data indicated thorough annual flushing by snowmelt and little opportunity for accumulation of introduced nutrients and associated eutrophication. Limited testing for total coliform bacteria led to a greatly expanded study (summer 1975) of total coliform, fecal coliform, and fecal streptococci indicator bacteria in 12 watersheds of the Yosemite wilderness. Typical waters ranged from virtual sterility in early July snowmelt, to light and moderate levels in August and September samples, to heavy levels in storm runoff. Little correlation of human use with increased indicator levels was shown, due either to masking by background levels of indicators from the native warm-blooded species or to lack of markedly substantial human bacterial inputs to surface and ground waters. There was a strong indication that lake waters are safer sources of drinking water than streams, except along heavily used lakeshores. (Seip-IPA)
W78-07142

ANAEROBIC MICROBIAL COMMUNITY METABOLISM IN SPARTINA ALTERNIFLORA SOILS,
Georgia Univ., Athens. Dept. of Microbiology.

For primary bibliographic entry see Field 2G.
W78-07156

THE DECOMPOSITION OF STANDING AND FALLEN LITTER OF TYPHA GLAUCA AND SCIRPUS FLUVIATILIS,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5C.
W78-07162

AN UNUSUAL PUMP TEST NEAR ESTERHAZY, SASKATCHEWAN,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5G.
W78-07172

WATER QUALITY INTERPRETIVE REPORT, PRINCE EDWARD ISLAND, 1961 - 1973,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 5A.
W78-07176

CRANKCASE OILS: ARE THEY A MAJOR MUTAGENIC BURDEN IN THE AQUATIC ENVIRONMENT,
Fisheries and Marine Service, St. John's (Newfoundland). Biological Station.
J. F. Payne, J. Martins, and A. Rahimtula.
Science, Vol 200, No 4339, April 21, 1978, p 329-330, 1 tab, 26 ref.

Descriptors: Environmental effects, *Water pollution, *Oil, Genetics, Fish genetics, Aquatic habitats, Aquatic environment, *Oil pollution, *Mutagenesis, Crankcase oil.

This study showed that fish can produce mutagenic metabolities from polycyclic aromatic hydrocarbons (PAH) and that used crankcase oils released to the aquatic and terrestrial environment may represent a considerable mutagenic threat. Benzopyrene and benzanthracene, which are produced in automobile engines, did not appear to be the major mutagenic components. Fish taken from environmental sites with a history of oil contamination have been shown to have elevated aromatic hydrocarbon hydrolases (AHH) levels. In some mammalian systems there has been seen a relationship between AHH activity and susceptibility to hydrocarbon-induced cancers. It is suggested that the public health hazard of crankcase oil should be reassessed. (Chilton-ORNL)
W78-07190

THE FATE OF CHLORINE IN SEA-WATER,
Woods Hole Oceanographic Inst., MA. Dept. of Chemistry.
G. T. F. Wong, and J. A. Davidson.
Water Research, Vol 11, No 11, 1977, p 971-978, 8 fig, 2 tab, 30 ref.

Descriptors: Water pollution, *Water pollution sources, Pollutants, Chlorine, *Sea water, Chemistry, Chemical reactions, *Path of pollutants.

In order to assess the full environmental impact of the chlorination of sea-water, it is necessary to understand the complex and competing reactions which take place in salt water systems. The term chlorine demand applied to sea water describes a variety of chemical reactions which all lead to the disappearance of titratable free or combined chlorine. It was concluded that measurements of chlorine demand in toxicity analyses of marine waters has limited usefulness because it does not provide any insight into the actual fate of chlorine added. Hypochlorite undergoes a rapid (2.5 min exchange reaction with bromide to form hypobromite which is unstable in seawater. The

products of the decomposition of hypobromite are not yet identified. There appears to be no limit to the capability of seawater to consume hypohalite indicating that the reaction is either an autodecomposition or that the reactant which consumes hypohalite must be abundant in seawater. (Chilton-ORNL)
W78-07193

5C. Effects Of Pollution

THE ENVIRONMENT OF AMCHITKA ISLAND, ALASKA.
Department of Energy, Washington, DC. Div. of Military Application.
For primary bibliographic entry see Field 6G.
W78-06702

WEST ANTARCTIC ICE SHEET AND CO2 GREENHOUSE EFFECT: A THREAT OF DISASTER,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
For primary bibliographic entry see Field 5B.
W78-06721

HIGHWAY OPERATION AND PLANT DAMAGE,
California State Dept. of Transportation, Sacramento. Transportation Lab.
For primary bibliographic entry see Field 5B.
W78-06725

ACCUMULATION OF WATER SOLUBLE PHOSPHORUS AND HYDROLYSIS OF POLYPHOSPHATES BY CLADOPHERA GLOMERATA (CHLOROPHYCEAE),
Wisconsin Univ., Milwaukee. Dept. of Botany.
C. K. Lin.
Journal of Phycology, Vol. 13, No. 1, March 1977, p. 46-51. 5 fig, 2 tab, 48 ref. OWRT A-041-WIS(2).

Descriptors: *Cladophora, *Phosphorus, *Hydrolysis, *Enzymes, *Hydrogen ion concentration, Chlorophyta, Phosphorus compounds, Catalysts, Light intensity, Magnesium, Lake Michigan, Great Lakes, Cladophora glomerata(L.) Kutz.

In a study of phosphorus accumulation by the aquatic algae Cladophora glomerata (L.) Kutz in relation to external nutrient supply and to hydrolysis of polyphosphates, it was found that concentrations of hot-water extractable phosphorus from most samples were relatively high (0.06-0.68%) and correlated closely wtih the amount of total dissolved phosphorus in the ambient Lake Michigan water. The massive growth of this green algae in the lower Great Lakes is related to phosphorus input from point source pollution stemming from waste water discharge, involving pyrophosphate and tripolyphosphate which have been commonly used as detergent builders. Using samples collected along the Lake Michigan shore near the Milwaukee River and the municipal sewage discharge into Milwaukee harbor, measurements were made for extractable phosphate and intracellular, extracellular and cell wall forms of phosphatases. Cladophora was able to hydrolyze polyophosphate by enzymes found in the three types of cell fractions. Intracellular phosphatase activity is pH dependent with the optimal hydrolysis rate at pH 7.8. Phosphatase secretion is affected by pH, with the maximum rate at 7 but affected little by light intensity. Magnesium is the most important effective metallic cofactor required for maximal rates of intracellular phosphatase activities. (See also W72-13644) (Harris-Wisconsin)
W78-06747

SHELL GROWTH OF UNFED OYSTERS IN THE LABORATORY: A SUBLETHAL BIOASSAY SYSTEM FOR POLLUTANTS,
Maryland Univ., College Park. Dept. of Chemistry.
K. A. Conger, M. L. Swift, J. B. Reeves, III, and S. Lakshmanan.
Life Sciences, Vol. 22, No. 3, January 1978, p 245-254, 5 fig, 3 tab, 12 ref. OWRT B-012-MD(2), 14-31-0001-3669.

Descriptors: Environmental effects, *Water pollution effects, *Bioassay, Oysters, Calcium, Toxicity, Pollutant identification, Sublethal bioassay.

Unfed oysters were maintained in tanks at 17C and a salinity of 12 g/l. When the tanks were supplemented with calcium ion concentrations of 1.5 mM was determined. Oysters subjected to an initial concentration of 0.25 mg/l cadmium to oysters is well known and this experiment was done to delineate the responsiveness of the assay system to a general metabolic inhibitor. (Chilton-ORNL)
W78-06750

COMBINED EFFECT OF THERMAL AND ORGANIC POLLUTION ON OXYGEN SAG CURVE - PHASE II,
Worcester Polytechnic Inst., MA.
K. Keshavan, and G. C. Sornberger.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 034, Price codes: A05 in paper copy, A01 in microfiche. Completion Report, (1978). 89 p. OWRT C-4067 (No 9014)(1).

Descriptors: *Water pollution effects, *Organic wastes, *Dissolved oxygen, *Oxygen sag curve, *Thermal pollution, *Thermal overload, Deoxygenation coefficient, Reaeration coefficient, Optimal location, Critical oxygen concentration, Saturation oxygen concentration, Temperature gradient, Plug flow model, Longitudinal dispersion, Variable temperature, *Estuarine dynamics, *Monte Carlo simulation, Stochastic model, Oxygen demand, Biochemical oxygen demand.

In Part I a hydraulic model was used to obtain the longitudinal dispersion coefficient to be used in a set of three differential equations to obtain the Oxygen Sag Curve. The three differential equations could not be solved in this research because of the extreme complexity faced as a result of variable coefficients. In Part II a Monte Carlo computer simulation of the estuarine dynamics of BOD motion and decomposition was developed subject to the effects of longitudinal dispersion, fresh water flow, cyclic tidal flow, and thermal overload. Sample travel patterns and BOD decomposition profiles were obtained under varying sets of initial conditions with the results displayed both graphically and in tabular form. The interpretation of the underlying stochastic model and the Monte Carlo simulated travel patterns is discussed and the applicability of the method to water quality management is indicated. (See also W73-11423)
W78-06751

WATER QUALITY ASSESSMENT FOR THE KANAWHA RIVER BASIN (NORTH CAROLINA, VIRGINIA, WEST VIRGINIA),
Environmental Protection Agency, Wheeling, WV. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5G.
W78-06778

BENCHMARK ESTABLISHMENT AND WATER QUALITY MONITORING IN THE BRIDGEPORT AND BLACK ROCK HARBOR SYSTEMS,
Higher Education Center for Urban Studies, Bridgeport, CT.
For primary bibliographic entry see Field 5A.
W78-06787

STUDY OF THE CONDITIONS OF POLIOMYELITIS VIRUS AND ESCHERICHIA COLI BACTERIOPHAGE CONCENTRATION ON ION-EXCHANGE RESINS (IN RUSSIAN),
Institute of General and Municipal Hygiene, Moscow (USSR).
N. K. Lepakhina
Gig Sanit 2, p 56-59, 1977

Descriptors: *Poliomyelitis virus, *Viruses *E. coli, *Bacteraphages, *Ion exchange resins, Enterioviruses, Picornavirus, Water pollution

A comparative study of a number of Soviet ion-exchange resins was conducted to determine their suitability for the isolation of enteroviruses (poliomyeltis virus) and coli phages in water bodies and in drinking water. Resins AV-17-IK and An31G proved most effective. Optimal conditions for concentrating the viruses were determined.--Copyright 1978, Biological Abstracts, Inc.
W78-06816

SUBLETHAL EFFECTS OF THE WATER-SOLUBLE FRACTION OF NIGERIAN CRUDE OIL ON THE JUVENILE HARD CLAMS, MERCENARIA MERCENARIA (LINNE),
Delaware Univ., Lewes. Marine Studies Complex.
R. T. Keck, R. C. Heess, J. Wehmiller, and D. Maurer.
Environmental Pollution, Vol 15, No 2, p 109-119, February 1978. 5 fig, 2 tab, 30 ref.

Descriptors: *Oil pollution, *Clams, *Water pollution effects, Resources development, Environmental effects, Mortalities, Outer Continental Shelf, Crude oil, Mercenaria mercenaria, Hydrocarbons, Nigerian crude oil, Sublethal effects, Petroleum.

Juvenile hard clams, Mercenaria mercenaria (Linne), were exposed to the water-soluble fraction (WSF) of Nigerian crude oil at cncentrations ranging from 7 ppm to 0.06 ppm. During the six-week experimental period the feeding rates of the clams exposed to hydrocarbons were significantly lower than those of the controls. The growth rates of control clams were three times greater than the growth rates of the experimental groups. Mortalities were low during the entire experimental period; however, during a two-week depuration period all clams in the most polluted conditions (7 ppm) died. (Sinha - OEIS)
W78-06831

RESISTANCE OF DETRITOPHAGES OF BIOFILTERS IN PHENOL POISONING (IN RUSSIAN),
Research Inst. of Chemical Technology and Polymer, Dzerzhinsk (USSR).
O. G. Bobrov, and V. V. Sudakova.
Gidrobiol Zh 13(1), p 71-74, 1977.

Descriptors: *Detritophages, *Bacteriophages, Biofilters, *Phenols, Lethal limit, Toxicity, Caloglyphus-sphaerogaster, Histiogaster-sp, Psychoda-alternata.

Resistance (MTC (maximum tolerable concentration), CL50 and CL100) of Psychoda alternata (Say.) and Histiogaster sp. and Caloglyphus sphaerogaster Zachv. larvae was determined in aqueous solutions of salicylic and carboxlic acids (acute experiments). This established index depended mainly on the morphophysiological peculiarities of the organisms. Discussed is the possibility of using the highly toxic phenolic waste of salicylic acid production for mite and insect control to render sediments of biological purification plants harmless.--Copyright 1978, Biological Abstracts, Inc.
W78-06833

BIOAVAILABILITY OF NAPHTHALENES FROM MARINE SEDIMENTS ARTIFICIALLY

CONTAMINATED WITH PRUDHOE BAY CRUDE OIL,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
G. Roesijadi, D. L. Woodruff, and J. W. Anderson.
Environmental Pollution, Vol 15, No 3, p 223-229, March 1978. 2 tab, 17 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Sediments, *Clams, *Absorption, Outer Continental Shelf, *Bioavailability, Marine sediments, Prudhoe Bay crude oil, Crude oil, Naphthalenes, Macoma inquinata.

Uptake of naphthalenes from sand and detritus contaminated with Prudhoe Bay crude oil was examined in the detritivorous clam Macoma inquinata. Concentrations of naphthalenes were determined by ultraviolet spectrophotometry and the use of radiolabelled 14C-2-methylnaphthalene. Exposure of M. inquinata to contaminated sediments indicated that uptake of naphthalenes which were released from sediment to the surrounding water were available from uptake by the clams. Results were consistent with the results of other studies which examined bioavailability of naphthalenes from oil-contaminated sediment. (Sinha - OEIS)
W78-06834

EFFECTS OF CRUDE OILS AND THE OIL DISPERSANT COREXIT ON PRIMARY PRODUCTION OF ARCTIC MARINE PHYTOPLANKTON AND SEAWEED,
Fisheries and Marine Service, Ste Anne de Bellevue (Quebec). Arctic Biological Station.
S. I. C. Hsiao, D. W. Kittle, and M. G. Foy.
Environmental Pollution, Vol 15, No 3, p 209-221, March 1978. 7 fig, 4 tab, 21 ref.

Descriptors: *Oil pollution, *Phytoplankton, *Arctic, *Toxicity, *Water pollution effects, Oil spills, Algae, Outer Continental Shelf, *Dispersants, *Corexit, Laminaria, Seaweeds.

Effects of crude oil and Corexit on primary production of arctic marine phytoplankton were studied in situ. The production rate varied with types and concentrations of crude oil, method of preparation of oil-seawater mixtures, environmental conditions and species composition of each sample tested. In samples with the same species composition, inhibition of production generally increased ith increasing oil concentration. The crude oil-Corexit mixtures were more toxic than crude oil or Corexit alone. In situ primary production of the seaweeds, Laminaria saccharina (L.) Lamouroux and Phyllophora truncata (P.) Newroth et Taylor was significantly inhibited by all types and concentrations of oil tested. (Sinha - OEIS)
W78-06835

THE BIOLOGICAL EFFECTS OF THE WATER-SOLUBLE FRACTIONS OF A NO. 2 FUEL OIL ON THE PLANKTONIC SHRIMP, LUCIFER FAXONI,
Texas Univ. at Austin, Port Aransas. Marine Science Inst.
W. Y. Lee, K. Winters, and J. A. C. Nicol.
Environmental Pollution, Vol 15, No 3, p 167-183, March 1978. 3 fig, 8 tab, 40 ref.

Descriptors: *Water pollution effects, *Oil pollution, *Plankton, *Shrimp, Aromatic compounds, Resources development, Outer Continental Shelf, Lucifer faxoni, Hydrocarbons, Fuel oil.

The biological effects of water-soluble fractions (WSFs) of a No. 2 fuel (heating) oil on the planktonic shrimp, Lucifer faxoni, were investigated. Biological parameters used to assess toxicity were survival, respiration, feeding rate and degree of activity. The biological and chemical data appear to indicate that the higher toxicity of fresh WSF to L. faxoni was due to volatile aromatic hydrocarbons. It seems that the toxicity of oil spills could be markedly less than some laboratory results suggest because there is reduced toxicity following weathering by evaporation. Respiration rates of L. faxoni during an 8 hr. exposure to freshly prepared WSF rose with increasing concentrations up to 30% of WSF, then fell further increases of concentration of WSF. (Sinha - OEIS)
W78-06836

TOXICOLOGY OF POLYETHYLENEPOLYAMINE AND SUBSTANTIATION OF ITS MAXIMUM PERMISSIBLE CONCENTRATION IN BODIES OF WATER (IN RUSSIAN),
V. I. Antonova, Z. A. Salmina, and T. V. Vinokurova.
Gig Sanit (2), p 32-35, 1977.

Descriptors: *Toxicology, *Polyethylenepolyamine, Amines, Lethal limit, Pollutant identification, Water quality standards, Mice, Rats, *Organoleptic indices.

The effect of polyethylenepolyamine on the organoleptic indices of water, the sanitary regimen of water bodies and the body of warm-blooded animals (rats, mice) under conditions of acute, subacute and chronic action were studied. The data obtained allowed the substantiation and recommendation of the maximum permissible concentration of polyethylenepolyamine to be 0.005 mg/l in bodies of water.--Copyright 1978, Biological Abstracts, Inc.
W78-06837

ON THE QUESTION OF O2 REQUIREMENT IN DETERMINING ACUTE TOXICITY IN FISH (IN GERMAN),
Bundesgesundheitsamt, Berlin (West Germany). Inst. fuer Wasser-, Boden- und Lufthygiene.
P. Sobhani, and F. Herzel.
Z Angew Zool 63(1), p 111-114, 1976.

Descriptors: *Oxygen requirements, *Toxicity, Water pollution effects, Pollutant identification, *Chub, Leucisus-idus.

The O2 content in test squaria is an important criterion for the determination of toxicity for fish. Since continuous aeration had an unfavorable effect upon a number of chemical tested, the dynamics of O2 concentration resulting from the keeping of test animals (chub, Leuciscus idus) in non-aerated aquaria over a number of days were measured.--Copyright 1978, Biological Abstracts, Inc.
W78-06838

POLYAROMATIC HYDROCARBONS IN OYSTER FROM COASTAL LAGOONS ALONG THE EASTERN COAST OF THE GULF OF MEXICO, MEXICO,
Universidad Nacional Autonoma de Mexico, Mexico City. Inst. de Geofisica; and Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Ciencias del Mar y Limnologia.
H. A. Bravo, S. L. Salazar, A. V. Botello, and E. F. Mandelli.
Bulletin of Environmental Contamination and Toxicology, Vol 19, No 2, p 171-176, February 1978. 2 fig, 1 tab, 11 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Gulf of Mexico, Mollusks, Resources development, Outer Continental Shelf, Natural sources, Benzene, Polyaromatic hydrocarbons.

Polynuclear aromatic hydrocarbons (PAHs) appear to be widely distributed in the sea, as well as in river water and soil. The presence of these compounds in aquatic organisms has been mainly attributed to oil spills, but biosynthesis, aerial transport, and terrestrial contributions are also important sources. The assessment of PAHs levels in marine bivalve mollusks has attracted great interest, since they are useful in determining the status of coastal areas with regard to petroleum contamination. The total concentrations of the PAHs in the analyzed samples are surprisingly high for oyster tissues. No single causative factor will adequately explain environmental data of this kind because the possibility of accidental spillages and intermittent activities that may contribute to the distortion of these results and provide a basis for further investigation. (Sinha-OEIS)
W78-06840

THE EFFECTS OF THE WATER-SOLUBLE FRACTIONS OF NO. 2 FUEL OIL ON THE EARLY DEVELOPMENT OF THE ESTUARINE FISH, FUNDULUS GRANDIS BAIRD AND GIRARD,
Texas A and M Univ., College Station. Dept. of Biology; and Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Labs.
V. Ernst, J. M. Neff, and J. W. Anderson.
Environmental Pollution, Vol 14, No 1, p 25-35, September 1977. 7 fig, 2 tab, 14 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Embryonic growth stage, Estuarine fisheries, Resources development, Outer Continental Shelf, Fundulus grandis, Fuel oil, Petroleum, Hydrocarbons.

Embryos of Fundulus grandis were exposed continuously to 12.5, 25 and 50% dilutions of the water-soluble fraction (WSF) of No. 2 fuel oil, corresponding to aqueous petroleum hydrocarbon concentrations of 1.1, 2.2 and 4.4 ppm, respectively, and aqueous naphthalenes concentrations of 0.56, 1.07 and 1.26 ppm, respectively. At different times during development, embryos were examined histologically and compared wit unexposed controls. Embryos exposed to 12.5% WSF generally hatched earlier than the controls and most were normal. Some of those exposed to 25% WSF has pathological liver, kidney, lens and epithelial tissues while others appeared normal. None of the embryos exposed to 50% WSF hatched and all had pathological tissues. (Sinha-OEIS)
W78-06841

DISTRIBUTION OF N-PARAFFINS IN SEAGRASSES, BENTHIC ALGAE, OYSTERS AND RECENT SEDIMENTS FROM TERMINOS LAGOON, CAMPECHE, MEXICO,
Universidad Nacional Autonoma de Mexico, Mexico City, Centro de Ciencias del Mar y Limnologia.
For primary bibliographic entry see Field 5B.
W78-06842

ENVIRONMENTAL RISK OF BEAUFORT SEA OIL SPILLS--A MANAGEMENT TOOL,
Coast Guard Research and Development Center, Groton, CT.
For primary bibliographic entry see Field 5G.
W78-06844

DISTRIBUTION OF TAR BALLS ON BAHAMIAN BEACHES,
Canada Centre for Inland Waters, Burlington (Ontario).
For primary bibliographic entry see Field 5B.
W78-06845

BIOLOGICAL EFFECTS OF OIL ON EARLY DEVELOPMENT OF THE BALTIC HERRING CLUPEA HARENGUS MEMBRAS,
Swedish Water and Air Pollution Research Lab, Nykoping. Baltic Sea Lab.
O. Linden.
Marine Biology, Vol 45, No 3, p 273-283, 1978. 6 fig, 3 tab, 27 ref.

Descriptors: *Oil pollution, *Water pollution effects, *Oil spills, *Herrings, Fish egg, *Outer Continental Shelf, *Baltic Sea, Clupea harengus membras, Crude oil, Fuel oil.

The effects of petroleum hydrocarbons from two crude oils and one fuel oil (no. 1) were studied on the ontogenic development of the Baltic herring, Clupea harengus membras L. The results are discussed in relation to the potential effects of oil spills and chronic oil pollution on fish eggs and larvae in the Baltic Sea. (Sinha-OEIS)
W78-06847

HYDROCARBONS IN THE MARINE ENVIRONMENT. II. DISTRIBUTION OF N-ALKANES IN THE FAUNA AND ENVIRONMENT OF THE SUB-ANTARCTIC ISLAND OF SOUTH GEORGIA,
Torry Research Station, Aberdeen (Scotland); and British Antarctic Survey, Cambridge (England).
For primary bibliographic entry see Field 5B.
W78-06849

ACCUMULATION AND ELIMINATION OF DIELDRIN IN MUSCLE TISSUE OF CHANNEL CATFISH,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 5B.
W78-06853

THE RELATIONSHIP BETWEEN LIGHT AND PHOTOSYNTHETIC RATE IN A RIVER COMMUNITY AND IMPLICATIONS FOR WATER QUALITY MODELING,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
G. M. Hornberger, M. G. Kelly, and R. M. Eller.
Water Resources Research, Vol. 12, No. 4, p 723-730, August 1976. 7 fig, 1 tab, 31 ref. OWRT C-5333(No. 4231)(3).

Descriptors: *Photosynthesis, Aquatic environment, Aquatic habitats, Nutrients, Inhibition, *Model studies, Water quality, *Light, *Productivity, *Virginia, *Mechum River(Va), *Water quality modeling.

Saturation of photosynthesis at naturally occurring high light intensities has widely been reported for aquatic communities. Contrary to this, using free water measurement methods, we found a relationship between light intensity and photosynthesis in a small river that was unmistakably linear on cloudless days and on days when points corresponding to times of highly variable radiaton were discarded. The linear relationship obtained through the year. Simulations of nutrient-limited growth in light-dark bottles show that nutrientf depletion effects can explain the cases of light saturation and inhibition previously reported in the literature. If light saturation and inhibition of photosynthesis are due even in part to artificially induced nutrient limitation, then the inclusion of nonlinear light terms in water quality models is inappropriate. (Skogerboe-Colorado State)
W78-06854

EFFECTS ON THE DELAWARE RIVER ESTUARY OF THE CORINTHOS OIL SPILL AT MARCUS HOOK ON JANUARY 31, 1975,
Rutgers - The State Univ., new Brunswick, NJ. Water Resources Research Inst.
R. C. Ahlert, W. Clement, and H. H. Haskin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 734, Price codes: A02 in paper copy, A01 in microfiche. Staff Report, 'Petroleum Industry in the Delaware Estuary'. National Science Foundation Report No. NSF-RA-E-75-193, December 1975. 17 p, 2 fig, 3 tab. Grant No. G42282.

Descriptors: *Oil spills, *Oil pollution, *Water pollution effects, Estuaries, Fish, Toxicity, *Outer Continental Shelf, Corinthos Oil spill, Tanker ships, Crude oil, *Delaware River Estuary.

The data collected subsequent to the Corinthos oil spill on January 31, 1975 did not indicate any 96 hour fish toxicity in the waters adjacent to and influenced by the spill either immediately after the spill or 60 hours after the spill. There is some indication that the spill increased the hydrocarbon contents of the water immediately after and adjacent to the spill, but subsequent analysis did not reveal any picture of waters containing high hydrocarbon levels proceeding down the estuary. No effect was observed when the phenol analyses are considered. A few relatively high values are susceptible to differing interpretations. Thus, whatever effects there were seem mainly to be concentrated in the vicinity of the spill and analytically disappear rapidly thereafter. (Sinha-OEIS)
W78-06857

THE METULA OIL SPILL,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Lab.
For primary bibliographic entry see Field 5B.
W78-06862

COMBINED TOXICITY EFFECTS OF CHLORINE, AMMONIA, AND TEMPERATURE ON MARINE PLANKTON,
Woods Hole Oceanographic Inst., MA.
J. C. Goldman, and J. H. Ryther.
Available from the National Technical Information Service, Springfield, VA 22161 as COO-2532-2, Price codes: A04 in paper copy, A01 in microfiche. Woods Hole Oceanographic Institution Progress Report for Period Sept 16, 1975 - Sept 30, 1976 for the U.S. Energy Research and Development Administration, Oct 1976. 57 p, 11 fig, 9 tab, 51 ref. ERDA-E(11-1)-2532.

Descriptors: *Pollutant identification, *Chlorine, *Ammonia, *Temperature, *Water pollution effects, *Environmental effects, Plankton, Fish, Shellfish, Bioassay, Outer Continental Shelf.

Research on the combined effects of chlorine, ammonia and temperature on marine plankton have been carried out for 20 months. To date continuous-flow bioassays have been conducted on lobster larvae, oyster larvae, copepods, rotifers, three juvenile and larval fish, killifish, scup, and winter flounder, and phytoplankton. In addition, studies on zooplankton metabolism, filtration rates and growth were carried out on exposed organisms. In general, the responses of invertebrates were distinctly different than those of fish: increasing mortality with increasing chlorine dose and greater sensitivity of chloramines than free chlorine in the former, and a threshold level of chlorine and greater sensitivity to free chlorine in the latter. Phytoplankton responses indicate that chlorine effects on primary producers are minimal compared to the serious effects on zooplankton, particularly larval forms that spawn intermittently. The chemistry of chlorine is exceedingly complex. Bromine compounds are formed upon chlorination of seawater and the disappearance of added chlorine is rapid and occurs in two phases: an organic demand and chemical decomposition of the halites. The overall conclusions is that chlorine application at power plants must be carried out with extreme caution and that serious consideration should be given to applying dechlorination at all coastal cooling systems. (Sinha-OEIS)
W78-06863

POTENTIAL MARICULTURE YIELD OF FLOATING SEA THERMAL POWER PLANTS. PART I--GENERAL STATEMENT,
Lamont-Doherty Geological Observatory, Palisades, NY.; and City Univ. of New York. Inst. of Marine and Atmospheric Science.
O. A. Roels, S. Laurence, L. Van Hemelrijck, and A. F. Amos.
Available from the National Technical Information Service, Springfield, VA 22161 as CONF-751235-2, Price codes: A02 in paper copy, A01 in microfiche. Presented at Fall Meeting of American Geophysical Union, held in San Francisco, CA, Dec 8-12, 1975, and at Conference 'Energy from the Oceans--Fact or Fantasy' Held Raleigh, NC on Jan 27-28, 1976. 21 p, 2 fig, 4 tab, 3 ref. ERDA-E(11-1)-2581.

Descriptors: *Aquaculture, *Thermal pollution, *Thermal powerplants, Water resources, Resources development, Environmental effects, Outer Continental Shelf, Ocean thermal energy, *Mariculture, *Floating power plants.

Mariculture is not only compatible with electrical power production in sea-thermal power plants, but it is a highly desirable and economically sensible approach to the energy and food situation currently facing the world. The technical feasibility of maintaining the proper mixing of deep and surface water, and keeping this mixed layer at an optimum depth within the euphotic zone, remains to be demonstrated, as does a simple and inexpensive means of growing and harvesting shellfish in the open sea. Increasing cooperation between the power engineers, economists and mariculturists interested in OTEC plants is obviously needed. No sea-thermal power plant design which excludes the possibility of mariculture should be adopted until the relative contribution of the energy-production and biological potential of OTEC plants is examined carefully and in detail. (Sinha-OEIS)
W78-06864

COPPER IN THE SEA - A BIBLIOGRAPHY,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
R. L. Schmidt.
Available from the National Technical Information Service, Springfield, VA 22161 as BNWL-2206, Price codes: A03 in paper copy, A01 in microfiche. Battelle Pacific Northwest Laboratory Report No. BNWL-2206 to the U.S. Energy Research and Development Administration, April 1977. 45 p, 784 ref. EY-76-C-06-1830.

Descriptors: *Copper, *Toxicity, Water pollution sources, *Bibliographies, *Outer Continental Shelf.

Copper has a toxic potential exceeding all other metals due to the quantity discharged and its toxicological effect. Fortunately, copper in the oceans is rendered less bioavailable or less toxic by its ready interaction with the complex chemical components of seawater. This bibliography was prepared to illustrate the status of current knowledge of the biogeochemistry of copper and to aid the development of research programs to define the effects of copper discharged to the marine environment. The references are categorized to aid the reader to locate literature concerning specific aspects of the biogeochemistry of copper. A brief comment describing the important findings in each category is given. Although this bibliography is not exhaustive, the listed references are likely representative of current knowledge. (Sinha-OEIS)
W78-06865

A CASE OF POISONING BY AMMONIUM SULFATE IN DRINKING WATER (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow.
G. G. Okropiridze.
Gig Sanit 2, p 100, 1977.

Descriptors: *Potable water, *Ammonium sulfate, Sulfates, Public health, *Fertilizers, *Gastrointestinal dysfunction, Human poisoning, Intestinal diseases.

Gastrointestinal dysfunction giving symptoms similar to acute dysentery was observed in a group of 18 people who drank water containing 1500-2000 mg/l ammonium sulfate. The water was drunk from a faucet located next to vegetable hothouse where the ammonium sulfate was used as fertilizer. All of those affected were in satisfactory con-

dition after 24 h. Copyright 1978, Biological Abstracts, Inc.
W78-06866

COPPER.
National Research Council, Washington, DC. Committee on Medical and Biologic Effects of Environmental Pollutants.
For primary bibliographic entry see Field 5B.
W78-06872

SALT REGIME OF RESERVOIRS, CHAPTER 6: ELEMENTARY HYDROBIOLOGICAL PROGNOSIS,
Ya. F. Pleshkov.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A037 453, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 612, March 1977. 6 p, 1 tab. Translated from Gidrokhimicheskiye Materialy, Vol. 19, p 99-102, 1951.

Descriptors: *Reservoirs, *Hydrobiology, *Salts, Phytoplankton, Zooplankton, Trophic level, Nutrients, Eutrophication, Mesotrophy, Oligotrophy, Nitrates, Nitrites, Phosphates, Iron, Carbonates, Chlorides, Sulfates, Water quality, Water chemistry, Biology.

Hydrobiological prognosis basically reduces to weighting two factors accompanying outflow control: (1) blooming and overgrowth of a reservoir, depending on the growth possibilities of plant plankton or phytoplankton (trophicity of a reservoir), and (2) water quality viewed from the standpoint of possible growth of animal plankton (zooplankton) of various species typical of water of given quality (saprobicity of a reservoir). (Sims-ISWS)
W78-06880

PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON MARINE POLLUTION RESEARCH.
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5G.
W78-06906

INVESTIGATION OF POLLUTION-STRESSED LITTORAL COMMUNITIES IN THE NORTHERN ADRIATIC,
Institut Rudjer Boskovic Inst. Zagreb (Yugoslavia). Center for Marine Research.
D. Zavodnik.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 80-89, 12 ref.

Descriptors: *Water pollution effects, *Littoral, *Aquatic life, Benthos, *Adriatic Sea, Littoral communities.

The distribution and general features of several littoral communities in the northern Adriatic have been surveyed over the past 3 years with special regard to oil and ore pollution. Communities of the supralittoral rocks are generally unaffected by polluted waters, rather, they are distributed in relation to physiographical features of the habitat. The community of the mediolittoral rocks is most stable in polluted regions, but it can become deteriorated due to continuous oil influences. The most resistant organisms is the barnacle Chthamalus stellatus, which can survive under a layer of tar one centimeter thick. The most pollution-affected benthic communities are the biocoenosis of photophilic seaweeds and the beds of marine phanerogams, which vanished recently from vast areas in the northern Adriatic. The photophilic seaweeds are usually limited to a narrow zone in the upper infralittoral, but frequently are replaced by dense populations of the common sea urchin Paracentrotus lividus. Laboratory bioassays on the synergistic effects of lead and temperature salinity on selected benthic species (seaweeds, shellfish, crustacea, and fish) were conducted. (See also W78-06906) (Sinha-OEIS)
W78-06916

MICROBIOLOGY AND CHEMISTRY OF ESTUARINE SURFACE MICROLAYERS,
Environmental Research Lab., Gulf Breeze, FL; and Georgia State Univ., Atlanta. Dept. of Biology.
A. W. Bourquin, and D. G. Ahearn.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 89-96, 3 fig, 3 tab, 23 ref.

Descriptors: *Oil spills, *Films, *Water pollution effects, *Microorganisms, Estuaries, Coasts, Industrial wastes, Sewage, Outer Continental Shelf, Surface microlayers.

Organic microlayers occur at the air-water interface of most bodies of water. The microlayer or 'sea slick' formation appears to be related mainly to decay of naturally occurring aquatic organisms or to their production of lipodial by-products. In coastal regions particularly, the direct activities of man are of increasing importance in the generation of surface slicks. Industrial and municipal sewage effluents constitute the major source of films and foams, but crude oil spillage appears to be a major contributor in localized areas. The role of surface film microorganisms in metabolism or co-metabolism of normally recalcitrant type molecules such as pesticides and heavy aromatic hydrocarbons are being investigated. Laboratory studies on the metabolism of organochlorine pesticides by hydrocarbon-degrading microorganisms may help determine the fate of these and other pollutants when they are concentrated in organically rich and microbiologically active estuarine surface microlayers. (See also W78-06906) (Sinha-OEIS)
W78-06917

RELATIONSHIP OF MARINE POLLUTION TO HUMAN HEALTH,
Environmental Protection Agency, Washington, D.C. Office of Research and Development.
R. Engle.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 110-113.

Descriptors: *Water pollution effects, *Pollutants, *Food chains, *Toxins, Ecosystems, *Public health, Human health, Toxicants, Carcinogens.

Some toxic substances, carcinogenic compounds or biological agents are concentrated in invertebrates and lower vertebrates suggesting the possibility that these compounds could be transferred through the food chain to humans. A good example of biological magnification occurred when Japanese fishermen developed mercury poisoning from consuming fish from Minamata Bay. Superior methods must be developed to screen new chemicals for toxicity, especially since less than one-half of the new chemicals that go into major production are screened for carcinogenicity. The development of marine biomedicine will not be realized unless biomedical scientists, knowledgeable about human health problems, learn more about marine biology. Similarly, marine biologists, knowledgeable about the great variety of creatures of the sea, must learn more about biomedical problems and needs. Both will suffer if scientists fail to initiate integrated studies of the marine biota and human health. (See also W78-06906) (Sinha-OEIS)
W78-06918

EFFECT OF LEAD ON DINOPHYCEAE,
Biologische Anstalt Helgoland (West Germany).
S. M. Saifullah.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976, 'Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 120-132, 6 fig, 4 tab, 29 ref.

Descriptors: *Water pollution effects, *Lead, *Toxicity, Heavy metals, *Dinophyceae.

The effect of lead on growth, chlorophyll 'a' concentration and rate of uptake of radioactive carbon by Prorocentrum micans and Scrippsiella faroens was studied with intergeneric differences evident. So far as cell numbers and chlorophyll 'a' concentrations were concerned no response to lead was shown by Prorocentrum micans; however, inhibitory effects of lead were visible in Scrippsiella faroens. Lead decreased rate of uptake radioactive carbon by both species. In general the effect of lead on the two species was mild and therefore can be considered the less toxic heavy metal. (See also W78-06906) (Sinha-OEIS)
W78-06920

BIOASSAYS AS INDICATORS OF POLLUTION EFFECTS,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5A.
W78-06921

EFFECTS OF HYDROXAMIC ACIDS, IRON-SPECIFIC CHELATORS, ON THE GROWTH OF ALGAE,
Washington Univ., Seattle. Coll. of Seattle.
F. B. Taub, and K. M. Bailey.
Completion Report, September 25, 1977. 65 p, 25 fig, 4 tab, 62 ref. OWRT A-085-WASH(1), 14-34-0001-7102.

Descriptors: *Cyanophyta, *Algal growth, *Schizokinen, *Chelation, Algae, Hydroxamic acids, Iron, *Algal inhibition, Anabaena, Chlorella, Chlamydomonas, *Iron-specific chelators, Eutrophication, Water pollution effects, Bioassay, Lake water.

The tested hypothesis was that some species of algae may be selectively inhibited by trace element chelators excreted by other microorganisms, including blue-green algae. A ferric iron chelator, schizokinen, was obtained in a purified form from Anabaena sp. grown in a low-iron medium. This chelator inhibited the growth of Chlamydomonas reinhardi when in excess of the iron concentration. The inhibition was overcome by adding excess iron. The chelators apparently stimulated the growth of Chlorella vulgaris and Anabaena sp. itself. Another strong iron chelator, desferrioxamine-B from Streptomyces pilosus inhibited C. reinhardi, Selenastrum capricornutum, Ankistrodesmus sp. and others. Inhibition was overcome by adding excess iron. This compound did not inhibit Chlorella vulgaris or Anabaena sp. A weaker chelator, Rhodotorulic acid, was not inhibitory to ay of the species tested. Bio- and chemical assay showed that Anabaena sp., Chroococcus sp., Bacillus megaterium and Streptomyces viridochromogenes produce the iron chelators called hydroxamic acids. Small amounts of the chelators stimulate algal growth when iron is present as a hydrous ferric oxide by solubilizing this form of iron and making it available for algal uptake. Overchelation of iron prevents uptake by many algal species. the presence of this type of compound in lakes may affect species composition, blooms and dominance of blue-green algae. A

method for assay of lake water and obtaining iron chelators is presented.
W78-06930

DRINKING WATER AND HUMAN HEALTH: PART II.
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 5A
W78-06971

PETROLEUM HYDROCARBONS IN THE NORTHERN PUGET SOUND AREA--A PILOT DESIGN STUDY,
NOAA National Analytical Facility, Seattle, WA.
W D MacLeod, Jr., D W Brown, R. G. Jenkins, L. S. Ramos, and V. D. Henry
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 591, Price codes: A04 in paper copy, A01 in microfiche. E P A., Office of Research and Development, Interagency Energy-Environment Research and Development Program Series No. EPA-600/7-77-098, Sept 1977. 60 p, 5 fig, 12 tab, 11 ref, 2 append. Also as NOAA Technical Memorandum ERL MESA-8, Nov 1976.

Descriptors: *Washington, *Water pollution effects, *Oil pollution, *Baseline studies, *Bioindicators, Sediments, Mussels, Snails, Biota, Analytical techniques, *Outer Continental Shelf, *Petroleum hydrocarbons, Residual hydrocarbons, Puget Sound(WA), Strait of Juan de Fuca, Mytilus edulis, Mytilus californianus, Thais lamellosa

This pilot study has demonstrated that methodology exists to detect and measure a number of hydrocarbons in sediments, mussels (Mytilus edulis and M. californianus), and a snail (Thais lamellosa). The use of this methodology in an area relatively polluted with oil (Port Angeles) and in a relatively unpolluted area (Dungeness Bay) has revealed substantial quantitative differences in these compounds. During the first year, major emphasis should be given to seasonal variations and broad geographical coverage with minor effort devoted to widening the list of compounds and trophic levels under study. Work should continue to emphasize analysis of sediments since this is where indications of the accumulation of petroleum contamination can be expected. Past and current problems with water column analyses preclude main reliance on water as a sample matrix but further study of it is warranted. A number of parameters important in baseline studies are undefined. For example, the optimum interval for sampling for baseline studies has not been established; seasonal differences are unknown. Areas having the highest and lowest probable petrogenic contamination thus should be sampled more frequently. If hydrocarbon levels in these areas fluctuate significantly, the program should be flexible enough to allow even more frequent sampling. Although trophic levels were treated minimally in the pilot study (snails which feed on the mussels), this area of study could be expanded. (Sinha-OEIS)
W78-06981

OFFSHORE OIL AND GAS EXTRACTION: AN ENVIRONMENTAL REVIEW.
Battelle Columbus Lab., OH.
For primary bibliographic entry see Field 5B.
W78-06983

RECREATIONAL REUSE OF MUNICIPAL WASTEWATER--PHASE II.
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5G.
W78-06997

EVALUATION OF FACTORS PROMOTING THE PRESERVATION OF AQUATIC ECOSYSTEMS IN RECLAIMED STRIP MINE AREAS.
Grover City Coll., PA. Dept. of Biology
For primary bibliographic entry see Field 5G.
W78-06998

PO210 AND PB210 IN ZOOPLANKTON FECAL PELLETS.
International Lab. of Marine Radioactivity, Monte Carlo (Monaco). Oceanographic Museum
For primary bibliographic entry see Field 5B.
W78-07018

OIL SPILL DISPERSANTS CAUSE BRADYCARDIA IN A MARINE FISH.
Fisheries and Marine Service, Saint John's (Newfoundland).
J. W. Kiceniuk, W. R. Penrose, and W. R. Squires.
Marine Pollution Bulletin, Vol 9, No 2, p 42-45, 1978. 2 fig, 1 tab, 13 ref.

Descriptors: *Oil spills, *Oil pollution, *Detergents, *Fish physiology, *Oxygen demand, *Respiration, *Toxicity, *Fish behavior, Surfactants, Water pollution effects, Bioassay, Heart, *Bradycardia, *Dispersants, *Cunner, *Tautogolabrus.

The symptoms of detergent poisoning have been observed to be similar to those of asphyxic hypoxia. If hypoxia is in any way involved in the toxicity of detergents the sublethal physiological effects of the detergents in oil dispersants would be expected to be similar to the effect of hypoxia alone. When subjected to hypoxia fish decrease their heart rate and increase ventilation volume. This study found that oil dispersants caused bradycardia in fish similar to the effect of hypoxia. The bradycardia was sustained for the duration of exposure and was reversible. (Deal - EIS)
W78-07019

SIZE-SELECTIVE MORTALITIES OF CLAMS IN AN OIL SPILL SITE.
Maine State Dept. of Marine Resources, Augusta.
R. L. Dow.
Marine Pollution Bulletin, Vol. 9, No. 2, p 45-48, 1978. 2 fig, 3 tab, 2 ref.

Descriptors: *Mortality, *Toxicity, *Oil spills, *Oil pollution, *Fuels, *Clams, *Shellfish, *Bottom sediments, *Soil contamination, *Juvenile growth stage, Growth rates, Growth stages, Water pollution sources, Water pollution effects, *Spatfall.

In March 1971, a mixture of No. 2 fuel oil and JP 5 jet fuel spilled into Long Cove, Searsport, Maine. It became concentrated locally at levels up to more than 250 ppm in intertidal sediments from 15 to 25 cm below the surface. This oil continued to kill successive year classes juvenile clams as they burrowed down through redistributed overlying clean sediments into the oil until 1977. (Deal-EIS)
W78-07020

ANESTHETIC AND HANDLING STRESS ON SURVIVAL AND CORTISOL CONCENTRATION IN YEARLING CHINOOK SALMON (ONCORHYNCHUS TSAWYTSCHA).
Oregon Cooperative Fishery Research Univ. Corvallis.
R. J. Strange, and C. B. Schreck.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 345-349, 1978. 2 fig, 1 tab, 9 ref.

Descriptors: *Fish handling facilities, *Salmon, *Chinook salmon, *Fish physiology, *Toxicity, *Mortality, *Animal metabolism, Fish management, *Salinity, *Fish behavior, Salmonids, *Anesthetics, *Cortisol, *MS-222, *Handling stress(Fish).

Brief anesthetization with 50 mg/L buffered MS 222 (ethyl m-aminobenzoate methane-sulfonate) of yearling chinook salmon during mild handling caused no change in plasma cortisol concentrations compared with levels in non-anesthetized fish. Prolonged exposure (180 min) to a depressing dose of buffered MS-222 (25 mg/L) elevated cortisol more than an immobilizing dose (50 mg/L) while 100 mg/L was lethal within 30 min. Fish anesthetized (50 mg/L MS-222) during a severe 30 min handling stress had significantly lower mortality than controls to a second handling stress applied when the fish were no longer anesthetized. Anesthetization during the first stressor also prevented the cortisol stress response evident in the control fish. Anesthetic (with or without buffer) administered before initial capture was most effective at increasing survival during a second stressor, while anesthetic supplied after initial capture may have been slightly less effective. (Deal-EIS)
W78-07021

REQUIEM FOR A RIVER. POLLUTION OF THE MOISIE AND PEKANS RIVER.
M. Campbell.
Atlantic Salmon Journal, No. 1, p 17-20, 1978. 8 fig.

Descriptors: *Mine wastes, *Mine water, *Industrial wastes, *Salmon, *Atlantic salmon, *Fish behavior, Fish physiology, *Fish food organisms, *Suspended solids, Water pollution sources, Salmonids, Canada, *Moise River, *Pekans River, Quebec.

The pollution of the Moisie River Watershed (Canada) is described. Wastewater from an iron ore concentrator reduced visibility in the water to zero, thus inhibiting the visual stimulus necessary for salmon spawning. Further, the suspended sediments prevent penetration of sunlight necessary for photosynthesis in fish food organisms. (Deal-EIS)
W78-07022

SORPTION OF ARSENIC AND CADMIUM AND THEIR EFFECTS ON GROWTH, MICRONUTRIENT UTILIZATION, AND PHOTOSYNTHETIC PIGMENT COMPOSITION OF ASTERIONELLA FORMOSA.
Argonne National Lab., IL. Radiological and Environmental Research Div.
H. L. Conway.
Journal of the Fisheries Research Board of Canada, Vol. 35, p 286-294, 1978. 5 fig, 6 tab, 30 ref.

Descriptors: *Arsenic, *Cadmium, *Growth rates, *Toxicity, *Absorption, *Photosynthesis, *Diatoms, Population, Path of pollutants, Cytological studies, Aquatic environment, Pigments, Bioaccumulation, *Asterionella.

By use of continuous-culture techniques, populations were exposed to various concentrations of arsenic or cadmium for periods of 6-23 days. Sorption of arsenic (as arsenate) was a linear function of ambient concentrations less than 130 micro g As L-1 but reached an apparent plateau at ambient values greater than 130 micro g As L-1. In contrast, cadmium sorption was a complex function of ambient concentration and time. Fractionation experiments suggest that a large proportion of the cellular arsenic was associated with the organic layer surrounding the frustule, while most of the cellular cadmium was associated with the cell contents. (Deal-EIS)
W78-07024

MICROELEMENTS OF IRON AND COPPER IN LIVER AND MUSCLES OF RAINBOW TROUT (SALMO GAIRDNERI RICHARDSON) FROM DIFFERENT HATCHERIES.
Sarajevo Univ. (Yugoslavia). Bioloski Inst.
For primary bibliographic entry see Field 5A.

W78-07026

THE UPTAKE OF BORON BY LEMNA MINOR,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
R. P. Glandon, and C. D. McNabb.
Aquatic Botany, Vol 4, p 53-64, 1978. 2 fig, 2 tab, 22 ref.

Descriptors: *Absorption, *Boron, *Growth rates, *Plant growth, *Plant physiology, *Plant tissues, *Growth stages, *Aquatic plants, Metabolism, Biomass, *Bioaccumulation, *Lemna, *Ceratophyllum, *Macrophytes.

This study characterizes Lemna minor L. as a bioaccumulator of boron relative to other species of aquatic macrophytes. Laboratory experiments using 0.01, 0.11, and 1.01 mg B l-1 indicated that ambient boron was a determining factor in rate of boron accumulation in plant tissue. Field studies showed that the tissue boron concentration of L. minor, growing on the canopy of submerged Ceratophyllum demersum L. and presumably drawing from the same boron supply, was 10-45 times greater than the tissue boron concentration of C. demersum. In this instance, L. monor had a growing season maximum of near 3200 microgram B g-1 ash-free dry weight. The laboratory and field data further suggest that growth rate and uptake rate are both important in determining the tissue concentration of boron. (Deal - EIS)
W78-07027

THE EFFECT OF HYPEROXIA ON THE BREATHING OF MARINE FISHES,
Laboratoire de Physiologie Respiratoire, Strasbourg (France). Station Biologique de Roscoff.
P. Dejours, A. Toulmond, and J. P. Truchot.
Comparative Biochemistry and Physiology, Vol. 58A, p 409-411, 1977. 3 fig, 1 tab, 10 ref.

Descriptors: *Oxygen, *Respiration, Fish behavior, Fish physiology, *Oxygen requirements, *Bass, *Mullets, *Teleosts, Elasmobranchs, *Marine fish, Sea water, Dogfish, *Wrasse, *Gurnard, *Pollack.

Oxygen tensions of inspired and expired respiratory waters were measured in seven species of elasmobranch and teleost fishes breathing normoxic or hyperoxic sea water. From these measurements, the oxygen extraction coefficient and the ventilatory requirement--an index of the ventilatory activity--were calculated. Hyperoxia decreased the ventilatory requirement by a factor of 2-5 with respect to normoxia, the O2-extraction coefficient did not change significantly. These observations support the conclusion that the oxygenation of the milieu controls the level of the ventilatory activity in the water breathers. (Deal-EIS)
W78-07028

EFFECTS OF THE WATER SOLUBLE FRACTION OF EKOFISK CRUDE OIL ON ZOEAL LARVAE OF THE CRAB HYAS ARANEUS,
Biologisk Museum, Oslo (Norway).
T. E. Christiansen, and F. C. Stormer.
Ambio, Vol 7, No 1, p 23-25, 1978. 2 fig, 2 tab, 11 ref.

Descriptors: Solubility, *Oil pollution, *Oil spills, Larval growth stage, *Toxicity, *Mortality, Crabs, Commercial shellfish, *Growth rates, Plankton, Water pollution effects, Growth stages, Crustaceans, *Crude oil, *Zoeae, Hyas.

Effects of the water soluble fraction of crude oil were tested on zoeal larvae of the brachuran crab Hyas araneus. The water soluble fraction had no acute effect on survival at concentrations of 0.3, 1.5, and 3.0 ppm hydrocarbons. A long-term effect on survival was observed at the 3.0 ppm concentration. While 95-100 percent of the first zoeal larvae survived to the meglopa stage in the control and in the two lower concentrations of hydrocarbons, only 25 percent reached this stage at 3.0 ppm. It was also found that the duration of zoeal development lengthened significantly with an increase in hydrocarbon concentrations. (Deal - EIS)
W78-07029

LETHAL AND SUBLETHAL EFFECTS OF DREDGING ON REEF CORALS,
Caraibisch Marien-Biologisch Inst., Curacao (Netherlands Antilles).
R. P. M. Bak.
Marine Pollution Bulletin, Vol 9, No 1, p 14-16, 1978. 2 fig, 1 tab, 15 ref.

Descriptors: *Dredging, *Coral, *Calcium carbonate, *Reefs, *Channel improvement, *Light penetration, *Light intensity, *Bottom sediments, *Growth rates, *Suspended solids, *Sediments, *Mortality, Marine animals, Colonies.

Effects of dredging on a coral reef are described. Under water light values at a depth of 12-13 m were reduced from about 30% to less than 1% surface illumination. Colonies of coral species which are inefficient sediment rejectors (Porites astreoides) lost their zooxanthellae and died. Calcification rates in Madracis mirabilis and Agaricia agaricities were observed to decrease by 33%. The period of suppressed calification exceeds that of environmental disturbance. (Deal - EIS)
W78-07030

THE EFFECT OF HEAVY METALS ON THE SURVIVAL, REPRODUCTION, DEVELOPMENT, AND LIFE CYCLES FOR TWO SPECIES OF POLYCHAETOUS ANNELIDS,
California State Univ., Long Beach. Dept. of Biology.
D. J. Reish, and R. S. Carr.
Marine Pollution Bulletin, Vol 9, No 1, p 24-27, 1978. 2 tab, 12 ref.

Descriptors: *Heavy metals, *Reproduction, Cadmium, Chromium, Copper, Lead, Mercury, Zinc, *Toxicity, *Mortality, *Lethal limit, *Annelids, *Growth rates, Life cycles, Water pollution effects, Effluents, *Polychaetes.

The effects of exposure of six metals on survival and reproduction in tow species of polychaetous, Ctendrilus serratus and Ophryotrocha diadema, possessing short life histories were measured. The suppression of reproduction was generally two orders of magnitude less than the 96 h LC50. (Deal - EIS)
W78-07032

PRODUCTION PROCESSES UNDER THE ICE IN LAKE ST. CLAIR I. IRRADIATION AND TEMPERATURE,
Windsor Univ. (Ontario). Dept. of Biology.
D. G. Wallen.
Water Resources Bulletin, Vol. 13, No. 2, p 299-307, April 1977. 5 fig, 1 tab, 20 ref.

Descriptors: *Lakes, *Phytoplankton, *Ice, Effects, *Primary production, Standing crops, Chlorophyll a, Irradiation, Temperature, Winter, Lake St. Clair(Canada), Rivers, Nutrients, Measurement, Sampling.

Data from three ice-covered stations in Lake St. Clair were collected to evaluate the effect of ice and related variables on phytoplankton production. Primary production, phytoplankton standing crop, irradiation and temperature were measured from January to April, 1973. Mean production values ranged from 0.74 mgC/m3/h at station 1 near Mitchell Bay to 3.4 mgC/m3/h in waters at stations 2 and 3. Temperature stratification occurred at the three stations. However, the temperatures at station 1 were consistently more than a degree warmer than at the other two stations. Irradiation was low, having a mean value at the sampling depth of .075 ly/min. The data is interpreted to indicate that the ice-bound phytoplankton were adapted to the low irradiation. It is suggested that the variation observed between stations is related to the formation of a plume by the Thames River and differences in nutrient loads carried by the St. Clair and Thames Rivers. (See also W78-07040) (Bell-Cornell)
W78-07039

PRODUCTION PROCESSES UNDER THE ICE IN LAKE ST. CLAIR II. NUTRIENTS (SILICATE) AS A LIMITING FACTOR,
Windsor Univ. (Ontario). Dept. of Biology
D. G. Wallen, and E. Tuppling.
Water Resources Bulletin, Vol 13, No 3, p 515-520, June 1977. 3 fig, 1 tab, 16 ref

Descriptors: *Lake St. Clair(Canada), *Nutrients, *Primary production, *Ice, Chlorophyll a, Limiting factors, Phytoplankton, Winter, Measurement.

During the winter of 1972, nutrient concentrations beneath the ice (and snow when present) were measured at three stations in Lake St. Clair. Nutrient patterns are herein compared and discussed in relation to primary production. Typically nutrient concentrations were high for a few weeks after ice formation and high again in the spring with mid-winter declines. At station 3, soluble reactive silica appeared to influence primary production and chlorophyll a. Nutrient limitation was not detected at the other two stations. The nutrient patterns, primary production and temperature provide evidence that a water mass or plume peculiar to the inflowing Thames River moves down the southeastern side of the lake beneath the ice. (See also W78-07039) (Bell-Cornell)
W78-07040

PRODUCTION AND ECOLOGY OF EELGRASS (ZOSTERA MARINA L.) IN GREVELINGEN ESTUARY, THE NETHERLANDS, BEFORE AND AFTER THE CLOSURE,
Delta Inst. for Hydrobiological Research, Yerseke (Netherlands).
For primary bibliographic entry see Field 2I.
W78-07063

THE MYXOPHYCEAE OF THE MARSHES OF SOUTHERN DELAWARE,
Delaware Univ., Newark. School of Life and Health Sciences.
R. D. Ralph.
Chesapeake Science, Vol. 18, No. 2, p 208-221, June, 1977. 1 fig, 7 tab, 25 ref.

Descriptors: *Marshes, *Cyanophyta, *Delaware, *Spatial distribution, Wetlands, Coastal marshes, Tidal marshes, Salt marshes, Aquatic algae, Distribution patterns, Biological communities, Environmental effects, Habitats.

Thirty-six species of blue-green algae were observed in collection from the marshes of southern Delaware. All major vegetational zones support a single myxophycean association dominated by the three primary oscillatoriaceous species--Microcoleus lyngbyaceus, Schizothrix calcicola, and Schizothrix arenaria. All three species contribute to the formation of coherent mats over the marsh sediments in bare areas subject to alternate periods of inundation by salt water and exposure. Firm mats are not produced unless S. arenaria is present in abundance. Pannes and pools support the largest populations of blue-green algae in the summer. Significant but reduced populations overwinter in mats of macroscopic green algae and among the dead, lodged culms of the grasses of the high and low marshes. The availability of light at the sediment surface and the extent to which it is attenuated by the marsh angiosperms are the

major factors determining the distribution of the algae on the marshes. It is suggested that the pyxophycean association found on the marshes of southern Delaware may, with certain reservations, be taken as the type of a single ubiquitous, endemic temperature North Atlantic blue-green algal association. (Steiner-Mass)
W78-07069

OBSERVATIONS ON THE GROWTH OF SPHAGNUM CUSPIDATUM IN A BOG POOL ON THE SILVER FLOWE NATIONAL NATURE RESERVE,
Hull Univ. (England). Dept. of Plant Biology.
D. J. Boatman.
Journal of Ecology, Vol. 65, p 119-126, 1977. 2 fig, 4 tab, 8 ref.

Descriptors: *Bogs, *Mosses, *Plant growth, *Productivity, Wetlands, Aquatic plants, Standing waters, Plant populations, Community development, Environmental effects, Biological communities, Seasonal, Chlorophyll, *Sphagnum, *Silver Flowe National Nature Reserve(Scotland), Bog pools.

The growth of Sphagnum cuspidatum was measured from two sources, a bog-surface pool and a lagg-pool. Sphagnum in the lagg-pool had a lower total dry weight, greater capitulum dry weight, and higher concentrations of chlorophyll, nitrogen, potassium, and magnesium initially. They produced more extension-growth and more innovations. The low rate of innovations in the bog-surface pool suggests that ombrotrophic conditions are sub-optimal for growth and production. In summer, shoots floating freely in pool tend to be moved about the pool by wind and heaped together at the ends and bays. In winter, shoots sink to the bottom and some are smothered by others. The results of one experiment indicated that the new growth produced by partially smothered for several months will die, and if only 10% of them die in this way a year, it is obvious that innovation production will be insufficient to maintain the population of shoots in a pool. Smothering and a low rate of innovation production could therefore be important factors limiting the ability of S. cuspidatum to occury fully the bog pools.
W78-07070

ABUNDANCE AND PRODUCTION OF MACROINVERTEBRATES FROM NATURAL AND ARTIFICIALLY ESTABLISHED SALT MARSHES IN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W78-07084

ENVIRONMENTAL CHEMICALS: HUMAN AND ANIMAL HEALTH, AUGUST 7-11, 1972, FORT COLLINS, COLORADO.
Colorado State Univ., Fort Collins. Inst. of Rural Environmental Health.
For primary bibliographic entry see Field 5B.
W78-07134

TRACE ELEMENTS IN WATER,
Environmental Protection Agency, Denver, CO.
For primary bibliographic entry see Field 5B.
W78-07135

MOLYBDENUM AS AN ENVIRONMENTAL POLLUTANT,
Colorado State Univ., Fort Collins. Dept. of Animal Science.
For primary bibliographic entry see Field 5B.
W78-07137

LEAD IN SOILS AND PLANTS,
Colorado State Univ., Fort Collins. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 5B.
W78-07138

CHEMICALS IN THE WATERS OF THE ROCKY MOUNTAIN REGION,
Colorado State Univ., Fort Collins. Dept. of Zoology.
For primary bibliographic entry see Field 5B.
W78-07139

NITRATES: HUMAN AND ANIMAL HEALTH,
Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W78-07140

POLYCHLORINATED BIPHENYLS: AN INDUSTRIAL POLLUTANT,
Colorado State Univ., Fort Collins. Dept. of Entomology.
For primary bibliographic entry see Field 5B.
W78-07141

VEGETATION ON ROCKY SHORES AT SOME NORTH IRISH SEA SITES,
Liverpool Univ. (England). Hartley Botanical Labs.
G. Russell.
Journal of Ecology, Vol. 65, p 485-495, 1977. 3 fig, 13 ref.

Descriptors: *Aquatic plants, *Intertidal areas, *Water pollution effects, Rooted aquatic plants, Algae, Beaches, Aquatic habitats, Water pollution, Biomass, Census, Intertidal vegetation, Hilbre Island(England), River Dee(England), Isle of Man(England), New Brighton(England).

The intertidal vegetation of Hilbre Island, Merseyside, has undergone a major floristic change involving a considerable reduction in the number of species due to the light pollution of the River Dee. Its vegetation was compared with unpolluted localities on the Isle of Man and with that of New Brighton, Merseyside, which is grossly polluted. The Hilbre and New Brighton samples may be assigned either to the littoral fringe or to the eulittoral zone but not the sublittoral fringe. The Hilbre samples were floristically between those of New Brighton and the Isle of Man. This intermediate character is also apparent in species diversity, life-form composition, biomass and dominance. These features, together with historical evidence, illustrate the process of degradation which the Hilbre vegetation has undergone throughout this century, and suggest possible future trends. (Steiner-Mass)
W78-07155

NITROGEN FIXATION BY ALGAE IN A MASSACHUSETTS SALT MARSH,
State Univ. of New York at Stony Brook. Marine Sciences Research Center.
For primary bibliographic entry see Field 2L.
W78-07157

THE GROWTH OF AQUATIC MACROPHYTES IN THE BAY OF QUINTE PRIOR TO PHOSPHATE REMOVAL BY TERTIARY SEWAGE TREATMENT (1975-1976),
Queen's Univ., Kingston (Ontario). Dept. of Biology.
J. W. Bristow, A. A. Crowder, M. R. King, and S. Vanderkloet.
Le Naturaliste Canadien, Vol. 104, p 465-473, 1977. 2 fig, 2 tab, 25 ref.

Descriptors: *Aquatic plants, *Distribution patterns, *Sewage treatment, Rooted aquatic plants, Biomass, Productivity, Eutrophication, Tertiary treatment, Plant growth, Phosphates, Water pollution sources, *Canada, *Bay of Quinte(Ontario), Aquatic macrophytes.

In a study of the distribution of aquatic macrophytes in the Bay of Quinte (southeastern Ontario), fewer species and a lower density of cover were recorded in the upper portion of the Bay. Biomass was generally low. The poorer macrophyte growth in the shallow, nutrient-rich upper Bay was probably a result of algal blooms and high turbidity of the water, but the absence of suitable substrate might also be a contributing factor. The lower Bay was similar to adjacent areas of Lake Ontario in species composition and density of plant cover. (Steiner-Mass)
W78-07160

THE DECOMPOSITION OF STANDING AND FALLEN LITTER OF TYPHA GLAUCA AND SCIRPUS FLUVIATILIS,
Iowa State Univ., Ames. Dept. of Botany and Plant Pathology.
C. B. Davis, and A. G. Van Der Valk.
Canadian Journal of Botany, Vol. 56, p 662-675, 1978. 8 fig, 1 tab, 29 ref.

Descriptors: *Freshwater marshes, *Cattails, *Bulrush, *Cycling nutrients, Wetlands, Marshes, Marsh plants, Aquatic plants, *Iowa, Detritus, Biomass, Leaching, Nutrients, Microorganisms, *Goose Lake(Iowa).

Changes in dry weight and N, P, K, Na, Ca, Mg, Al, and Fe content were studied in decomposing Typha glauca and scirpus fluviatilis shoots. Submerged Typha litter decomposed more rapidly than submerged Scirpus litter, losing 50% of its original dry weight in 325 days while Scirpus litter still retained 62% of its original dry weight after 525 days. Major pathways of mineral flow from standing litter were leaching during the first few weeks after shoot death and fragmentation and litter fall during the rest of the study. Mineral losses from fallen liter were mainly due to leaching or to excretion by microbial populations associated with the litter. Microbial uptake (N,P) and adsorption (Ca, Al, Fe) were important processes in the fallen litter. At the end of the study, the calculated combined dry weight of undecomposed standing and fallen litter had decreased by only 20% in Typha litter and 14% in Scirpus litter. Most of the biomass and minerals were in fallen litter. (Steiner-Mass)
W78-07162

POTATO PROCESSING PLANT LIQUID EFFLUENT REGULATIONS AND GUIDELINES.
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
For primary bibliographic entry see Field 5G.
W78-07174

HISTOPATHOLOGICAL EFFECTS OF INTERMITTENT CHLORINE EXPOSURE ON BLUEGILL (LEPOMIS MACROCHIRUS) AND RAINBOW TROUT (SALMO GAIRDNERI),
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
M. L. Bass, C. R. Berry, Jr., and A. G. Heath.
Water Research, Vol. 11, No. 8, 1977, p 731-735, 9 fig, 39 ref.

Descriptors: Environmental effects, *Water pollution effects, Chlorine, Fish, Trout, Bioassay, Fish pathology, *Rainbow trout, *Sunfishes.

Fish were exposed to multiple pulses (45 min three times a day at 8-h intervals for 7d) of free residual chlorine to achieve peak total residual chlorine concentrations of 0.21, 0.31, 0.41, and 0.52 mg/l. Tests were run at 15, 25 and 32C. 96 h LC50 values for bluegill in these tests was 0.44 mg/l with temperature having only slight effect on this value. Moderate gill hyperplasia and swelling of the

lamellar epithelial cells resulted at sublethal concentrations while lethal concentrations caused extensive hyperplastic lesions of gill epithelium. Hepatic glycogen depletion was attributed to the stressful effects of the arterial hypoxia produced by chlorine damage to the gills. Liver necrosis was found at chlorine concentrations of 0.4 or 0.5 mg/l at 25 and 32C. No histological changes were found in either trout or bluegill kidney. (Chilton-ORNL)
W78-07178

THE UPTAKE OF HEAVY METALS BY EPIPHYTIC BACTERIA ON ALISMA PLANTAGO-AQUATICA,
Otago Univ., Dunedin (New Zealand). Dept. of Microbiology.
F. M. Patrick, and M. W. Loutit.
Water Research, Vol. 11, No. 8, 1977, p 699-703, 2 fig, 3 tab, 19 ref.

Descriptors: Environmental effects, *Water pollution effects, *Bacteria, Heavy metals, Aquatic plants, Absorption, *Epiphytic bacteria, Bioaccumulation.

Bacterial epiphytes on the surface of Alisma plantago-aquatica were found to be a major factor in contributing to the total metal concentrations of the plant. Concentrations of Cr, Cu, Fe, Pb, and Zn were reduced by removal of the epiphytes from the surface of plant leaves. It was concluded that bacterial epiphytes may contribute significantly to the concentrations of heavy metals measured in aquatic plants from both polluted and unpolluted sources. (Chilton-ORNL)
W78-07179

AQUATIC BACTERIAL POPULATIONS AND HEAVY METALS - I. COMPOSITION OF AQUATIC BACTERIA IN THE PRESENCE OF COPPER AND MERCURY SALTS,
Texas Univ. Health Science Center at Houston. School of Public Health.
F. L. Singleton, and R. K. Guthrie.
Water Research, Vol. 11, No. 8, 1977, p 639-642, 4 fig, 1 tab, 7 ref.

Descriptors: Environmental effects, *Water pollution, *Heavy metals, *Copper, *Mercury, Populations, *Bacteria, Biological communities, Community stability, Diversity, Total colony forming units.

The naturally occurring bacterial populations of two aquatic systems were evaluated for the effect of additions of copper and mercury upon the populations. The addition of either element singularly or of both elements together resulted in an increase in total colony forming units (TCFU), a reduction in diversity, and a variation in the percentage chromagens in the population. It was concluded that heavy metal addition reduces bacterial community stability by the reduction in diversity coincident with increased TCFU of surviving organisms. (See also W78-07181) (Chilton-ORNL)
W78-07180

AQUATIC BACTERIAL POPULATIONS AND HEAVY METALS - II. INFLUENCE OF CHEMICAL CONTENT OF AQUATIC ENVIRONMENTS ON BACTERIAL UPTAKE OF CHEMICAL ELEMENTS,
Texas Univ. Health Science Center at Houston. School of Public Health.
R. K. Guthrie, F. L. Singleton, and D. S. Cherry.
Water Research, Vol 11, No 8, 1977, p 643-646, 3 tab, 10 ref.

Descriptors: Environmental effects, *Water pollution, *Heavy metals, *Copper, *Mercury, *Bacteria, Absorption, Halides, Metals, Bioaccumulation.

The naturally occurring bacterial populations in three aquatic systems (a coal ash basin, a brackish lake, and a freshwater lake) containing different levels of chemical element concentration and salinity were found to increase their uptake of certain elements following addition of at least twice the EPA recommended limits of Cu and Hg for surface water. In the presence of added Cu or Hg in brackish water, concentrations of active metals and halogens were generally decreased in bacterial cells. In ash basin water, these concentrations varied as did concentrations of light metals in both brackish and ash basin water. In freshwater, the bacterial cell concentration of all light and active metals and the halogens was increased in the presence of Cu or Hg. (See also W78-07180) (Chilton-ORNL)
W78-07181

THE EFFECTS OF DEPRESSED PH ON FLAGFISH REPRODUCTION, GROWTH AND SURVIVAL,
Ontario Ministry of the Environment, Rexdale. Limnology and Toxicity Section.
G. R. Craig, and W. F. Baksi.
Water Research, Vol. 11, No. 8, 1977, p 621-626, 4 fig, 3 tab, 24 ref.

Descriptors: Environmental effects, *Water pollution effects, *Hydrogen ion concentration, Fish, Reproduction, *Growth rates, Mortality, Water quality, *Flagfish, Jordanella floridae.

Breeding communities of flagfish, Jordanella floridae, were exposed to depressed pH levels of 6.0, 5.5, 5.0, and 4.5. The order of sensitivity of life stages at the 50% reduction level was: egg production>fry survival>fry growth>egg fertility. Egg production was reduced by about 50% under pH 6.0 conditions. Egg fertility and fry growth were both reduced by about 20% at pH 6.0. Overall reduction in recruitment in a flagfish community was about 32% at pH 6.0. (Chilton-ORNL)
W78-07183

EFFECT OF TEMPERATURE INCREASES ON THE SIZE AND WEIGHT OF SOME INVERTEBRATE POPULATIONS IN THE COOLING RESERVOIR OF THE KURAKHOVSK STATE REGIONAL ELECTRIC POWER PLANT, (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Inst. Hidrobiologii.
L. A. Kititsyna, and O. A. Sergeeva.
Ekologiya 5, p 99-102, 1976.

Descriptors: *Thermal pollution, *Invertebrates, Benthic animals, Water pollution effects, Electric powerplants, *Ceriodaphnia-reticulata, *Daphnia-cucullata, *Diaphanasoma-brachyurum, *Pontogammarus-robustoides, *Ukrainian-SSR, USSR, Valvata-piscinalis.

Five populations of benthic invertebrates (Diaphanasoma brachyurum, Daphnia cucllata, Ceriodaphnia reticulata, Valvata piscinalis and Pontogammarus robustoides) inhabiting different temperature regimes of the Kurakhovsk thermal electric power plant cooling reservoir (Ukrainian SSR, USSR) were analyzed. The size and weight of organisms living in heated water (17 degrees C) was 16-58% greater than those living under normal water temperatures (control = 12 degrees C).--Copyright 1978, Biologica Abstracts, Inc.
W78-07184

RADIOCESIUM DYNAMICS IN HERONS INHABITING A CONTAMINATED RESERVOIR SYSTEM,
Savannah River Ecology Lab., Aiken, SC.
A. H. Domby, D. Paine, and R. W. McFarlane.
Health Physics, Vol. 33, No. 6, December 1977, p 523-532, 6 fig, 3 tab, 35 ref.

Descriptors: Environmental effects, *Water pollution, *Radionuclides, *Cesium radioisotopes, Reservoirs, Birds, *Herons, Nestlings, Body burdens.

Two species of herons, the little blue heron and the green heron, both of which nest on the same radioactivity contaminated reservoir, showed marked differences in radiocesium levels. Nestlings from different nests of the little blue heron showed significant differences of radiocesium body burdens; nestling within the same nest did not exhibit strong differences in body burdens. Radiocesium levels in food from the crops of little blue heron nestlings had a high correlation with the observed levels in the nestlings. A primary food item of the blue heron colony, the bluegill, has significant differences of mean radiocesium levels within the reservoir system in which the herons forage for food as a result of differential radionuclide contamination. The little blue heron tended to spatially partition available foraging areas within the contaminated reservoir, while the green heron foraged primarily in Carolina bays around the system. Nestlings of green heron showed low radiocesium body burdens. (Chilton-ORNL)
W78-07185

RADIATION DOSES AND EFFECTS ESTIMATED FOR AQUATIC BIOTA EXPOSED TO RADIOACTIVE RELEASES FROM LWR FUEL-CYCLE FACILITIES,
Oak Ridge National Lab., TN. Environmental Sciences Div.
B. G. Blaylock, and J. P. Witherspoon.
Nuclear Safety, Vol. 17, No. 3, May-June 1976, p 351-361, 8 tab, 26 ref.

Descriptors: Environmental effects, *Water pollution effects, *Radioactivity, *Radionuclides, Nuclear reactors, Nuclear wastes, Aquatic life, Hazards, *Biota.

The objectives of this study were to estimate the radiation dose received by aquatic biota from process in the nuclear fuel cycle, to determine the major dose-contributing radionuclides and to assess the impact of estimated doses on aquatic biota. Higher doses were found to be due to naturally occurring radionuclides, Ra226, Po210, and Th230. It was concluded that somatic or genetic effects produced on aquatic biota at the dose rates estimated for conversion, enrichment, fuel fabrication, nuclear power reactor, and reprocessing facilities would not significantly affect the exposed aquatic populations. Dose-rate estimates for aquatic biota from milling and mining operations were much higher than estimates from other facilities in the nuclear fuel cycle. (Chilton-ORNL)
W78-07186

EVALUATION OF THE RADIOACTIVE WASTES DISPOSAL INTO THE DEEP OCEAN,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 5E.
W78-07187

ACUTE TOXICITY OF SELECTED HYDRAZINES TO THE COMMON GUPPY,
Aerospace Medical Research Lab., Wright-Patterson AFB, OH.
A. R. Slonim.
Water Research, Vol. 11, No. 10, 1977, p 889-895, 4 tab, 16 ref.

Descriptors: Environmental effects, *Water pollution effects, *Toxicity, Fish, *Organic compounds, Aquatic environments, Water quality, *Hydrazines, Guppy.

The paper presents the results of static bioassays conducted in series for a period of over a year to obtain median lethal concentration (LC50) values for hydrazine, unsymmetrical dimethylhydrazine (UDMH), Aerozine-50 and monomethylhydrazine. LC50 values for hydrazine, Az-50 and MNH were in the same concentration range in hard water and soft water and were reduced over time. Hydrazine

was the most toxic compound while UDMH was the least toxic compound and the only one more toxic in hard water than in soft water. All four compounds caused some degree of distress in surviving fish. Investigations with pre-exposed and previously unexposed fish indicated that the toxic effects of the hydrazines are cumulative. (Chilton-ORNL)
W78-07188

ALGAL NUTRIENT LIMITATION IN LAKE ONTARIO AND TRIBUTARY WATERS,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
N. Sridharan, and G. F. Lee.
Water Research, Vol. 11, No. 10, 1977, p 849-858, 10 fig, 4 tab, 1 ref.

Descriptors: Environmental effects, *Nutrients, Phosphorus, *Algae, Growth rates, Plant growth, Wastes, *Lake Ontario, Eutrophication, Water pollution control.

A nutrient enrichment study was conducted in Lake Ontario during 1972-1973 as part of the International Field Year for Great Lakes. The study included the measurements of the growth response of laboratory-grown and natural algae in nutrient enriched water. Based on results of the study, it was concluded that a substantial reduction of immediate and potentially available phosphorus will tend to reduce planktonic algal growth in Lake Ontario. It is suggested that immediate steps should be taken to provide advanced waste treatment removal of phosphorus from all major domestic wastewater sources entering the lake and its tributaries. (Chilton-ORNL)
W78-07189

CRANKCASE OILS: ARE THEY A MAJOR MUTAGENIC BURDEN IN THE AQUATIC ENVIRONMENT,
Fisheries and Marine Service, St. John's (Newfoundland). Biological Station.
For primary bibliographic entry see Field 5B.
W78-07190

THERMAL EFFECTS ON FISH ECOLOGY,
Oak Ridge National Lab., TN. Environmental Sciences Div.
C. C. Coutant.
In: Encyclopedia of Environmental Engineering, Vol 2, 1976. W. & G. Baird, Ltd., Northern Ireland. p 891-896 3 fig, 24 ref.

Descriptors: *Environmental effects, *Thermal pollution, *Water pollution effects, Temperature, Fish, Ecology.

A general review of the present knowledge of the thermal effects on fish ecology is presented which includes information on temperature as a lethal agent, as a stressing factor, as a controling factor, as a limiting factor, as a masking factor, as a directing agent. It was concluded that temperature is probably the preeminent master factor in the lives of fish and that no study of fish ecology would be meaningful without consideration of thermal relationships. It is said that while, within limits, fish possess effective mechanisms for adapting to thermal changes, man must be careful not to exceed these limits if he wishes to preserve a productive commercial and recreational fishery. (Chilton-ORNL)
W78-07191

HYGIENIC EVALUATION OF FARM CROPS IRRIGATED WITH EFFLUENTS OF COAL-TAR CHEMICAL PLANTS (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
L. R. Polishchuk, I. N. Matvienko, and N. M. Baravanova.
Gig Sanit 1, p 34-38, 1977.

Descriptors: Industrial wastes, Coal-tar effluents, Plant growth, Growth rates, Irrigation, Waste water disposal, Calcium, Corn(Field), Fats, Iron, Potassium, Potatos, Starch, Vitamin C.

Chemical composition of coal-tar effluents were presented. Dilutions of 1:4 produced depressing effects on plant growth. Irrigation of corn with dilutions of 1:8 did not cause accumulations of 3,4-benzopyrene in potatoes with a decrease in mineral content of 10-17%. Indices of chemical composition were studied including starch, vitamin C, fat, K, Ca and Fe. The level of fats in corn dropped 29%. The 1:8 dilutions of coal-tar effluents may be used for corn irrigation.--Copyright 1978, Biological Abstracts, Inc.
W78-07194

DIATOM FLORA IN A EUTROPHIC POND IN BRITTANY: JUGON POND: AUTOECOLOGY OF A FEW SPECIES (IN FRENCH),
Institut Comportement et Environment, Rennes (France). Lab. Hydrobiology.
R. Le Cohu.
Ann Hydrobiol 8(1), p 1-26, 1977.

Descriptors: *Diatoms, *Eutrophication, Ponds, Jugon Pond(Brittany), France, Seasonal, Water pollution effects, Centrales, Cocconeis-placentula, Cyclotella-memeghiniana, Cymbella, Fragilaria, Littoral, Melosira, Pennales, Synedra-ulna.

The diatom flora of an eutrophic pond in Brittany is described; 179 spp. and 58 varieties were identified (11 Centrales, 168 Pennales). Samples were collected monthly from 3 stations (1 in open water, the other 2 littora); the variations of the diatom community were studied in the different seasons. In open water Melosira italica and M. granulata were dominant. The diatom flora generally shows a higher diversity on the littoral than in open water; some species can be found in abundance at the same time. The Nygaards photoplankton quotient and the Stockners ration were used. The validity of the results is discussed. The autoecology was examined for the following species: Achnanthes hungarica, A. lanceolata, A. minutissima, Cocconeis placentula, Cyclotella meneghiniana, Cymbella cistula, C. prostata, C. ventricosa, Fragilaria bidens, F. capucina, F. crotonensis, Melosira granulata, M. italica, M. varians and Synedra ulna. Some of these may be used (at least in Brittany) as eutrophic indicators.--Copyright 1978, Biological Abstracts, Inc.
W78-07195

HYGIENIC CHARACTERISTICS OF A NEW FLOCCULATION AGENT POLYETHYLENIMINE AND ITS STANDARDIZATION IN BODIES OF WATER (IN RUSSIAN),
Moskoviskii Gosudarstvennyi Meditsinskii Inst. (1) (USSR). Dept. of Public Hygiene.
A. S. Kinzirskii.
Gig Sanit 7, p 19-23, 1976.

Descriptors: Public health, Lethal limit, Water quality standards, Cations, Toxicity, *Flocculation agents, *Polyethylenimine.

Experiments on mice, rats and guinea pigs showed the maximum permissible concentration of cationic flocculation agent polyethylenimine was 0.1 mg/l. The limiting index of noxiousness is sanitary-toxicologic.--Copyright 1978, Biological Abstracts, Inc.
W78-07196

VIRULENCE OF CULTURES OF SALMONELLA TYPHI AND SALMONELLA PARATYPHI B FROM SEWAGE AND SOIL (IN RUSSIAN),
Uzbekskii Nauchno-Issledovatelskii Inst. Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR).
L. E. Ergasheva, and L. A. Savitskaya.
Gig Sanit 1, p 110-111, 1977.

Descriptors: *Salmonella, Sewage, Culture, *Pathogenic bacteria, *Bacteria

Virulence of S. paratyphi B for white mice was 2.7-3 times greater than that of S. typhi. Virulence of S. paratyphi B from soil was greater than that of samples from sewage. Virulence of these organisms decreased with prolonged exposure to their natural environment. Growth and reproduction of Salmonella in the liquid phase of the tissue culture was good but the development of pathogenic action on tissue cells was different. Virulent bacteria produced cytopathogenic effects sooner (24-28 h) than weakly virulent strains. Saprophytic strains (controls) did not produce changes in tissue cells.--Copyright 1978, Biological Abstracts, Inc.
W78-07197

5D. Waste Treatment Processes

FEDERAL GUIDELINES: STATE AND LOCAL PRETREATMENT PROGRAMS, MCD-43, (3 VOLS).
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W78-06704

FERMENTATION--LESS DEGRADING FOR PROBLEM EFFLUENT TREATMENT,
H. Mueller, K. Jarl, H. Skomann, and M. Mueller.
Environmental Protection Survey, p 17-19, February, 1977. 4 fig, 2 tab, 2 ref.

Descriptors: *Food processing industry, *Fermentation, *Industrial wastes, *Recycling, *Microorganisms, Hydrolysis, Biological treatment, Biochemical oxygen demand, Waste water treatment.

Several different bioconversion processes are discussed as alternatives to biodegradation for the treatment of highly loaded effluents from the food processing industry. Fermentation is used in achieving the goals of this method, which are to reduce the BOD and to form a biomass, such as fodder yeast, having by-product value. Continuous rather than batch operation of the fermenter is the more sophisticated mode; down-times for filling and emptying are eliminated, and an equilibrium state can be reached, providing the best conditions for microorganisms growth. One plant converts potato treatment plant effluent containing up to 3% of soluble and suspended starch into a single cell protein for human consumption by using a symbiotic process between two microorganisms, Candida utilis and Endomycopsis fibuliger. Cheese whey can be converted by fermentation or ultrafiltration into lacto-proteins, and at the same time 90 to 95% of the BOD can be removed. To further increase BOD reduction, the Fermix process can be applied. This uses low-grade cereal starch to enzymatically hydrolyze whey. The substrate of lactose, glucose, whey and cereal proteins is then fermented and spray-dried, yielding a protein-rich product appropriate as a milk food additive. Another bioconversion process is being developed to treat the cellulosic waste from rice, wheat, cotton, and sugar cane. After undergoing chemical hydrolysis and fermentation, a fibrous substance is produced which is easily digested by ruminants, and which can replace grass and hay. Although bioconversion is often very promising, in manufacturing alcohol, sugar, and baker's yeast, biodegradation is still the more suitable treatment method because of high organic loads in the wastes. Treatment methods for these waters are described. (Kutcher-FIRL)
W78-06705

THE REDOX POTENTIAL OF ACTIVATED SLUDGE,
Northumbrian Water Authority, Gostorth (England).
M. G. Burrows.
Journal of the Institute of Water Pollution Control, Vol. 76, No. 4, p 415-422, 1977. 6 fig, 3 tab, 3 ref.

Descriptors: *Oxidation-reduction potential, *Electrodes, *Activated sludge, *Laboratory tests, *Biological treatment, Waste water treatment, Treatment facilities, Nitrification, Municipal wastes.

The redox potential of activated sludge was examined under laboratory and full-scale conditions using a platinum electrode with a Ag/AgCl2 reference electrode, a pH meter, and a recorder. Samples collected during three cycles were monitored for EH, BOD, ammonia-nitrogen, nitrite, nitrate, dissolved oxygen, mixed liquor suspended solids, and pH. The rate of change of the sludge redox potential during aeratuion was directly related to the concentration of mixed liquor suspended solids and the rate of aeration of the activated sludge. The redox potential increased further with the preconditioning of the sludge through aeration cycles. The establishment of nitrification was also found to result in an increase in the plateau level of the redox potential. A higher potential was considered better for activated sludge processes. Redox potentials were monitored at an activated sludge facility which was subject to variations in loading and at a diffused air activated sludge treatment plant which produced a 30:20 standard effluent. It was discovered that redox potential was related to loading variations, with a 12-hour delayed effect. Low quality effluent was produced at lower redox potentials, while a higher redox potential enhanced nitrification. (Lisk-FIRL)
W78-06706

WATER RECLAMATION AND RECYCLING,
South West Water Authority (England).
M. D. Kavanagh.
Chartered Municipal Engineer, Vol. 105, No. 1, p 7-14, January, 1978. 6 fig, 5 tab, 9 ref.

Descriptors: *Recycling, *Reclaimed water, *Recirculated water, *Potable water, *Waste treatment, Waste water disposal, Reclamation, Industrial wastes, Water allocation(Policy), Treatment facilities, River basins, Municipal wastes.

Water recycling and reclamation practices are reviewed for municipal and industrial wastes and water supplies. A study of the River Exe in England revealed that the river's water was reused three times through removal for municipal water supplies and discharge from treatment plants. A study of the River Exe in England revealed that the river's water was reused three times through removal for municipal water supplies and discharge from treatment plants. A total of 92,901 cu m was removed and 70,038 cu m discharged daily as indicated by licensed uses of the River Exe. Fifty sewage treatment plants are located within the River Exe basin. Research and methods for the recycling of sewage for potable water supplies are discussed. Industrial plants have the option of treating their own wastes or discharging them to municipal or regional waste treatment plants. The latter alternative involves a surcharge tax for discharge or a contribution to treatment plant construction and operation, eliminating discarge costs. In-plant industrial treatment processes were examined at a cement company which recovers materials from its concrete mixer, using recycled water at a significant savings. The reuse of municipal sewage for industrial cooling was cites for electrical powerplants, steel manufacturers, gas production, and food processing industries. (Lisk-FIRL)
W78-06707

ROTATING BIOLOGICAL CONTACTORS TREAT ISLAND'S SALINE SEWAGE,
Rhode Island Univ. Kingston. Dept. of Environmental Engineering.
C. P. Poon, and W. J. Mikucki.
Water and Sewage Works, Vol. 125, No. 2, p 62-66, February, 1978. 5 fig, 4 tab, 10 ref.

Descriptors: *Biological treatment, *Trickling filters, *Saline water, *Biochemical oxygen demand, *Suspended solids, Pilot plants, Nitrogen, Phosphorus, Chlorides, Treatment facilities, Waste water treatment, Municipal wastes.

The performance of a compact, low power biological contactor that functions as both an activated sludge reactor and a trickling filter for the South Pacific island of Kwajalein was simulated in pilot studies at the University of Rhode Island. The highly saline Kwajalein sewage effluent was monitored for BOD, chloride, total and volatile suspended solids, nitrogen, and phosphorus. Organic overloading could be controlled by recirculation of 50% of the effluent to reduce BOD and prevent trickling filter failure. Recirculation was effective at organic loadings exceeding 3.3-4.0 lbs BOD/1000 sq ft/day. Low mixed liquor suspended solid levels ranging 100-215 mg/liter with a hydraulic contact time of 1-3 hrs, allowed both the activated sludge and trickling filter processes to function. A decrease in biooxidation by the filter during intense storms could be counteracted by increasing the mixed liquor suspended solids concentration to 2,000 mg/liter. Higher hydraulic loadings were effective with low BOD effluent. Removal of 50% of the nitrogen from the effluent was realized for a sewage nitrogen concentration of 4.5 mg/liter. (Lisk-FIRL)
W78-06708

WASTE TREATMENT, (ETC).
Canadian Chemical Processing, Vol. 61, No. 11, p 4-5, 1977.

Descriptors: *Oxidation, *Aeration, Equipment, *Design data, *Organic wastes, Municipal wastes, Microorganisms, Oxygen, Treatment facilities, Waste water treatment.

Rapid changes occurring in waste treatment due to the use of new reactor designs are cited. The new reactors are more compact than conventional oxidation tanks and are better suited for handling waste during cold weather. A recent development is the Oxitron process which uses the upward flow of effluent through a sand bed to fluidize the sand. Bacteria coating each grain of sand metabolize wastes in the stream. Pure oxygen is injected into the solution. The Oxitron reactor occupies 10-20% of the land area required for conventional aeration tank designs. Another compact waste treatment system the Wetox process, a wet-air oxidation process which decomposes organics in the waste stream. For small plants, requiring less than 20 mg oxygen per day, a pressure-swing adsorption system is economical. Large plants can use less expensive, cryogenic air separation. New technology and regulations on sludge utilization and disposal will be reviewed in a seminar being sponsored by Environment Canada and the Ontario Minstry of the Environment to be held Toronto in Feburary 1978. (Baker-FIRL)
W78-06709

DIGGING DEEP TO TREAT DOMESTIC SEWAGE,
J. C. Ousby, J. Walker, and R. T. Jones.
Process Engineering, p 81-84, September, 1977. 3 fig, 6 tab, 6 ref.

Descriptors: *Sludge treatment, *Dewatering, *Biochemical oxygen demand, *Chemical oxygen demand, *Suspended solids, Pilot plants, Domestic wastes, Waste water treatment, Sludge disposal, Separation techniques.

The ICI deep shaft, activated sludge treatment process increases oxygen transfer intensity and effectively reduces BOD. The single cell protein fermentation process was modified to allow longer bubbling times at a greater height or depth, resulting in the higher oxygen transfer intensity and a lower power use. The average BOD, COD, and suspended solids removal with a 100-m shaft depth was monitored at a pilot plant over a period of 194 days. BOD was reduced from 182 mg/liter t 7 mg/liter; COD decreased from 317 mg/liter to 83 mg/liter; and suspended solids dropped from 222 mg/liter to 18 mg/liter. The total removal of BOD was 92%. A three-month study of sludge production from conversion of BOD demonstrated that one kg of BOD was converted to 0.5 kg of sludge, suggesting an effective reduction in sludge production. Dewatering characteristics of the sludge were also found to improve with the deep shaft process. A pressed cake containing 38% solids was produced after 4 hours of filtration at 100 pounds/square inch; a cake containing 30% solids was achieved at the same pressure after 2 hours pressing time. (Lisk-FIRL)
W78-06710

A STUDY ON WATER POLLUTION CONTROL IN WATER SUPPLY SYSTEMS--BACKFLOW PREVENTER IN WATER SUPPLY SYSTEMS (KYUSUI SETSUBI NI OKERU JOSUI OSEN BOSHI NI KANSURU KENKYU),
T. Egawa.
Fukui kogyo daigaku kenkyu kiyo, (Memoirs of the Fukui Inst. of Technology) No 7, p 59-71, 1977. 11 fig, 4 tab, 8 ref.

Descriptors: *Water supply, *Waste disposal, *Plumbing, *Equipment, *Sanitary engineering, Environmental sanitation, Sewerage, Sewage disposal, Waste water treatment.

Prevention of backflow into water supply systems from sanitation facilities is discussed. Backflow of water from sanitation facilities presents a serious threat to water supply systems. Pollution of water supplies can be restricted or eliminated by the use of air gaps or backflow preventers. Air gaps tend to be impractical in areas of limited space, such as closet flush pipes. In such areas of restricted space, the installation of backflow preventers is recommended. The backflow preventer allows air to circulate through the interior openings in the water supply system from the exterior openings of the fixtures. Experiments on the function of backflow preventers produced in Japan are discussed. (Lisk-FIRL)
W78-06711

ASPECTS OF LAND-TREATED WASTE APPLICATIONS IN LOUISIANA WETLANDS,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
R. E. Turner, J. W. Day, Jr., M. Meo, P. M. Payonk, and J. H. Stone.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 546, Price codes: A02 in paper copy, A01 in microfiche. Report No. LSU-R-76-055, May, 1976. In: Proceedings of the National Symposium on Freshwater Wetlands and Sewage Effluent Disposal, Ann Arbor, Mich., p 147-167. 2 fig, 8 tab, 18 ref. OWRT A-033-LA(3); SG No. 04-3-158-19.

Descriptors: *Overland flow, *Land management, *Louisiana, *Water reuse, *Coastal marshes, *Wetlands, Marshes, Phosphorus, Nitrogen, Carbon, Spoil banks, Waste disposal, Waste water disposal, Plant growth, Plant tissues, Soil microbiology, *Land treated waste applications, Direct application, Soil-plant systems, Fishing wastes, Topical application, Stick water, Bail water, Menhaden, Heterotrophic microbial biomass, Proteolytic activity, Ammonia-N, Nitrates, Nitrites, Total organic carbon, Dissolved organic carbon.

A short-term feasibility study was conducted in a South Louisiana coastal marsh to investigate disposal of wastes produced by menhaden fish processors by topical (direct) application and overland flow application. Experimental and control above-ground plant material were analyzed after application for biomass and nutrients (including Total Organic Carbon, Dissolved Organic Carbon, ammonia-N, nitrate-nitrite-N, total-N and phosphorus); microbial numbers were measured in soil samples. Data are presented in tabular form and indicate that overland flow application of wastes generally increases plant production. Overland flow removed an average of 40 to 50% of the nutrients; nitrogen and phosphorus levels in treated plant materials increased by 47% and 13%, respectively, over control plants. System performance and cost estimates are included. (Seip-IPA)
W78-06744

SWINE WASTE NUTRIENT RECOVERY SYSTEM BASED ON THE USE OF THERMAL DISCHARGES,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
J. R. Miner, L. Boersma, J. E. Oldfield, and H. K. Phinney.
In: Managing Livestock Wastes, ASAE Publication PROC-275, Proceedings of the 3rd International Symposium on Livestock Wastes held at the University of Illinois, Urbana-Champaign, April 21-24, 1975, p. 160-163. 4 fig, 3 tab, 4 ref. OWRT B-039-ORE(6), NSF GI-43681.

Descriptors: *Hogs, *Nutrient recovery, *Recycling, *Waste disposal, Livestock, Nutrients, *Farm wastes, Thermal powerplants, Heat, Slurries, Methane, Conservation, Solid wastes, Beneficial use, Algae, Chlorella vulgaris.

A swine manure nutrient recovery system using waste heat from a thermal power plant produced consistently high yields of dry matter and protein. Mean dry matter yield of all experiments was equal to a production rate of 121.5 tons/ha/year. This corresponds to yields of 55 tons of crude protein/ha/year and 47.6 tons/ha/year of total amino acids. Developed at Oregon State University, the facility is a recirculating hydraulic manure transport system in which the solids are anaerobically digested for methane recovery and nutrient release, and algae are used to capture soluble plant nutrients. Maure regularly is flushed from six pens with discharge from an overhead sophon tank; the pens hold about 50 finishing hogs. A gutter with a 1% slope carries the slurry to a pump pit and into a rotating flighted cylinder for solid-liquid separation. Following separation, the solids-rich stream drops into an anaerobic digester, and liquid from the separator, combined with effluent from the digester, is pumped to the algal growth basins. Effluent from the growth basins is centrifuged; algae are harvested and the liquid is pumped to the flush tanks for reuse. Organic matter in the untreated swine waste appeared to provide some carbon dioxide for the algae (Chlorella vulgaris). Total nitrogen content of the waste was reduced by 90% by the algae, and nitrate was less than one mg/l in the outflow. (Lynch-Wisconsin)
W78-06745

SOIL TEMPERATURE INCREASES INDUCED BY SUBSURFACE LINE HEAT SOURCES,
Long Island Vegetable Research Farm, Riverhead, NY.
For primary bibliographic entry see Field 5B.
W78-06748

AUTOMATIC CONTROL STRATEGIES FOR URBAN STORMWATER,
Northern Arizona Univ., Flagstaff. Dept. of Civil Engineering.
P. D. Trotta, J. W. Labadie, and N. S. Grigg.
Journal of the Hydraulics Division, Proceedings of ASCE, Vol. 103, No. HY12, p. 1443-1459, December, 1977. 5 fig, 4 tab, 22 ref. OWRT B-113-COLO(12).

Descriptors: *Automatic control, *Control systems, *Flood control, *Treatment facilities, *Urban runoff, Stochastic processes, Storm water, Overflow, Municipal wastes, Sewage treatment, Waste water treatment.

The efficiencies of automatic control strategies for sewage treatment plants were compared under simulated storm conditions. The control methods were analyzed using the San Francisco Master Plan as the treatment plant case study. Reactive control, adaptive control with limited forecast or with quadratic objective, and stochastic adaptive control with quadratic objective or with linear objective were compared according to their ability to predict strom water quantity and quality and to control overflow. Storm water inflows to subbasins, calculated over 20-min intervals for 3-1/3 hrs of the simulated storms' duration, ranged 1-1,500 cu ft/sec. The results of the simulation showed that a certain degree of storm prediction by control strategies was necessary for overflow control. Reactive control was the least effective system for the prevention of overflow tested, while adaptive control with limited forecast proved to be the safest. When the risk of forecast errors in the other three control strategies was taken into consideration, limited forecast provided better results because of the high degree of forecast error associated with stochastic adaptive control with linear objective. Stochastic adaptive control with quadratic objective proved effective even with a high degree of error in prediction. A hierarchical algorithm was designed for an automatic control system. (See also W77-09207; W77-07100 and W76-02878) (Lisk-FIRL)
W78-06749

INVESTIGATION OF EFFLUENT FILTERING SYSTEMS FOR DREDGED MATERIAL CONTAINMENT FACILITIES,
Northwestern Univ., Evanston, IL. Dept. of Civil Engineering.
R. J. Krizek, J. A. FitzPatrick, and D. K. Atmatzidis.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A031 468, Price codes: A11 in paper copy, A01 in microfiche. Contract Report No. D-76-8, August, 1976. 155 p, 46 fig, 32 tab, 102 ref, 4 append. DACW39-74-C-0090.

Descriptors: *Filtration, *Confined water, *Dredging, *Waste water treatment, *Separation techniques, Adsorption, Dikes, Effluents, *Dredged material containment, *Granular media, *Solid-liquid separation, Pervious dikes, Sand fill weirs, Granular media cartridges.

The functional capabilities and performance characteristics of effluent filtering systems were investigated and guidance regarding the design of filtering systems to improve the quality of effluent from dredged material containment facilities is provided. About 300 laboratory and field tests (on vacuum filtration and the use of granular filter media, fibrous filter media, and unconventional filter materials) were conducted and used to develop new concepts for the design of non-mechanized granular media filter systems (pervious dikes, sand fill weirs with or without backwash, and granular media cartridges). Each new system has a specific applicability with respect to the concentration of suspended solids in the effluent. Guidelines for the application of conventional solid-liquid separation technology to the design of dredged material confinement facilities are summarized. Classical sedimentation basin theories were adapted and nomographs were prepared to estimate the amount and gradation of suspended solids in the effluents when the geometry of the area, flow rate, and the pertinent characteristics of the dredged material slurry are known (Seip-IPA)
W78-06757

PRELIMINARY DESIGN OF A HOUSEHOLD REFUSE GRINDER,
Foster-Miller Associates, Inc., Waltham, MA
A. T. Fisk, and A. R. Guzdar
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 503. Price codes: A07 in paper copy, A01 in microfiche. Report to Environmental Protection Agency, Cincinnati, Ohio, Solid Waste Research Laboratory, January 19, 1973. 124 p, 22 fig, 10 tab, 11 ref, 1 append. CPE-70-115.

Descriptors: *Domestic wastes, *Waste disposal, Design data, Cost analysis, Waste water treatment, *Household wastes, *Grinding, *Household refuse grinder.

A preliminary design for a single family household refuse grinder was developed as part of an overall study to evaluate the technical feasibility of transporting ground household refuse through existing sewers. The grinder reduces most of the components of household refuse into a slurry formed with the non-fecal component of household water and transports it through the house sewer lateral to the sewer where it is mixed with the rest of the water. The system requires a modification in household plumbing and a storage tank to separate and store the non-fecal component of waste water. The grinder would be capable of grinding most of the components of household refuse, i.e., paper, cardboard, plastics, cloth, glass, lightweight aluminum, and garbage; it would accept (but would not grind) heavy aluminum and steel cans without damage to the machine, clean the cans of putrescible matter, and probably crumble them to a smaller volume. Simplicity of design, jam-free operation, and low cost were achieved within the maximum power limitations of available electrical household service. Typical estimated costs are: (1) $780 for the grinder and water supply system, (2)$200-$500 for the modification of new construction, and (3) $500-1200 for the modification of existing homes. The annual cost of the system, including depreciation and maintenance, is estimated to be in the range of $70-115. (Seip-IPA)
W78-06758

ECONOMIC IMPACT OF PROPOSED AMENDMENTS TO MERCURY EFFLUENT STANDARDS IN ILLINOIS (R 76-17) (R 76-21),
Southern Illinois Univ. at Carbondale.
For primary bibliographic entry see Field 5G.
W78-06759

COSTS OF WASTEWATER TREATMENT BY LAND APPLICATION, MCD-10,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
C. E. Pound, R. W. Crites, and D. A. Griffes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 439, Price codes: A08 in paper copy, A01 in microfiche. Report No. EPA-430/9-75-003, June, 1975. 156 p, 41 fig, 15 tab, 61 ref, 7 append. 68-01-0966.

Descriptors: *Land use, *Waste water treatment, *Economics, Cost-benefit analysis, Costs, Irrigation, Surface irrigation, Infiltration-percolation, Overland flow, Cost-effectiveness.

Preliminary cost screening is discussed and detailed cost estimates are presented for alternative land application systems for wastewater treatment. Cost categories include land, preapplication treatment, transmission, storage, land application, and recovey of renovated water. For preliminary screening costs, curves are presented relating capital, amortized, and operation and maintenance costs to average flow rates. Cost calculation procedures and an illustrative example are in-

cluded. For detailed planning costs, curves, tables, and data are presented for 33 individual cost components related to either flowrate or field area. For capital items, total construction costs are shown, and operation and maintenance costs are divided into labor, materials, and power, where applicable. The appendices contain: (1) information on revenue-producing and non-revenue producing benefits; (2) references; (3) sewage treatment plant and sewer construction cost indexes; (4) present worth and capital recovery factors; (5) cost-effectiveness analysis guidelines; and (6) a glossary of terms, abbreviations, and English-metric conversion factors. (Wares-IPA)
W78-06760

HANDBOOK FOR SEWER SYSTEM EVALUATION AND REHABILITATION, MCD-19,
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 457, Price codes: A10 in paper copy, A01 in microfiche. Report No. EPA - 430/9-75-021, December, 1975. 218 p, 47 fig, 26 tab, 17 ref, 4 append.

Descriptors: *Infiltration, *Inflow, *Sewers, *Water quality standards, Evaluation, *Rehabilitation, Inspection analysis, Water pollution control, *Infiltration inflow, *Federal Water Pollution Control Act Amendments.

The methodology necessary for an effective investigation and subsequent correction of Infiltration/Inflow (I/I) conditions in a sewer system is described in a handbook, which provides assistance in the preparation and review of I/I Analyses and Sewer System Evaluation Surveys. Chapters on: (1) methodology for conducting I/I analysis; (2) methodology for conducting Sewer System Evaluation Survey; (3) information on current state-of-the-art techniques for sewer rehabilitation; (4) costs associated with conducting Sewer System Evaluaton Survey and rehabilitation; and (5) how to utilize this guide are included. Each specific task that may be required in conducting I/I analysis and Sewer System Evaluation Survey explained in detail. A set of cost curves indicates the correlation between the cost for each phase of sewer system evaluation work and variables such as sewer length, population, and magnitude of I/I. (Seip - IPA)
W78-06761

COOLING TOWERS: A BIBLIOGRAPHY (JUNE 1977 - DECEMBER 1977).
Department of Energy, Oak Ridge, TN. Environmental Sciences Information Center.
For primary bibliographic entry see Field 5G.
W78-06763

ALTERNATIVE WASTE MANAGEMENT TECHNIQUES FOR BEST PRACTICABLE WASTE TREATMENT, MCD-13.
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W78-06765

BEHAVIOR OF WASTEWATER SLUDGES AND CHEMICAL WASTEWATER SLUDGES DURING AEROBIC DIGESTION,
Toronto Univ. (Ontario).
M. F. Hamoda.
Available from University Microfilms International, Ann Arbor, Michigan 48106. PhD Thesis, 1975.

Descriptors: *Activated sludge, *Aerobic treatment, *Sludge digestion, *Ammonium, *Alum, Lime, Chemical precipitation, Volatility, Iron, Dewatering, Filtration, Physical properties, Phosphorus, Waste water treatment.

Aerobic digestion of chemically-treated activated, primary, and precipitated sludges was evaluated in labortory experiments with alum, ferric chloride, and calcium hydroxide. Doses of 200-600 mg/liter of calcium hydroxide, 8.1-22.3 mg/liter of alum, or 10-30 mg/liter of ferric chloride were added to five types of sludge originating from primary treatment, activated sludge, lime treatment, and mixed liquor treatment with alum or ferric chloride. The primary and activated sludges were employed as the controls in the batch and semi-continuous aerobic digestion systems. Sludges treated in semi-continuous digestors had a higher supernatant quality, dewaterability and oxygen uptake rate. A linear correlation existed between the decomposition rate constant for volatile suspended solids reduction and the initial volatile suspended solids concentration in batch digestion systems. For lime primary sludge, a linear relationship was found between the decomposition constant and alkalinity during digestion. Nitrification decreased in sludges treated with high lime dosages; settling and filtration improved after aerobic digestion for 10-12 days. Soluble phosphorus was released from the lime primary sludge after storage for 15 days at 20C. Aerobically-digested alum or ferric chloride activated sludge required storage for up to 10-15 days and exhibited poor settling and filtration properties. Control activated sludges were unaffected by aluminum or ferric additions during aerobic digestion and displayed lower oxygen uptake rates than primary sludges. (Lisk-FIRL)
W78-06785

VIRAL MONITORING OF WASTEWATER AEROSOLS,
Michigan Univ., Ann Arbor, Dept. of Epidemiology.
For primary bibliographic entry see Field 5A.
W78-06806

RESEARCH NEEDS RELATING TO ON-SITE TREATMENT OF DOMESTIC WASTES.
Maine Univ. at Orono. Land and Water Resources Inst.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 989, Price codes: A02 in paper copy, A01 in microfiche. A Workshop Sponsored by Northeast Water Institute Directors and New England Council of Water Center Directors, Technical Report, (Partial Completion Report), April 1978, 14 p. OWRT B-061-RI(4). 14-31-0001-3953.

Descriptors: *Research priorities, Sewage disposal, *Sewage treatment, *Waste water treatment, *Domestic wastes, *On-site sewage systems.

There has been a dispersal of urban populations in the U.S. into rural areas outside older cities and towns. This dispersal has been accompanied by widespread use of private on-site sewage systems. Initially, the proliferation of such systems caught state and local governments off guard. Many early systems were poorly designed and poorly constructed. Some private wells became contaminated, and threats became apparent to lakes, streams, and other water resources. In response, laws and regulations were adopted, mostly through state governments, intended to guarantee proper design and installation of on-site systems. To a large extent, however, these laws and regulations were not reinforced by a technical mastery of how on-site systems perform. The immediate environmental effects of on-site systems have been poorly understood, as have the broader land-use effects of widespread use of such systems. This workshop brought together people knowledgeable about the situation in New England. The purpose of the workshop was to identify research needs with respect to on-site sewage disposal. Principal suggestions made during and following the workshop are summarized. Other alternative methods of sewage treatment (e.g. aerobic units) were not examined at the workshop and therefore are not covered in this summary. This report does not summarize state-of-the-art information presented at the workshop, but rather outlines areas in which knowledge should be expanded. Intended to be a step toward a comprehensive regional research program, the report is in two parts: an outline of topic areas/problems/research needs; and elaborations upon principal research needs. (Harsbrouck-Maine)
W78-06807

WASTEWATER RECYCLING: DEVELOPMENT OF MYCORRHIZAL ROOT SYSTEMS FOR INCREASED EFFICIENCY,
Michigan State Univ., East Lansing. Dept. of Botany.
For primary bibliographic entry see Field 5G.
W78-06808

EFFECTS OF WATER TREATMENT PLANT WASTES ON DOMESTIC WASTEWATER TREATMENT PROCESSES,
Auburn Univ., AL. Water Resources Research Inst.
J. M. Morgan, B. A. Rindt, J. R. Vorhees, and M. E. Burman, III.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 970. Price codes: A06 in paper copy, A01 in microfiche. OWRT A-040-ALA(1).

Descriptors: Water quality, Water treatment, Waste water treatment, *Alum sludge, Waste disposal, Waste water disposal, Clarification, Sludge digestion, Activated sludge, Dewatering.

The principal and most troublesome waste produced during ordinary domestic water treatment is alum sludge. Many methods have been suggested for the treatment and disposal of this material, but none is universally applicable. Among the more promising techniques is discharge of the sludge to a domestic sewerage system. This research was undertaken to ascertain the effects that this action would have on the receiving wastewater treatment plant. The effects of alum-water-treatment-plant sludge on primary clarification, anaerobic sludge digestion, activated sludge wastewater treatment, and the dewatering of various sludges were investigated. Results indicated that few ill effects would result from disposal of alum sludges in this manner, and that under certain conditions the performance of the wastewater treatment plant might be enhanced. Th only potentially serious adverse effect was that the total volume of sludge to be treated and disposed of at the wastewater treatment plant would increase somewhat.
W78-06811

THE APPLICABILITY OF PYROLYSIS-GAS-LIQUID CHROMATOGRAPHY FOR THE QUANTITATIVE IDENTIFICATION OF BACTERIA IN SEWAGE TREATMENT PLANT EFFLUENT,
Catholic Univ. of America, Washington, DC. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W78-06814

GAS-LIQUID-CELL OXYGEN ABSORPTION IN FERMENTATION,
Iowa State Univ., Ames. Engineering Research Inst.
For primary bibliographic entry see Field 5A.
W78-06824

SPIRAL-WOUND POLY(ETHER/AMIDE) THIN-FILM COMPOSITE MEMBRANE SYSTEMS,
Universal Oil Products Co., San Diego, CA. Fluid System Div.
For primary bibliographic entry see Field 3A.
W78-06829

GAS SEPARATION MEMBRANES: TECHNOLOGY AND APPLICATIONS,
Universal Oil Products, Inc., San Diego, CA. Basic Development Dept.
For primary bibliographic entry see Field 3A.
W78-06830

NITROGEN REMOVAL BY ION EXCHANGE: BIOLOGICAL REGENERATION OF CLINOPTILOLITE,
Illinois Univ. at Urbana-Champaign. Dept. of Civil Engineering.
M. J. Semmens, J. T. Wang, and A. C. Booth.
Journal Water Pollution Control Federation, Vol. 49, No. 12, p 2431-2444, December, 1977. 14 fig, 1 tab, 12 ref. OWRT A-080-ILL(2).

Descriptors: *Nitrification, *Ion exchange, *Zeolites, *Ammonium compounds, *Dissolved oxygen, Organic compounds, Nitrogen fixing bacteria, Phenols, Humic acids, Industrial wastes, Municipal wastes, Waste water treatment, *Clinoptilolite.

The regeneration of clinoptilolite, a zeolite used for removal of ammonium from waste water, by the use of nitrifying bacteria was examined. Clinoptilolite containing high concentrations of ammonium was treated with a slurry of nitrifying bacteria containing 0.3 M sodium nitrate. Biological regeneration of the zeolite during 20 tests occurred over a time range of 1.3-4.6 hrs. The rate of regeneration was found to be based on the rate of nitrification. Optimum nitrificAtion rates were achieved by the addition of pure oxygen to maintain the dissolved oxygen level above 6 mg/liter. Additions of phenol and humic acid to the regeneration process did not have deleterious effects on the nitrifying bacteria or the regeneration process. Chemical regeneration of clinoptilolite at a neutral pH with 0.3 M sodium chloride was more effective than the biological regeneration. This difference was attributed to the production of magnesium and calcium ions in the brine during the biological regeneration process. (Lisk-FIRL)
W78-06855

A SURVEY OF PRACTICES AND REGULATIONS FOR REUSE OF WATER BY GROUNDWATER RECHARGE,
SCS Engineers, Long Beach, CA.
C. J. Schmidt, E. J. Clements, and S. P. Skelton.
Journal American Water Works Association, Vol. 70, No. 3, p 140-147, March, 1978. 4 fig, 13 tab, 15 ref.

Descriptors: *Artificial recharge, *Injection wells, *Water spreading, *Waste water disposal, Ground water, Aquifers, Regulation, Legislation, Water pollution, Water quality control, Percolation, Water reuse, California, New York.

Present interest in formal, regulated wastewater reuse projects is simply bringing focus upon an informal practice which has existed for a long time. To date, ground water recharge by direct injection of wastewater is practiced at one site (Orange Co., California), under construction at another (Nassau Co., New York), and in planning stages at three. Formal ground water recharge by landspreading and percolation is practiced at six sites, five located in California. By 1976, approximately 26 states had prepared regulations and guidelines for ground water recharge; proposed U.S. EPA regulations for underground injection programs would generally allow the states to exercise maximum flexibility to prevent ground water pollution. Direct injection of treated wastewater is regulated on an individual project basis in California and New York, the two states where such systems are in use. Individual case regulation is also practiced for spreading and percolation but with less stringent requirements for the quality data for each recharge site discussed, as well as procedural details of the various operations. (Eberle-NWWA)
W78-06958

WASTEWATER TREATMENT PLANT CLEANS UP MASSACHUSETTS RIVER.
Water and Sewage Works, Vol 125, No 3, p 75, March, 1978.

Descriptors: *Rivers, *Treatment facilities, *Aeration, *Settling basins, *Chlorination, Slide gates, Sluice gates, Interceptor sewers, Flowmeters, Data collections, Incineration, Waste water treatment, Municipal wastes.

A municipal waste water treatment plant with a 52 mgd capacity was constructed to reduce the pollutant load on the Merrimack River in Massachusetts. The activated sludge treatment plant, designed by Camp, Dresser, and McKee, Inc of Boston, serves the municipalities of Lawrence, Andover, North Andover, and Methuen. Influent is pumped through a 2,800 ft long force main to the plant where it undergoes primary sedimentation and aeration. The effluent is then treated with secondary sedimentation and is chlorinated before discharge into the Merrimack River. Sludge produced during treatment is dewatered and incinerated; stack gases are scrubbed before emission into the atmosphere. The treatment plant is equipped with 8 heavy duty sluice gates, 40 aluminum slide gates, and 9 roller gates. Six of the 8 sluice gates are electrically operated. Two interceptor sewer lines, one 21,600 ft long and the other 9,400 ft long, collect the municipal wastes for transport to the facility. Flowmeters measure the input from each community for calculation of operating expenses. (Lisk-FIRL)
W78-06976

BLOWERS FOR WATER RECLAMATION WORKS.
Water Services, Vol 81, No 982, p 752, December, 1977.

Descriptors: *Aeration, *Dissolved oxygen, *Aerobic treatment, *Aerated lagoons, Design data, Equipment, Aerobic conditions, Monitoring, Automation, Air pollution, Filters, Treatment facilities, Waste water treatment, Municipal wastes.

Waste water treatment aeration units, manufactured by Hick Hargreaves, a division of Electrical and Industrial Securities Ltd, have been designated for installation in the Loughborough Water Reclamation Works in England. Two 3150 Series 1423 Blowers will be put into operation with a third maintained as a standby. The aerators will have variable capacities ranging 2,000-5,000 cu ft/min at a pressure of 6 lb/sq in-g. Dissolved oxygen concentrations in the four aeration tanks will be monitored by eight probes mounted in banks of four. Each bank is capable of operating the aerators at variable speeds, dependent upon the measured dissolved oxygen levels. The aerators will function automatically when the oxygen level deviates by 0.5 mg/liter from 2.0 mg/liter. Noise levels at speeds between 450-980 rpm will be controlled by acoustic hoods and reactive-absorptive silencers. Electrostatic dry clean precipitors will filter the air. (Lisk-FIRL)
W78-06977

SCALE-FREE-VAPOR-COMPRESSION EVAPORATION.
Office of Water Research and Technology, Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 124, Price codes: A02 in paper copy, A01 in microfiche. Water Research Capsule Report, 1977. 9 p, 5 fig, 4 tab.

Descriptors: *Brines, *Waste water treatment, *Evaporation, *Desalination processes, Equipment, Design, *Technology transfer, Information exchange, *Brine concentration.

The development and applications (current and potential) of a tube-in-shell, vapor-compression evaporator (Brine Concentrator) utilizing a seed slurry process for scale control, are described. Water is pumped through a heat exchanger (after being treated to hold acidity (pH) between 5.5 and 6.5 for decarbonating), which raises its temperature to near the boiling point. Passing through a deaerator to be stripped of carbon dioxide, nitrogen, and oxygen, the waste combines with a slurry concentrate in the evaporator sump. The slurry is constantly circulated from the sump to the top of the evaporator from which it is distributed as a falling film on the inside of the tubes. During the process, a portion of the water in the slurry film is vaporized; the vapor is then compressed and introduced to the shell side of the evaporator tubes. Due to the temperature differential between the vapor and the brine slurry film, the vapor condenses as water on the outside of the tubes; this condensation releases energy for further process evaporation. A sensing device controls the concentration in the sump and supersaturaed brine-slurry waste is continuously withdrawn for final disposal. The product water gives up its heat to the incoming waste stream in the heat exchanger and is then collected and returned for use in the power plant's process system. By using a brine concentrator, water-intensive industries can maximize water recovery and reuse without the in-process buildup of precipitated solids. Several features support the system's broad industrial application, including: water, energy, and pollution control; functional versatility; and production of high quality water. (Seip-IPA)
W78-06994

EVALUATION OF TECHNIQUES FOR ALGAE REMOVAL FROM WASTEWATER STABILIZATION PONDS, REVIEW PAPER,
Utah Water Research Lab., Logan.
E. J. Middlebrooks, D. B. Porcella, R. A. Gearheart, G. R. Marshall, and J. H. Reynolds.
Report No. PRJEW115-1, January, 1974. 20 p, 2 fig, 1 tab, 10 ref. OWRT A-015-UTAH(2), 14-31-0001-3845; and 68-03-0281.

Descriptors: *Algae, *Algal control, Evaluation, Ponds, Waste water(Pollution), Waste water treatment, Waste storage, Stabilization, Centrifugation, Coagulation, Flocculation, Filtration, Soil filters, *Algal removal, Particulates, Microstraining, Containment.

Review and evaluation of techniques for algae removal from wastewater stabilization ponds are presented. Criteria for candidate processes for removal of particulate matter (e.g., microorganisms) include ease of operation, minimum maintenance and cost, dependability of operation, and efficiency of particulate removal, including preventing recycling biological oxygen demand and nutrients from decay of particulates. Processes reviewed ae centrifugation, microstraining, coagulation-flocculation, containment, and soil filtration. The use of the soil mantle for polishing effluents is the most economically and technologically feasible method for algae removal, despite questions concerning environmental effects. Granular media filtration through soil mantles offers the advantages of automatic operation, clear effluent, low effluent biological oxygen demand, nutrient removal, and economy. (Wares-IPA)
W78-06995

RECREATIONAL REUSE OF MUNICIPAL WASTEWATER--PHASE II,
Texas Tech Univ., Lubbock. Water Resources Center.
For primary bibliographic entry see Field 5G.
W78-06997

FEASIBILITY OF USING IRON ORE OVERBURDEN MATERIAL AS A MEDIA FOR

DISPOSAL OF SECONDARY SEWAGE EFFLUENT IN NORTHEASTERN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Forest Resources.
For primary bibliographic entry see Field 5E.
W78-07000

THE EFFECTS OF TEMPERATURE CONTROL ON BIOLOGICAL WASTEWATER TREATMENT PROCESSES,
Purdue Univ., Lafayette, IN. Water Resources Research Center.
C. E. Collins, C. P. L. Grady, Jr., and F. P. Incropera.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 567, Price codes: A08 in paper copy, A01 in microfiche. Purdue University Water Resources Research Center Technical Report No. 98, March 1978. 143 p, 49 fig, 13 tab, 64 ref. OWRT A-042-IND(2).

Descriptors: *Waste water treatment, *Water temperature, *Sludge digestion, *Sludge disposal, Sludge, Sludge treatment, Activated sludge, Biodegradation, Heated water, Thermal water, Aeration.

This study is concernedf with the feasibility of using waste heat to optimize the performance of a biological wastewater treatment facility through temperature control. The effect of temperature on biological wastewater treatment was modelled by considering its influence on several important processes. In particular, the specific influence of temperature on the bacterial kinetic parameters, the oxygen transfer process and the biomass settling was included in the model. The parameters chosen to determine the effect of temperature on the system were effluent quality, mass wastage (sludge disposal) rate, and the power requirements for aeration. These parameters reflect both the primary purpose of waste treatment and the major operating costs. The parameters were determined as a function of both temperature and sludge age, since both of these variables may be used to control the operation of a wastewater treatment facility. The results of a computer simulation show that an optimal temperature for operation of a secondary wastewater treatment facility is approximately 25C. Operation at this temperature provides improved effluent quality and reduced sludge protection, without incurring an excessive increase in the power requirements for aeration.
W78-07001

BIOLOGICAL CONTROL OF WATER POLLUTION.
Pennsylvania Univ., Philadelphia. Center for Ecological Studies in Planning and Design.
University of Pennsylvania Press, 1976, 340 p, Edited by Joachim Tourbier and Robert W. Pierson, Jr.

Descriptors: *Biocontrol, *Water pollution control, *Waste water treatment, *Biological treatment, Water pollution effects, Potable water, Alternative planning, Aquifer recharge, Waste disposal.

In the conference, scientists, environmental experts, and city planners from Germany, Holland, the Sudan, Finland, Romania, the United States, and Puerto Rico discuss how biological systems may be utilized to deal with water pollution problems. Papers are presented suggesting that green plants and biological systelms have the capacity to detoxify dangerous synthetic chemicals in industrial wastes, and that vegetation can capture nutrients and be harvested directly as food for man and domestic animals or used for paper manufacture or composting. More complex systems are also presented in which food chains are reconstructed from nature, beginning with green plants and phytoplankton and ending with animals of economic value. Biological systems are discussed which rely on forest, marsh, or crop vegetation together with soil microorganisms to improve the quality of aquifer recharge water. (See W78-07004 thru W78-07012)
W78-07003

THE ROLE OF AQUATIC PLANTS IN AQUATIC ECOSYSTEMS,
Academy of Natural Sciences of Philadelphia, PA. Dept. of Limnology.
R. Patrick.
In: Biological Control of Water Pollution. Univ of Penn. Press, Inc., Philadelphia, Pa. Tourbier, J. and R. W. Pierson Jr. (editors). 1976. p 53-59. 15 ref.

Descriptors: *Aquatic plants, *Nutrient removal, *Heavy metals, *Aquatic algae, Primary production, Nickel, Manganese, Wetlands, Estuaries, Rivers, Aquatic ecosystems, Vanadium.

Aquatic plants enrich aquatic and wetland ecosystems by fixing carbon and giving off free oxygen during photosynthesis. They also provide shelter for aquatic organisms. In the growth of aquatic plants various nutrients are removed from the water. Nutrients may be accumulated in excess of what is needed for growth. Significant amounts of heavy metals are also accumulated. Nutrients and trace metals are stored in plant tissues and are returned to the aquatic ecosystem as food or detritus. In the case of emergent vegetation, they may be dispersed into the terrestrial ecosystem. Wetlands are important for the production of various substances essential for the aquatic ecosystem. An example is the production of vitamin B12 by fungi and bacteria in swamps. (See also W78-07003) (Stihler-Mass)
W78-07004

DEWATERING OF SLUDGE AT COMPACT SEWAGE TREATMENT WORKS.
Water Services, Vol 81, No 982, p 757, December, 1977.

Descriptors: *Treatment facilities, *Dewatering, *Sludge treatment, *Design data, *Activated sludge, Screens, Lime, Flocculation, Vacuum drying, Filtration, Waste water treatment, Municipal wastes.

Restricted land area in Copthorne, Sussex, England, mandated the installation of a compact, drum vacuum filter for sludge dewatering rather than drying beds which would have required a 10,000 sq ft area. The treatment system selected to serve the population of 10,000 included initial pretreatment with screening and degritting. The system contained turbine aerators with high rate circulation for activated sludge treatment; provisions were also made for aerobic treatment of sludge. A daily volume of 5,000 gal of sludge with a 98% moisture content was conditioned with lime and ferric chloride and thickened in storage tanks before filtration. The rotating drum vacuum filter with a surface area of 78 ft and a belt discharger, dewatered the sludge to 80% moisture content. Capital and maintenance costs of the system were about equal to those of drying bed-sludge treatment systems. (Lisk-FIRL)
W78-07005

ROTATING DISC SEWAGE TREATMENT SYSTEM,
Dickson Environmental Engineering Ltd., Guildford (England).
R. E. Godfree.
Water Services, Vol 81, No 982, p 748, December, 1977.

Descriptors: *Filters, *Biological membranes, *Construction materials, *Separation techniques, *Biochemical oxygen demand, Suspended solids, Filtration, Teritary treatment, Waste water treatment, Municipal wastes.

A rotating biological disc with an automatic drum filter allows higher loading rates and eliminates the need for final clarification or settlement of the municipal effluent. The biological disc is constructed of polyvinyl chloride in a continuous spiral configuration which maintains uniform contact of the sewage effluent with the rotating disc. The waste water passes by gravity flow through a filter cloth mounted on a perforated drum. The filtration process requires about 3 min, with longer times allowed for effluent with a high suspended solids content such as activated sludge. The 1.5 m and 2.0 m diameter disc packs have effective capacities of 12 g/sq m and 16 g/sq m BOD load, respectively. Under these loading conditions, the treated effluent has a BOD content of 20 mg/liter and a suspended solids level of 30 mg/liter. Higher removal rates can be achieved by the rotating disc filter with longer contact times; filter performance is dependent upon the texture of the filter cloth. The system can function as a secondary or tertiary treatment method, based upon the filter texture. (Lisk-FIRL)
W78-07006

VACUUM FILTRATION, WITH PARTICULAR REFERENCE TO OPERATIONAL AND MAINTENANCE PROBLEMS,
R. A. Mansfield.
Water Pollution Control, Vol 77, No 1, p 61, 1978.

Descriptors: *Filtration, *Vacuum drying, *Dewatering, *Sludge treatment, *Operation and Maintenance, Sludge disposal, Filters, Polyelectrolytes, Labor, Capital costs, Waste water treatment, Municipal wastes.

Problems encountered with the operation and maintenance of a vaccum filter for digested sludge dewatering at the New Germany waste water treatment facility in South Africa were discussed. The sludge, which was buried after treatment, was excessively dewatered, creating an additional 21% solids loading on the digestor. The edges of the polypropylene monofilament filter, with a 1.85 m diameter, were sealed by vulcanizing the rubber edges with heat. Fibers and other materials collected and clogged the pipelines at the check valves, the polyelectrolyte-sludge mixing unit, and the spray nozzles. Sand and grit caused excessive pump water; the dosing pumps in the polyelectrolyte make-up tank were obsructed by insects entering the tank. An overhead gantry was required for repairs; the use of reclaimed effluent required pump, blower, and chlorinator housings. (Lisk-FIRL)
W78-07007

APPLICATION OF VASCULAR AQUATIC PLANTS FOR POLLUTION REMOVAL, ENERGY, AND FOOD PRODUCTION IN A BIOLOGICAL SYSTEM,
National Aeronautics and Space Administration, Bay Saint Louis, MS. National Space Technology Labs.
B. C. Wolverton, R. M. Barlow, and R. C. McDonald.
In: Biological control of water pollution, Univ. of Penn. Press, Inc., Philadelphia, Pa., Toubier, J. and Pierson, R. W., Jr. (Editors). 1976. p 141-149. 5 fig, 3 tab, 18 ref.

Descriptors: *Vascular plants, *Water hyacinths, *Nutrient removal, Heavy metals, Wetlands, Water pollution, Alligator weed, Sewage effluents, Waste water, Primary production, Nitrogen, Phosphorus, Phenol, Food production, Biogas production.

A one-acre (0.40 ha) water hyacinth wetland has the potential for removing over 3500 pounds of nitrogen and over 800 pounds of phosphorus annually from sewage effluent, absorbing and metabolizing over 150 pounds of phenol every 72 hours from phenol-polluted water, and removing over 120 gm of trace heavy metals daily. Under

favorable conditions, one acre of wter hyacinth has the potential of producing over 70 tons of dry plant material annually. This can be converted, through anaerobic decomposition, to over one million cubic feet of biogas; A high grade fertilizer is produced as a by-product. Water hyacinths may, eventually, be used as food for cattle and even man. Field demonstrations using a chemical waste lagoon and a municipal sewage lagoon are in process. Processing equipment, including scaled-up laboratory models of biogas generating units, is being developed. (See also W78-07003) (Stihler-Mass)
W78-07008

SEWER JET CLEANER THAWS WATER MAINS.
For primary bibliographic entry see Field 8G.
W78-07009

THE POTENTIAL USE OF FRESHWATER TIDAL MARSHES IN THE MANAGEMENT OF WATER QUALITY IN THE DELAWARE RIVER,
Rider Coll., Trenton, NJ. Dept. of Biology.
D. F. Whigham, and R. L. Simpson.
In: Biological Control of Water Pollution. Univ. of Penn. Press, Inc., Philadelphia, Pa., Tourbier, J. and Pierson, R.W., Jr. (Editors). 1976. p 173-186. 8 fig, 3 tab, 21 ref.

Descriptors: *Water quality, *Biological treatment, *Delaware River, Wetlands, Primary productivity, Soil algae, Nitrogen, Phosphorus, Dissolved oxygen, Carbon dioxide, *Freshwater tidal marshes, Hamilton Marsh, Aboveground production, Nutrient sink, Phizoclonium.

Freshwater tidal marshes, which make up 5% of the marshland in the Delaware River estuarine system, may be of use in the management of the water quality of that river. Hamilton Marsh, the northernmost tidal marsh in the Delaware River basin, can be divided into four habitats: 1. streams and stream banks, 2. high marsh, 3. pondlike areas drained only at low tide, and 4. continuously flooded areas. Seven vegetation types, as measured by harvesting on 0.25 sq m quadrats, varied from 6.5 t/ha/yr to 21.0 t/ha/yr. Mixed vegetation, the most expansive type, averaged 9.1 t/ha/yr. Freshwater tidal marshes are as productive as estuarine saltmarshes. Average nitrogen content for all species in the mixed type was 2.49%. Peat biomass of edaphic algae, the only functioning producers during eight months of the year, was 37.7 kg/ha. Graphs illustrate changes in water quality parameters between June 1974 and January 1975. Data suggest that high marsh areas act as a nutrient sink during summer months and that pond-like areas may serve a similar function during winter. (See also W78-07003) (Stihler-Mass)
W78-07010

AQUACULTURE AS AN ALTERNATIVE WASTEWATER TREATMENT SYSTEM,
Oklahoma State Dept. of Health, Oklahoma City.
R. L. Carpenter, M. S. Coleman, and R. Jarman.
In: Biological Control of Water Pollution. Univ. of Pennsylvania Press, Inc., Philadelphia, Pa., Tourbier, J. and Pierson, R. W., Jr. (Editors). 1976. p 215-224, 5 fig, 1 tab, 26 ref.

Descriptors: *Biological treatment, *Municipal wastes, *Sewage lagoons, *Waste water, Federal Water Pollution Control Act, Biochemical oxygen demand, Pathogenic bacteria, Oklahoma, Channel catfish, Tilapia, Suspended solids, Food habits, Minnows, *Aquaculture, Fecal coliforms.

The use of aquaculture to upgrade wastetreatment lagoons while producing a valuable by product is being studied in a six-cell, serially operated, experimental lagoon system. Fish were already present in the first two cells receiving conventional aerated treatment. The four non-aerated cells were variously stocked with channel catfish, golden shiners, fathead minnows, and Tilapia nilotica. The secondary treatment standard for 5-day biological oxygen demand was met in the effluent from the second cell; standards for suspended solids and fecal coliforms were met in the effluent of the fifth cell. Removal of nitrogen and phosphorus was excellent. No pathogens were found in waste water beyond the first two cells nor in any of the 179 fish sampled. Biomass increases were: 4 to 163 lbs for Tilapia nilotica; 600 to 4000 lbs for channel catfish, 85 to 535 lbs for golden shiners. When operated in the absence of fish, effluent quality was lower and the suspended solids standard was not met. (See also W78-007003) (Stihler-Mass)
W78-07011

A PROPOSED INTEGRATED BIOLOGICAL WASTEWATER TREATMENT SYSTEM,
Texas State Dept. of Health, Austin. Div. of Wastewater Technology and Surveillance.
R. Dinges.
In: Biological Control of Water Pollution. Univ. of Pennsylvania Press, Inc., Philadelphia, Pa., Tourbier, J. and Pierson, R. W., Jr. (Editors). 1976. p 225-230. 2 fig, 3 tab, 6 ref.

Descriptors: *Municipal wastes, *Biological treatment, *Nutrient uptake, *Aquatic plants, Water hyacinths, Harvesting, Zooplankton, Daphnia, pH reduction filter, Coliform reduction, Aquaculture, Glass shrimp, Asiatic clams.

The proposed system intended to correct the deficiency of stabilization pond effluent quality consists of four serially-operated treatment ponds. Stabilization pond effluent in which original organic matter has been reduced by bacterial action and converted to algal cells will be passed through a pH reduction filter and into the proposed unit. The first pond will contain water hyacinths and duckweed; scuds will be abundant. Expected results are mineral nutrient uptake, reduction of hardness and total dissolved solids, denitrification, and suppression of algal growth. Results expected of the second pond devoted to zooplankton culture are clarification, organic and coliform reduction, and mineralization and mineral nutrient uptake. The third pond will contain larger invertebrates such as glass shrimp. Expected results are biomass conversion to a larger life form, nutrient uptake, settling, and minimal organic reduction. Results of the fourth pond, which will contain fish, are biomass conversion to a larger life form, settling, and minimal organic reduction. By-product production may help offset the cost of treatment. (See also W78-07003) (Stihler-Mass)
W78-07012

PLEINS FEUX SUR LES EAUX ROUGES DE MONT-WRIGHT (RED WATER AND THE MOISIE RIVER).
Quebec Cartier Mining Co., Fermont.
For primary bibliographic entry see Field 5G.
W78-07023

LOCATING UNDERGROUND PIPES AT SEWAGE WORKS.
For primary bibliographic entry see Field 8G.
W78-07031

ASBESTOS-CEMENT PIPES FOR OUTFALL SEWER.
Pipes and Pipelines International, Vol. 22, No. 5, p 33, October, 1977.

Descriptors: *Outfall sewers, *Pipelines, *Pipes, *Concrete pipes, *Asbestos cement, Sewerage, Construction materials, Equipment, Conveyance structures, Asbestos, Waste water treatment, Waste water disposal, Municipal wastes.

The installation of an outfall sewer constructed of asbestos-cement pipes, manufactured by TAC Construction Materials Ltd is described. The final outfall sewer designed for Peterborough Eastern, included four miles of Turnall and Everite asbestos-cement pipes. Pipe diameters ranged 500-900 mm; transportation of the pipes to the outfall sewer site was completed within a seven day period so that pipes could be joined before installation. The location of the rising main was calculated by a laser beam which was directed over the pipe crowns. The rising man was constructed of 500 mm diameter pipe which did not require a jointing tackle for connection. A trench safety shield was employed during installation of the 5 m long, 900 mm diameter pipes rather than shuttering because of excessive groundwater below the 4 m excavation depth. (Lisk-FIRL)
W78-07044

OVERFLOW ABATEMENT ALTERNATIVES SELECTED BY COMBINING CONTINUOUS AND SINGLE EVENT SIMULATIONS,
Dorsch Consult, Munich (Germany).
For primary bibliographic entry see Field 5G.
W78-07059

INFILTRATION-INFLOW SEWER LINE ANALYZER,
For primary bibliographic entry see Field 5A.
W78-07076

PROCESS AND SYSTEM FOR TREATING WASTE WATER,
Battelle Pacific Northwest Labs., Richland, Wa. (Assignee).
D. E. Olesen, and A. J. Shuckrow.
United States Patent 4,076,615. Issued February 28, 1978. Official Gazette of the United States Patent Office, Vol. 967, No. 4, p 1568-1569, February, 1978. 1 fig.

Descriptors: *Activated carbon, *Biological treatment, *Activated sludge, *Patents, *Aeration, Coagulation, Flocculation, Oxygen, Organic wastes, Design data, Waste water treatment.

A patent has been issued for a combined powdered activated carbon-aerated biological treatment process to remove dissolved organic substances from waste water. Waste water is introduced into an oxygen aeration chamber containing 50 mg/liter powdered activated carbon and 100 mg/liter alum. The organic particles are adsorbed onto the carbon which is coagulated by the alum. Alum is precipitated as aluminum hydroxide by pH adjustment. Sludge and supernatant are produced with the addition of a polyelectrolyte flocculant; the sludge is aerated to enhance microbial degradation of the organic substances. Thermal regeneration of the sludge reactivates the carbon and converts the aluminum hydroxide to alumina. A portion of the activated sludge is returned to the initial aeration chamber for mixing with influent; the remainder is acidified with sulfuric acid to convert the alumina to alum. The sludge containing the reactivated carbon and alum is recycled to the aeration chamber for contact with the incoming waste water. (Lisk-FIRL)
W78-07079

PROCESS FOR THE BIOLOGICAL PURIFICATION OF SEWAGE,
L. Verde.
United States Patent 4,076,616. Issued February 28, 1978. Official Gazette of the United States Patent Office, Vol. 967, No. 4, p 1569, February, 1978. 1 fig.

Descriptors: *Activated carbon, *Biological treatment, *Oxygenation, *Aerobic treatment, *Patents, Design data, Filtration, Percolation, Bacteria, Waste water treatment, Municipal wastes.

A patent has been issued for a biological treatment process using activated carbon particles have a size range of 1.5-8.0 mm. Oxygen-bearing air is injected into an intermediate layer of the activated sludge bed, aerating only that portion of the activated carbon above that layer. The waste water percolates through the activated carbon bed at a rate less than 2 m/hr, providing a contact time in the layer above the intermediate level of 30 min or more. The lower levels of the activated carbon bed are free of bacterial colonies. Bacteria are retained within the intermediate layer as the waste water percolates through. (Lisk-FIRL)
W78-07081

SONIC CAVITATION AND OZONATION OF WASTE MATERIAL,
TII Corp., Lindenhurst, NY. (Assignee).
D. Bybel, N. Bellmore, R. F. Furey, and D. P. Stahl.
United States Patent 4,076,617. Issued February 28, 1978. Official Gazette of the United States Patent Office, Vol. 967, No. 4, p 1569, February, 1978. 1 fig.

Descriptors: *Ozone, *Patents, *Cavitation, *Bubbles, *Liquid wastes, *Waste water treatment, Acoustics, Physical control, Design data, Equipment.

A patent has been issued for a waste water treatment process which employs acoustic energy and ozone. The liquid waste is introduced into a vessel equipped with diffusers for emitting a gas stream containing 0.5-1.0% ozone. The bubbles cover at least 90% of the cross-sectional area of the vessel and act as a barrier to divide the vessel into a lower treatment section and an upper ozone contact region. Acoustic energy is applied to the waste water in the lower section at a level sufficient to cavitate and emulsify the waste material. The material is then transferred to the upper section where it is contacted with the ozone-bearing gas stream. (Schulz-FIRL)
W78-07082

METHOD FOR TREATMENT OF DIGESTOR SUPERNATANT AND OTHER STREAMS IN WASTEWATER TREATMENT FACILITIES,
M. D. Rickard.
United States Patent 4,076,515. Issued February 28, 1978. Official Gazette of the United States Patent Office, Vol. 967, No. 4, p 1541, February, 1978. 1 fig.

Descriptors: *Sludge treatment, *Dewatering, *Ammonia, *Sludge digestion, *Patents, Methane, Steam, Carbon dioxide, Nitrogen, Organic wastes, Design data, Lime, Waste water treatment, Municipal wastes.

A waste water treatment process to remove ammonia from the supernatant of anaerobically digested sludge has been patented. The waste water sludge is thickened and placed in an anaerobic digester where the organic materials are converted to methane and carbon dioxide; the nitrogen in the sludge is converted to ammonia. The digester supernatant is decanted from the tank; the digested sludge is dewatered by vacuum filtration. The dewatering liquor, containing water soluble ammonia, is mixed with the supernatant. The mixture is then reacted with a stoichiometric excess of lime. The ammonia salts contained in the supernatant and dewatering liquor are converted to aqueous or free ammonia which is contacted in a reactor with steam under low pressure. The ammonia is thus reduced to a less soluble form. The digested sludge is dried for use as fertilizer. (Lisk-FIRL)
W78-07088

DATA REPORT: MEADOW/MARSH/POND SYSTEM,
Brookhaven National Lab., Upton, NY. Dept. of Applied Science.
M. Small, and C. Wurm.
Available from the National Technical Information Service, Springfield, VA 22161 as BNL-50675, Price codes: A03 in paper copy, A01 in microfiche. Brookhaven National Laboratory, Associated Universities, Inc., April, 1977. 28 p. 16 fig, 2 tab, 14 ref.

Descriptors: *Biological treatment, *Nutrient removal, *Sewage treatment, Marshes, Ponds, Nitrogen, Phosphorus, Coliforms, Oxygen demand, Wetlands, Waste water treatment, New York, Meadows.

This report summarizes 13 months' operating data, August 1975-August 1976, from the Meadow/Marsh/Pond system, one of two natural sewage-treatment systems constructed at Brookhaven National Laboratory. These systems are free of disease vectors, aerosals, and objectionable odors. The Meadow/Marsh/Pond system appears superior to the Marsh/Pond system for renovating blends of septage and weak sewage to groundwater recharge quality. The only conclusion offered at the present time is that the system will produce potable water from raw sewage following recharge of pond effluent through a vegetated sandy soil. (Stihler-Mass)
W78-07145

BIOLOGICAL MICROORGANISM ACTIVITY CONTROL--IN SEWAGE TREATMENT BY COMPUTER FED WITH OXYGEN CONC., TEMP., PH AND TURBIDITY READINGS.
German Patent DS 2532-199. Issued February 23, 1978. Derwent German Patents Abstracts, Vol A, No 9, p 3, April, 1978.

Descriptors: *Biological treatment, *Microbial degradation, *Computers, *Instrumentation, *Patents, Measurement, Automation, Turbidity, Oxygen demand, Temperature, Aerated lagoons, Aeration, Patents, Waste water treatment.

A patent has been issued for a computerized method to control the biological treatment of waste water with respect to the quality of the effluent. The treatment process utilizes an aeration reactor, a clarification tank, and a secondary sludge aeration chamber. Oxygen concentration, turbidity, pH, temperature, and flow rate of the waste water into the aeration reactor are monitored by a computer. The biological activity of the microorganisms in the waste water is measured according to the temperature-dependent oxygen demand value obtained automatically from oxygen and turbidity data. The pH in both reactors is maintained at the desired value via additions of alkaline or acidic solutions. Variations in the specific oxygen demand, which directly relates to the microbial activity, are automatically controlled by adjustments in the inflow rate, aeration rate, and composition of added nutrients in the waste solution in one or both reactors. (Lisk-FIRL)
W78-07150

SEWAGE PURIFICATION PLANT FOR SMALL COMMUNITIES--OPERATING BY EXTENDED AERATION WITH GLASS WOOL MAT TO IMPROVE OXIDATION.
French Patent FR 2347-313. Issued December 9, 1978. Derwent French Patents Abstracts, Vol A, No 5, p 4-5, March, 1978.

Descriptors: *Oxidation, *Patents, *Aeration, *Activated sludge, *Flotation, Design data, Construction materials, Sludge treatment, Bubbles, Waste water treatment.

An extended aeration sewage treatment plant which uses a glass wool layer to diffuse air bubbles for small waste loads has been patented. The sewage treatment plant is a conical tank divided into a decantation zone containing a layer of glass wool coated with a polyester resin and an oxidation zone near the inside of the tank. Waste water is introduced into the base of the oxidation zone where air bubbles are supplied by a compressor. The waste passes into the decantation zone which is partitioned into four cells with walls bearing alternating top and bottom holes. Activated sludge and other heavy matter is separated and recirculated through the holes and is retained on the glass wool. Bulked sludge floats with the air bubbles to the surface of the tank through the upper cell of the decantation tank. The clarified liquid is free of suspended solids; the oxidation yield is high. (Lisk-FIRL)
W78-07151

PHOSPHORUS REMOVAL DEMONSTRATION STUDIES USING LIME, ALUM AND FERRIC CHLORIDE AT C. F. B. BORDEN,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
W. E. Stepko, and D. T. Vachon.
Technology Development Report EPS 4-WP-78-2, February, 1978. 41 p, 4 fig, 12 tab, 5 ref, 3 append.

Descriptors: *Phosphorus removal, *Separation techniques, *Waste water treatment, Lime, Biochemical oxygen demand, Solid wastes, Suspended solids, Effluents, Operating costs, Model studies, *Alum, *Ferric chloride, Canadian Forces Base, Borden.

Full scale phosphorus removal studies were conducted at the primary wastewater treatment plant at Canadian Forces Base (C. F. B.) Borden during 1974. Treatment plant performance with respect to total phosphorus, BOD5, and suspended solids removals was monitored under baseline (no chemical addition) and at various lime, alum and ferric chloride addition levels. The effluent total phosphorus objective of 1 mg per L was achieved with lime or alum addition to the primary influent at dosages of 250 mg per L Ca(OH)2 and 12 mg per L Al, respectively. For dosages of ferric chloride ranging from 9.6 to 26.6 mg per L Fe, this objective could not be achieved. Chemical addition improved BOD5, and suspended solids removal efficiencies. Based on the annual chemical operating costs, it was determined that it was cheaper to remove phosphorus by using alum than lime. (WATDOC)
W78-07167

SLUDGE DEWATERING DESIGN MANUAL,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
H. W. Campbell, R. J. Rush, and R. Tew.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 72, 1978. 133 p, 42 fig, 66 ref, 13 tab, append. 75-3-22.

Descriptors: *Dewatering, *Sludge, *Solid wastes, *Sludge digestion, *Sludge treatment, Zeta potential, Hydrogen ion concentration, Alkalinity, Rheology, Resistance, Compressibility, Capillary action, Flotation, Filtration, Design, Estimated costs, *Sludge characterization, *Sludge conditioning, *Sludge quantities, Design methodology, Cost estimation methodology.

The dewatering manual integrates bench and pilot scale data generated at the Wastewater Technology Centre with information assembled from the literature, with a view to presenting a practical step-by-step procedure for estimating the size and cost of sludge dewatering installations. Sludge characterization tests are identified, along with a discussion of each test and its potential use for design purposes. A procedure for estimating the quantities of primary, waste activated and digested sludge, including the contribution of sludge from phosphorus removal processes, is presented. Process design procedures for gravity thickening, dissolved air flotation, centrifugation, vacuum filtration and pressure filtration are presented. The procedure for each dewatering method includes a description of the unit process, a discussion of applicable bench or pilot plant

tests, a suggested method of scale-up and an example problem. Cost data (December, 1975) for the major pieces of equipment required for each process have been obtained from equipment suppliers and are reported as a function of an appropriate design parameter. Operating and maintenance costs collected from the literature are summarized. A methodology for developing cost estimates is presented and illustrated with example calculations. (WATDOC)
W78-07168

LAND DISPOSAL OF SEWAGE SLUDGE VOLUME V (APRIL, 1976 - MARCH, 1977),
Guelph Univ. (Ontario). Dept. of Land Resources Sciences.
For primary bibliographic entry see Field 5E.
W78-07170

THE ANALYSIS OF CHEMICAL DIGESTER SLUDGES FOR METALS BY SEVERAL LABORATORY GROUPS,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
R. Knechtel, K. Conn, and J. Fraser.
Technology Development Report EPS 4-WP-78-1, January, 1978. 38 p., 16 ref., 22 tab.

Descriptors: *Sludge digestion, *Sludge treatment, *Sludge disposal, *Phosphorus, Sewage sludge, Fertilizers, Soil contamination, Metals, Analysis, Laboratory tests, Analytical techniques, Spectrophotometry, Absorption, Standards, Treatment facilities, *Atomic absorption spectrophotometry.

The research program, conducted under the Canada-Ontario Agreement on Great Lakes Water Quality, identified a significant concern for the disposal of municipal sludges produced from the chemical treatment of sewage for phosphorus removal. As a result, a comprehensive, multi-agency program was established to examine the potential use of sludge as fertilizer and to investigate the risk of sludge becoming an environmental contaminant. To help verify analytical data collected, an interlaboratory comparison was conducted on four homogenized and dried municipal sludges from sewage treatment plants where chemical treatment was used for phosphorus removal. Constituents of interest were various metallic species. This report presents results obtained on the samples by atomic absorption spectrophotometry following sample pretreatment. The preparation of standards, aspects of sample preparation and problems encountered in the analysis of the samples are discussed. The atomic absorption data is compared to results obtained on the same samples by X-ray fluorescence, activation analyses (neutron and photon) and atomic emission. Finally, the samples are suggested for use as 'standards' for analysis of similar materials. (WATDOC)
W78-07175

AN INVENTORY OF THE FRUIT AND VEGETABLE PROCESSING INDUSTRY IN CANADA,
Stanley Associates Engineering Ltd., Edmonton (Alberta).
For primary bibliographic entry see Field 5G.
W78-07177

WARM SLUDGE DIGESTION WITH OXYGEN--USING OFF-GAS FOR TREATMENT OF WASTEWATER.
German Patent DS 2528-800. Issued February 2, 1978. Derwent German Patents Abstracts, Vol. A, No. 6, p 4, March, 1978.

Descriptors: *Activated sludge, *Aeration, *Patents, *Biological treatment, *Oxygen, Design data, Temperature control, Biochemical oxygen demand, Suspended solids, Waste water treatment, Municipal wastes.

A patent has been issued for a temperature-controlled sludge digestion process with off-gas aeration. A mixture of effluent and activated sludge is aerated with gas containing at least 40% O2 to yield a dissolved oxygen concentration of 0.5 mg/liter in the mixture. The temperature of the covered aeration tank is maintained above 15C during mixing; activated sludge, clarified liquid, and unused O2 are then decanted from the tank. The excess activated sludge is aerated in an enclosed degradation chamber with a gas containing at least 80% O2 at a temperatue of 25-75C. The total solids in the slurry is maintained above 1,500 mg/liter and the temperture 10C higher than the temperature in the aeration chamber. Dissolved oxygen is maintained at 2 mg/liter to degrade at least 60% of the volatile suspended solids. Stabilized sludge residue and depleted O2 gas are drawn off after the desired decomposition level is achieved. The depleted gas with an O2 content of at least 40% is recycled to the initial aeration stage. This feed gas is withdrawn at a rate that reduces the O2 concentration to at least 35%. Similarly, the gas from the aeration tank contains less than 40% O2 by volume, controlled by the withdrawal rate. The process, which effectively reduces BOD, conserves energy via oxygen reuse. (Lisk-FIRL)
W78-07182

5E. Ultimate Disposal Of Wastes

GEOHYDROLOGICAL ENVIRONMENTAL EFFECTS OF GEOTHERMAL POWER PRODUCTION - PHASE IIA,
Systems, Science and Software, La Jolla, CA.
For primary bibliographic entry see Field 5B.
W78-06701

THE REDOX POTENTIAL OF ACTIVATED SLUDGE,
Northumbrian Water Authority, Gostorth (England).
For primary bibliographic entry see Field 5D.
W78-06706

WATER RECLAMATION AND RECYCLING,
South West Water Authority (England).
For primary bibliographic entry see Field 5D.
W78-06707

ASPECTS OF LAND-TREATED WASTE APPLICATIONS IN LOUISIANA WETLANDS,
Louisiana State Univ., Baton Rouge. Dept. of Marine Sciences.
For primary bibliographic entry see Field 5D.
W78-06744

SWINE WASTE NUTRIENT RECOVERY SYSTEM BASED ON THE USE OF THERMAL DISCHARGES,
Oregon State Univ., Corvallis. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W78-06745

LEACHATE DAMAGE ASSESSMENT: CASE STUDY OF THE SAYVILLE SOLID WASTE DISPOSAL SITE IN ISLIP (LONG ISLAND), NEW YORK,
Environmental Protection Agency, Washington, DC. Office of Solid Waste Management Programs.
For primary bibliographic entry see Field 5B.
W78-06752

LEACHATE DAMAGE ASSESSMENT: CASE STUDY OF THE FOX VALLEY SOLID WASTE DISPOSAL SITE IN AURORA, ILLINOIS,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-06754

DISPOSAL OF FLUE GAS CLEANING WASTES: EPA SHAWNEE FIELD EVALUATION - INITIAL REPORT,
Aerospace Corp., Los Angeles, CA. Environment and Energy Conservation Div
R. B. Fling, W. M. Graven, F. D. Hess, P. P. Leo, and R. C. Rossi.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 876, Price codes: A10 in paper copy, A01 in microfiche Report No. EPA-600/2-76-070, March, 1976. 221 p, 56 fig, 10 tab, 32 ref, 3 append. ROAP No ABA-001, 68-02-1010.

Descriptors: *Sludge disposal, *Electric power, *Ponding, *Waste water disposal, *Leachates, Water quality, Monitoring, Tennessee Valley Authority, Kentucky, Cost analysis, Capital costs, Operating costs, *Flue gas desulfurization wastes, *Shawnee Power Station, Paducah(KY), Disposal ponds.

A status report describes the progress made in the initial phase (September 1974 - July 1975) of a field evaluation program conducted by EPA at the Tennessee Valley Authority Shawnee Power Station at Paducah, Kentucky, which was conducted to assess techniques for the disposal of power plant flue gas desulfurization (FGD) wastes. Two 10-MW prototype flue gas scrubber systems produce sludge that has been stored in the 5 disposal ponds on the plant site. Two of the ponds contan untreated wastes. Of the 3 treated sludge ponds, one represents an impoundment behind a dam, and two represent low spots (undrained) within a landfill. Ponds are monitored for leachate, supernate and groundwater quality, and soil and fixed sludge core characteristics. Results thus far indicate: (1) the leachates from ponds containing treated sludge show significantly lower concentrations of major soluble species and trace metals than do leachates from ponds containing untreated sludge; (2) the concentrations of major constituents in the leachate from ponds containing untreated sludge are increasing to levels approaching those of the input liquor; (3) the ground waters being monitored for all ponds show no effect from either treated or untreated sludge disposal; and (4) the estimated total disposal cost for treated sludge of the Shawnee Type, including capital and operating costs, is in the range of $7.30 to $11.40/ton of dry sludge in 1975 dollars; this estimate is based on a 50% average annual power load factor over a 30-year service life. (Seip-IPA)
W78-06756

COSTS OF WASTEWATER TREATMENT BY LAND APPLICATION, MCD-10,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W78-06760

ALTERNATIVE WASTE MANAGEMENT TECHNIQUES FOR BEST PRACTICABLE WASTE TREATMENT, MCD-13.
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5G.
W78-06765

VIRAL MONITORING OF WASTEWATER AEROSOLS,
Michigan Univ., Ann Arbor, Dept. of Epidemiology.
For primary bibliographic entry see Field 5A.
W78-06806

RESEARCH NEEDS RELATING TO ON-SITE TREATMENT OF DOMESTIC WASTES.
Maine Univ. at Orono. Land and Water Resources Inst.
For primary bibliographic entry see Field 5D.
W78-06807

EFFECTS OF WATER TREATMENT PLANT WASTES ON DOMESTIC WASTEWATER TREATMENT PROCESSES,
Auburn Univ., AL. Water Resources Research Inst.
For primary bibliographic entry see Field 5D.
W78-06811

NET DRIFT IN AN ATYPICAL ESTUARY, LONG ISLAND SOUND,
Naval Ocean Research and Development Activity, Bay St. Louis, MS.
For primary bibliographic entry see Field 5B.
W78-06843

CONTAMINANT INPUTS TO THE NEW YORK BIGHT,
National Oceanic and Atmospheric Administration, Boulder, CO. Marine Ecosystems Analysis Program.
For primary bibliographic entry see Field 5B.
W78-06858

OIL SPILL: DECISIONS FOR DEBRIS DISPOSAL. VOL I: PROCEDURES MANUAL,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5G.
W78-06859

OIL SPILL: DECISIONS FOR DEBRIS DISPOSAL. VOL II, LITERATURE REVIEW AND CASE STUDY REPORTS,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5G.
W78-06860

MODEL ANALYSIS OF THE IMPACT ON GROUND-WATER CONDITIONS OF THE MUSKEGON COUNTY WASTEWATER DISPOSAL SYSTEM, MICHIGAN,
Geological Survey, Lansing, MI. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06943

AN INTRODUCTION TO THE TECHNOLOGY OF SUBSURFACE WASTEWATER INJECTION,
Missouri Univ.-Rolla; and National Water Well Association, Worthington, OH.
D. L. Warner, and J. H. Lehr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-279 207, Price codes: A16 in paper copy, A01 in microfiche. Report EPA-600/2-77-240, December 1977. 355 p, 98 fig, 35 tab, 340 ref, 2 append.

Descriptors: *Injection wells, *Waste water disposal, Geologic formations, Sites, Drilling, Waste water treatment, Waste disposal, Industrial wastes, Rock properties, Design, Pumping, Well casings, Monitoring, Regulation.

When wastewater is injected into deep wells for disposal, it is necessary to undertake detailed evaluation of: (1) the geologic and hydrologic environment of the injection site and surrounding region; (2) physical, chemical, and biological characteristics of the wastewater; and (3) pre-injection wastewater treatment requirements. Injection well design and construction, pre-injection preparation and start up operations, and subsequent injection well monitoring may then proceed in light of these factors, given that injection is found to be feasible at all. This text has been designed for use by all those involved in the planning, design, construction, operation, and abandonment of injection wells. For those concerned with regulatory aspects, it provides minimum criteria necessary to protect ground water from degradation. Industries may use this manual to evaluate injection as an alternative to other means of waste disposal. (Eberle-NWWA)
W78-06965

APPLICATION OF BOREHOLE GEOPHYSICS TO SELECTION OF POTENTIAL SITES FOR DEEP-WELL DISPOSAL OF LIQUID WASTES,
D. L. Brown.
In: Groundwater Quality--Measurement, Prediction and Protection. Proc. of the Water Research Centre Conference, September 6-8, 1976, Univ. of Reading, Berks., England, p 221-245, (1976). 6 fig, 9 ref.

Descriptors: *Borehole geophysics, *Logging(Recording), *Injection wells, Electrical studies, Resistivity, Dissolved solids, Salinity, Stratigraphy, Sites, Geologic formations, Waste water disposal.

Borehole geophysical methods are predominantly used in the field of waste disposal as a detection device to record the movement and passage routes of contaminants, however, these same methods can be used to great advantage in the initial evaluation of site potential for deep well injection. In areas for which salinity data are sparse, regional water quality maps can be constructed via resistivity or SP logs. Such maps can indicate fresh-saltwater interfaces, direction of intrusion, direction of recharge, and perhaps even structural trends if saltwater is shown leaking upward along fault planes. Formation characteristics can be evaluated by standard oil well borehole techniques. Concerning fracture detection, the acoustic borehole televiewer is one of the best tools for measurement of width, strike and dip. Combined interpretation of water quality and structural maps makes possible the determination of large areas as either poor disposal site risks, or good potential for further investigation by means of test drilling. (Eberle-NWWA)
W78-06972

HYDROCARBONS IN SEDIMENTS AND BENTHIC ORGANISMS FROM A DREDGE SPOIL DISPOSAL SITE IN RHODE ISLAND SOUND,
Rhode Island Univ., Kingston. Graduate School of Oceanography.
For primary bibliographic entry see Field 5B.
W78-06982

FEASIBILITY OF USING IRON ORE OVERBURDEN MATERIAL AS A MEDIA FOR DISPOSAL OF SECONDARY SEWAGE EFFLUENT IN NORTHEASTERN MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Forest Resources.
K. N. Brooks, J. P. Borovsky, D. J. Holtschlag, and A. C. Mace, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 307, Price codes: A04 in paper copy, A01 in microfiche. Minnesota Water Resources Research Center, Minneapolis, WRRC Bulletin 93, July 1976. 45 p, 6 fig, 9 tab, 42 ref, 6 append. OWRT B-102-MINN(1).

Descriptors: *Wastewater renovation, Groundwater recharge, Sewage effluents, *Waste disposal, *Minnesota, Land disposal, Soil treatment, Percolation, Sprinkler irrigation, Loam, Soil analysis, Feasibility.

Open pit mining for iron-ore and magnetic taconite in northeastern Minnesota has produced a landscape with numerous overburden deposits or manmade plateaus susceptible to erosion and a physical environment hostile to natural revegetation. Many of these plateaus are in close proximity to small municipalities. This study investigated the sprinkler application of secondary treated sewage effluent to the overburden material at two sites; one was deposited 20 years ago and the other 2 months prior to the beginning of the study. Irrigation of 6 cm in 8 applications over a 9-week period on a poorly drained site resulted in 98, 89, and 99 percent renovations of nitrate plus nitrite-nitrogen, total kjeldahl nitrogen, and total phosphorus, respectively, based on soil percolate concentrations at the 1.2 meter depth. Surface ponding of effluent was observed during these applications. Although renovation of sodium, potassium and chloride was also indicated, calcium and magnesium concentrations at 1.2 meters were increased. Irrigation of 60 and 120 cm over a 12-week period on the newly deposited site resulted in renovations of over 99 percent for phosphorus, and 80 to 90 percent for total kjeldahl nitrogen, based on soil percolate concentrations at the 1.0 meter depth. Nitrate plus nitrite-nitrogen, calcium, magnesium, and potassium concentrations were substantially higher at the 1 meter depth than respective concentrations in effluent. Soil chemical properties for both sites indicated that the overburden material was deficient in nitrogen and phosphorus prior to irrigation. The ameliorative effects of effluent irrigation on overburden stripping dumps would be limited in scope; however, if the establishment and growth of vegetation is promoted on such sites a more effective physical and biological filter system for subsequent sewage effluent disposal may be realized.
W78-07000

BIOLOGICAL CONTROL OF WATER POLLUTION.
Pennsylvania Univ., Philadelphia. Center for Ecological Studies in Planning and Design.
For primary bibliographic entry see Field 5D.
W78-07003

AQUACULTURE AS AN ALTERNATIVE WASTEWATER TREATMENT SYSTEM,
Oklahoma State Dept. of Health, Oklahoma City.
For primary bibliographic entry see Field 5D.
W78-07011

MAN-MADE DEBRIS ON THE BERING SEA FLOOR,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5B.
W78-07033

STUDY OF THE INTERMITTENT STREAMFLOW IN AN OPEN CHANNEL,
Gdansk Technical Univ. (Poland).
J. Geringer.
In: Mathematical Models in Hydrology, Volume 2. Proceedings of the Warsaw Symposium, Poland, July 1971. International Association of Hydrological Sciences Publication No 101, p 808-814, 1974. 7 fig.

Descriptors: *Gravity waves, *Open channels, *Hydraulics, Flow, Depth, Effects, Evaluation, Methodology, Equations, Systems analysis, Hydrology, *Streamflow.

The influence of some hydraulic parameters on the transformation of a gravity wave was tested, using a mathematical model and hypothetical prismatic open channel. The results alow the effects of Manning's equation and initial depth on the wave velocity and the depth of flow at any point of the channel to be evaluated. (See also W77-06708) (Bell-Cornell)
W78-07053

MOBILE SLUDGE TRAILER AND METHOD OF FILLING AND EMPTYING SAME,
Liquid Removal Service, Co., Inc., Broomall, PA. (Assignee).
A. Petroski.
United States Patent 4,082,672. Issued April 4, 1978. Official Gazette of the United States Patent Office, Vol. 969, No. 1, p 272, April, 1978. 1 fig.

Descriptors: *Sludge disposal, *Transportation, *Transfer, *Patents, *Design data, Biodegradation, Mechanical equipment, Baffles, Disposal, Sludge treatment, Waste water disposal, Municipal wastes.

A patent has been issued for a mobile sludge trailer designed to transport partially biodegradable sludge. A double-frusto conical tank, divided into two bilateral symmertic sections by a vertical plane, is mounted on a trailer frame. The floor of the tank slopes down towards the bottom of the bisecting vertical plane and contains a sludge discharge apparatus. The inside of the tank contains circular baffles which are mounted parallel to one another and extend from the top peripheral edge of the tank parallel to the tank's floor. The baffles are positioned to form a sludge discharge chute. Discharge of the sludge from the trailer is assisted by pressurization of the head space in the tank to increase the pneumatic and hydraulic pressure at the sludge discharge apparatus. Fluid is injected under pressure into the tank near the discharge point. The fluid mixes with the sludge to facilitate sludge discharge. The trailer also has means for loading sludge into the trailer. (Lisk-FIRL)
W78-07078

STATUS OF GROUNDWATER CONTAMINATION IN THE US,
Geraghty and Miller, Inc., Tampa, FL.
For primary bibliographic entry see Field 5B.
W78-07103

THE EFFECTS OF SOLID WASTE LANDFILL LEACHATES ON RECEIVING WATERS,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W78-07104

WATER QUALITY AT A SLUDGE ENTRENCHMENT SITE,
Agricultural Research Service, Beltsville, MD. Soil Nitrogen Lab.
For primary bibliographic entry see Field 5B.
W78-07110

DESIGN GUIDE FOR METAL AND NONMETAL TAILINGS DISPOSAL,
Bureau of Mines, Spokane, WA. Spokane Mining Research Center.
R. L. Soderberg, and R. A. Busch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 858, Price codes: A07 in paper copy, A01 in microfiche. Report No. BuMines IC 8755, 1977. 136 p, 67 fig, 7 tab, 53 ref, 5 append.

Descriptors: *Mine wastes, *Waste disposal, *Mining, *Design criteria, Management, Testing, Construction, Sampling, Inspection, Instrumentation, *Tailings disposal, *Tailings embankments.

A design guide has been developed to assist the mining industry in the management of mill tailings disposal. Topics addressed include: basic considerations, site selection, subsurface exploration including laboratory and field testing, design criteria, initial construction, construction during operation, cores, blankets, and membranes, instrumentation, lope stability, maintenance, and inspection. The effects of environment, topography, and hydrogeology are also described. Various methods of stability analysis and factors affecting stability are reviewed. The guide is a useful checklist for designers, operators, and inspectors of tailings embankments, although specific solution to problems associated with embankments are not included. Appendices discuss tailings pond evaporation, runoff estimation, seepage and flow nets, slope stability analysis (simplified Bishop method) and nomenclature. (Seip-IPA)
W78-07123

HABITAT DEVELOPMENT ASPECTS OF THE DREDGED MATERIAL RESEARCH PROGRAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
For primary bibliographic entry see Field 6G.
W78-07158

SUBSURFACE WASTE DISPOSAL IN LAMBTON COUNTY, ONTARIO - PIEZOMETRIC HEAD IN THE DISPOSAL FORMATION AND GROUNDWATER CHEMISTRY OF THE SHALLOW AQUIFER,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
A. Vandenberg, D. W. Lawson, J. E. Charron, and B. Novakovic.
Technical Bulletin No. 90, 1977. 64 p, 37 fig, 4 tab, append.

Descriptors: *Waste disposal, *Industrial wastes, *Piezometry, *Water wells, *Oil wells, *Gases, *Groundwater, Disposal, Sampling, Aquifers, Movement, Subsurface drainage, Subsurface investigations, Subsurface runoff, Geologic mapping, Water chemistry, Model studies, *Canada, Lambton County(Ontario).

This report describes the results of a reconnaissance study on the effects of the disposal of liquid industrial wastes through wells into the subsurface of southwestern Ontario. The study was based primarily on the analysis of existing data concerning oil and gas wells, disposal wells, and water wells in Lambton County. A second important component of the study was a field survey and ground-water sampling program to help determine the chemistry and motion of shallow groundwaters in the County. It was hoped that the investigation of shallow groundwaters would provide some direct or indirect evidence for the effects of disposal at greater depths. Drilling records from oil and gas wells in Lambton County were computer processed to map the geological structure and the piezometric head in the disposal zone near the contact of the Dundee Formation and the Detroit River Group. The geological maps were in good agreement with the known geology of the area. Since there was considerable uncertainty about the exact location of the disposal zones within the 270 feet of the Lucas Formation and the validity of the piezometric data, a series of piezometric maps was prepared based on different subsets of the data base for the disposal interval. This uncertainty was made more evident by inconsistencies in the piezometric maps for the different data subsets. Several features of the resulting piezometric surface persisted, however, through all or most of the maps, and are therefore believed to be elements of the true piezometric surface. These persistent features are displayed in a final composite map, which exhibits a regional west-dip; hence, the regional motion of groundwater in the disposal interval is in that direction. (WATDOC)
W78-07166

SLUDGE DEWATERING DESIGN MANUAL,
Department of the Environment, Ottawa (Ontario). Wastewater Technology Centre.
For primary bibliographic entry see Field 5D.
W78-07168

LAND DISPOSAL OF SEWAGE SLUDGE VOLUME V (APRIL, 1976 - MARCH, 1977),
Guelph Univ. (Ontario). Dept. of Land Resources Sciences.
T. E. Bates, E. G. Beauchamp, A. Haq, J. W. Ketcheson, and R. Protz.
Canada-Ontario Agreement on Great Lakes Water Quality, Research Report No. 73, 1978. Environmental Protection Service, Environment Canada, Ottawa, Canada, 203 p., 172 tab. 72-5-17.

Descriptors: *Sewage sludge, *Sludge disposal, Land use, *Disposal, *Agriculture, Soils, Surface runoff, Surface drainage, Nitrates, Nitrogen, Phosphorus, Pathogenic bacteria, Crop production, Crop response, Bromegrass, Corn(Field), Volatility, Waste disposal, *Ryegrass

The objective of this research was to determine maximum rates of sewage sludge application which can be used on agricultural soil without contaminating subsurface water with nitrate nitrogen, and surface waters with elements pathogenic to humans and animals, and without reducing the yield or quality of the crops produced. This volume covers the fourth year of field rate and source studies with three sludges resulting from treatment of sewage with calcium hydroxide, ferric chloride and aluminum sulphate for phosphorus removal. One experiment involved surface sludge applications on a loam soil on which bromegrass was grown, and two experiments involved corn on a loam, and sandy soil. In a greenhouse experiment six fluid sewage sludges, selected for their high metal content, were applied to a soil previously adjusted to two pH levels. Eight crops of ryegrass were grown with sludges added before each crop. Half of the treatments received no sludge after the fifth crop. Crop growth and nutrient and metal uptake were studied. Field and laboratory studies have been used to estimate the nitrogen available from sludges and the rates of volatilization of nitrogen from surface applied sludge in the field. (WATDOC)
W78-07170

EVALUATION OF THE RADIOACTIVE WASTES DISPOSAL INTO THE DEEP OCEAN,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
I. Aoyama, M. Yamamoto, and Y. Inoue.
Health Physics, Vol. 33, No. 3, p 227-240, 5 fig, 12 tab, 16 ref. Sept. 1977.

Descriptors: *Environmental effects, *Water pollution, Radionuclides, Model studies, Disposal, Waste disposal, Oceans, Nuclear powerplants, Japan, Radioactivity, Hazards.

Models were used to assess the hazards for deep sea disposal of low level radioactive solid wastes originating from nuclear power plants in Japan. Calculations take account of leaching characteristics of radionuclides from solidified wastes. Comparing the results of calculations for two different radionuclides, it was found that a large retention capacity of radionuclides in the concrete was effective to decrease the concentration of radionuclides in the surface water soon after disposal. The key factor which most affected the concentration was found to be the depth of the sea where the wastes would be disposed of by the technique of sensitivity analysis. The level of significance of parameters was changeable with time. (Chilton-ORNL)
W78-07187

HYGIENIC EVALUATION OF FARM CROPS IRRIGATED WITH EFFLUENTS OF COAL-TAR CHEMICAL PLANTS (IN RUSSIAN),
Kiev Inst. of Nutritional Hygiene (USSR).
For primary bibliographic entry see Field 5C.
W78-07194

5F. Water Treatment and Quality Alteration

FEDERAL GUIDELINES: STATE AND LOCAL PRETREATMENT PROGRAMS, MCD-43, (3 VOLS).
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.

For primary bibliographic entry see Field 5G.
W78-06704

A STUDY ON WATER POLLUTION CONTROL IN WATER SUPPLY SYSTEMS--BACKFLOW PREVENTER IN WATER SUPPLY SYSTEMS (KYUSUI SETSUBI NI OKERU JOSUI OSEN BOSHI NI KANSURU KENKYU),
For primary bibliographic entry see Field 5D.
W78-06711

PRELIMINARY DESIGN OF A HOUSEHOLD REFUSE GRINDER,
Foster-Miller Associates, Inc., Waltham, MA.
For primary bibliographic entry see Field 5D.
W78-06758

PUBLIC BEHAVIOR AND ATTITUDES IN RESPONSE TO REPORTED HAZARDOUS DRINKING WATER. A FEASIBILITY STUDY,
Minnesota Univ., Duluth. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 5G.
W78-06779

EFFECTS OF WATER TREATMENT PLANT WASTES ON DOMESTIC WASTEWATER TREATMENT PROCESSES,
Auburn Univ., AL. Water Resources Research Inst.
For primary bibliographic entry see Field 5D.
W78-06811

A CASE OF POISONING BY AMMONIUM SULFATE IN DRINKING WATER (IN RUSSIAN),
Ministerstvo Zdravookhraneniya SSSR, Moscow.
For primary bibliographic entry see Field 5C.
W78-06866

DETERMINATION OF THE FLUORIDE ION IN THE PUBLIC HEALTH STUDY OF WATER (IN ITALIAN),
Siena Univ. (Italy). Inst. of Hygiene.
For primary bibliographic entry see Field 5A.
W78-06896

DRINKING WATER AND HUMAN HEALTH: PART II,
National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 5A.
W78-06971

WATER SUPPLY FEASIBILITY STUDIES IN PHILIPPINES,
Camp, Dresser and McKee, Inc., Boston, MA.
L. V. Gutierrez, Jr.
Journal of the Urban Planning and Development Division, Vol 104, No UP1, Proceedings of the American Society of Civil Engineers, p 59-71, May 1978. 3 fig, 5 tab.

Descriptors: *Cost benefit analysis, *Water supply, *Feasibility studies, *Public health, *Philippines, *Foreign engineering, Water quality, Financing, Planning, Waterworks, Economic analysis.

Field tests show that most water distribution systems have old and inadequately sized pipes with considerably reduced capacities, resulting in low pressures and marginal fire-fighting capabilities. Water sources, both surface and ground, are generally available, but water-handling facilities must be properly planned and constructed to convey the water to the demand centers. Water demand will increase exponentially as population grows and standard of living and opportunity increases. Quantifiable economic benefits exceed the known costs of the water supply construction stages, which are financially viable if water rates are set on the basis of the consumers' ability to pay. As a result of these feasibility studies, water supply projects are now being provided much needed foreign exchange by international loaning agencies. (Bell-Cornell)
W78-07047

5G. Water Quality Control

FEDERAL GUIDELINES: STATE AND LOCAL PRETREATMENT PROGRAMS, MCD-43, (3 VOLS).
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
Available from GSA (8FFS), Centralized Mailing Lists, Denver, CO 80225. Report No. EPA-430/9-76-017a, No. EPA-430/9-76-017b, No. EPA-430/9-76-017c, January, 1977. Volume I, 196 p, 22 fig, 7 tab. Volume II, 239 p, 16 fig, 24 tab, 288 ref, 7 append. Volume III, 418 p, 86 fig, 84 tab, 1 append.

Descriptors: *Waste water treatment, *Facilities, Management, Industrial wastes, Industrial water, Pollutants, Pollutant identification, Pollution abatement, Monitoring, Pollutant discharge.

Guidelines prepared in accordance with section 304(f) of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) to assist municipalities, States, Federal agencies, and others in developing requirements for the pretreatment of wastewaters which are introduced into publicly-owned treatment works, are presented. Technical and adminsitrative information relative to pretreatment and the control of industrial wastewaters is included. The information provides a basis for determining the impact of non-residential wastewaters and appropriate approaches for controlling pollutants from these sources. Also provided is guidance in complying with special conditions of the National Pollutant Discharge Elimination system permits relating to non-residential wastewaters. Information is given on managment of pollution control programs, legal aspects, monitoring, pollutant types and environmental considerations, and removal and pass through of pollutants in publicly-owned treatment works. The appendices contain pretreatment standards, secondary treatment information, test procedures for analysis of pollutants, effluent guidelines and standards, pollutant interference data, pollutant removal and pass through data, annotated bibliography, and data on major industries contributing wastewater to publicly-owned sewer systems and treatment works. (Wares-IPA)
W78-06704

A STUDY ON WATER POLLUTION CONTROL IN WATER SUPPLY SYSTEMS--BACKFLOW PREVENTER IN WATER SUPPLY SYSTEMS (KYUSUI SETSUBI NI OKERU JOSUI OSEN BOSHI NI KANSURU KENKYU),
For primary bibliographic entry see Field 5D.
W78-06711

INFLUENCE OF TIDAL INLETS ON SALINITY IN ESTUARIES,
Indian Inst. of Tech., Madras. Hydraulic Engineering Lab.
For primary bibliographic entry see Field 5B.
W78-06733

COAL GASIFICATION AND WATER RESOURCES DEVELOPMENT,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3E.
W78-06740

AUTOMATIC CONTROL STRATEGIES FOR URBAN STORMWATER,
Northern Arizona Univ., Flagstaff. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W78-06749

LEACHATE DAMAGE ASSESSMENT: CASE STUDY OF THE FOX VALLEY SOLID WASTE DISPOSAL SITE IN AURORA, ILLINOIS,
Environmental Protection Agency, Washington, DC.
For primary bibliographic entry see Field 5B.
W78-06754

A GUIDE TO ENVIRONMENTAL BENEFITS ASSESSMENT IN ECONOMIC IMPACT STUDIES.
Governors State Univ., Park Forest South, IL. Environmental Management Program.
For primary bibliographic entry see Field 6B.
W78-06755

DISPOSAL OF FLUE GAS CLEANING WASTES: EPA SHAWNEE FIELD EVALUATION - INITIAL REPORT,
Aerospace Corp., Los Angeles, CA. Environment and Energy Conservation Div.
For primary bibliographic entry see Field 5E.
W78-06756

ECONOMIC IMPACT OF PROPOSED AMENDMENTS TO MERCURY EFFLUENT STANDARDS IN ILLINOIS (R 76-17) (R 76-21),
Southern Illinois Univ. at Carbondale.
E. E. Cook, and L. Rogers.
Illinois Institute for Environmental Quality IIEQ Document No. 77/33, December, 1977. 244 p, 6 fig, 23 tab, 198 ref, 4 append. 80.093.

Descriptors: *Mercury, *Water quality standards, *Illinois, *Environmental effects, *Public health, *Industrial production, *Cost analysis, Employment, Water pollution treatment, Waste water treatment, Industrial water, Illinois Institute for Environmental Quality, Environmental Protection Act.

Economic and environmental impacts of proposed changes (submitted by the Illinois Institute for Environmental Quality) in the maximim allowable concentrations of mercury in water, of modifications in time-of-compliance regulations, and of deletion of requirements for reporting by those that use or maintain an inventory of mercury are assessed. The current Illinois Pollution Control Board Rules and Regulations mandate a maximum mercury concentration of 0.5 micrograms/l; the proposed change is to 3.0 micrograms/l. A cost-benefit approach is used to assess the reflected changes in prices, production activities, employment aspects, non-productive expenditures, and energy consumption; environmental and human health aspects are considered. A relaxed mercury effluent standard is not expected to adversely affect health, agriculture, or the environment. Compliance with present standards would probably result in partial or total closing of the Alton Box Board Company and the Monsanto Company. Adoption of the proposed standard could result in total annual benefits accrued by industry of $136,288,300 to $153,806,300 in treatment cost savings, 540 to 1890 saved jobs, and $5,500,000 to $29,500,000 in payroll savings; the municipal waste water treatment sector and the educational sector could reap benefits of $134,191,000 and $1,459,500/yr, respectively. If present standards were maintained the loss of production and industry would probably result in some general market price increases. Overall, the altered mercury concentration standards would result in significant benefits to industry, educational institutions, municipal waste water treatment districts, and the people of Illinois. (Seip-IPA)
W78-06759

HANDBOOK FOR SEWER SYSTEM EVALUATION AND REHABILITATION, MCD-19,
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
For primary bibliographic entry see Field 5D.
W78-06761

FIFTH ANNUAL REPORT: GREAT LAKES WATER QUALITY.
International Joint Commission-United States and Canada.
Available from Great Lakes Regional Office, Windsor, Ontario, Canada N9A,6T. (1977). 11 p. append.

Descriptors: *Great Lakes, *Water pollution, *Water quality, Water treatment, Monitoring, Toxicity, Radioactivity, Phosphorus, Ecosystems, Conservation, Mapping, Environmental effects, Remedies, *Surveillance, *Lake restoration, Enforcement, International Joint Commission on Great Lakes Water Quality.

In a report prepared in accordance with the Great Lakes Water Quality Agreement of 1972, comments and recommendations are presented on conditions relating to Great Lakes Water quality in 1976 and on progress under the Agreement in the areas of municipal treatment, surveillance, industrial pollution, toxic substances, radioactivity, nonpoint pollution, phosphorus, water quality objectives, an ecosystem approach to Great Lakes restoration, environmental mapping, review of the water quality agreement, and public participation. Progress has been slow and uneven with respect to these subbject areas. For example, although the phosphorus control program has been encouraging to the participants, and total phosphorus loadings have decreased, the program is generally behind schedule and has not yet resulted in significant overall improvement. The Commission is also concerned with growing evidence of the dangers of toxic chemicals in the lakes and with the failure to implement enforcement measures on industrial and municipal sources of pollution. Forty-seven special problem areas have been identified, compared with 63 identified in 1975. The lack of major improvement is probably due to the size of the lakes and their resulting slow response to remedial programs. However, the development of coordinated programs of research, surveillance, and remedial measures is a distinct accomplishment. The appendix contains recommendations to the Commision by the Research Advisory Board and the Great Lakes Water Quality Board on control of toxic substances. (Wares-IPA)
W78-06762

COOLING TOWERS: A BIBLIOGRAPHY (JUNE 1977 - DECEMBER 1977).
Department of Energy, Oak Ridge, TN. Environmental Sciences Information Center.
Available from the National Technical Information Service, Springfield, VA 22161 as TID-3360-S2, Price codes: A05 in paper copy, A01 in microfiche. Bibliography TID-3360-S2, Compiled by D. O. Galde, February, 1978. 33 p. Issued by DOE, Washington, D.C., Technical Information Center.

Descriptors: *Cooling towers, *Nuclear powerplants, *Fossil fuels, *Electric powerplants, Ponds, Canals, Construction, Design, Economics, Environmental effects, Performance, Operations, *Bibliographies, *Fossil-fuels, *Electric powerplants, Ponds, Canals, Construction, Design, Economics, Environmental effects, Performance, Operations, *Bibliographies, *Fossil-fuel powerplants, *Cooling ponds, Natural draft cooling towers, Mechanical draft cooling towers.

A total of 214 abstracted references, containing information on various aspects of large cooling tower technology (including design, construction, operation, performance, economics, and environmental effects) for fossil-fuel and nuclear power plants, are presented. The towers considered included natural draft and mechanical draft types employing wet, dry, or combination wet-dry, or combination wet-dry cooling. A few citations are included on other types of condenser cooling systems, e.g., cooling ponds and canals. The citations were compiled from the ERDA Energy Information Data Base (EDB) covering the approximate period June 1977 (EDB File No. 77J 66159) to December 1977 (EDB File No. 77C 147831). Report citations are arranged alphabetically by report number; nonreport literature citations are arranged chronologically. Corporate, personal author, subject, and report number indices are provided. (Seip-IPA)
W78-06763

ENVIRONMENTAL ASPECTS OF WATER SPREADING FOR GROUND WATER RECHARGE,
Agricultural Research Service, Fresno, CA. Water Management Research.
For primary bibliographic entry see Field 4B.
W78-06764

ALTERNATIVE WASTE MANAGEMENT TECHNIQUES FOR BEST PRACTICABLE WASTE TREATMENT, MCD-13.
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
Available from GSA (8-FY), Centralized Mailing List Services, Denver, CO 80225. Report No EPA-430/9-75-013, October, 1975. 71 p, 7 fig, 11 tab, 526 ref, 4 append.

Descriptors: *Waste disposal, *Management, Water quality, Navigable waters, Land use, Waste water treatment, Economics, Cost-benefit analysis, Cost-effectiveness.

Information pursuant to section 304(d)(2) of the Federal Water Pollution Control Act Amendments of 1972 is presented to guide operators of publicly-owned treatment works in selecting waste treatment alternatives to restore and maintain the integrity of the nation's waters. Criteria for treatment and discharge into navigable waters, land application and utilization practices, and reuse of treated wastewater are specified. The rationale behind the criteria is presented as well as information on acceptable alternative waste management techniques. Land application techniques discussed include irrigation, overland flow, and infiltration-percolation; land utilization techniques include land spreading of sludge, landfill of sludge and/or incinerator ash and composting and final disposal. Non-point sources of pollutants are also considered. Waste management techniques involving treatment and discharge, including flow reduction, secondary treatment and nitrification, storm and combined-sewer control, advanced waste treatment (nutrient removal), and sludge handling techniques are discussed. Reuse techniques are described for wastewater, and other treatment plant wastes, and for integrated reuse facilities. The appendices contain bibliographic material, cost-effectiveness analysis guidelines, secondary treatment information, and ground water requirements. (Wares-IPA)
W78-06765

A METHODOLOGY FOR PREPARING ENVIRONMENTAL ASSESSMENTS,
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 6G.
W78-06775

WATER QUALITY ASSESSMENT FOR THE KANAWHA RIVER BASIN (NORTH CAROLINA, VIRGINIA, WEST VIRGINIA),
Environmental Protection Agency, Wheeling, WV. Surveillance and Analysis Div.
R. C. George, and R. I. Cantor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB 255 132. Price codes: A03 in paper copy, A01 in microfiche. EPA Work Document No 50, September 1973. 41 p, 6 ref, 2 tab, 5 maps.

Descriptors: *Environmental effects, *Water quality, *Fishing, Planning, West Virginia, North Carolina, Recreation, Fish, Wildlife, Water pollution, River basins, Water quality standards, Water pollution, Virginia, *New River Basin, *Kanawha River, New River.

The report had four purposes: to assess current water quality; to investigate the causes responsible for the current situation; to study recent trends; and to project future water quality. Rather than being a detailed analysis of the basin's water qualities, the report was intended to serve as a baseline study for future planning that would be done to meet the Federal Water Pollution Control Act Amendments (1972) standards for water quality. Those water bodies that in 1973 met the 1983 goals of water adequate for swimming and propagation of fish and wildlife are identified; and identification is made of those bodies that might achieve the 1983 goals by 1977, 1983 or later. The Kanawha Basin is described and then divided into two study units: (1) the Kanawha River and its tributaries; and (2) the New River and tributaries. Water quality is then investigated and trends reported. (Zayac-NC)
W78-06778

PUBLIC BEHAVIOR AND ATTITUDES IN RESPONSE TO REPORTED HAZARDOUS DRINKING WATER. A FEASIBILITY STUDY,
Minnesota Univ., Duluth. Dept. of Sociology and Anthropology.
R. E. Franz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 981, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Health Effects Laboratory, Environmental Protection Agency, Cincinnati, OH. Report EPA-600/1-76-026, September 1976. 50 p, 2 append. P.O. 5-03-44975 Task 005.

Descriptors: *Water supply, *Social impacts, *Asbestos, *Psychological aspects, *Domestic water, *Feasibility studies, Water quality, Social values, Filtration, Surveys, Behavior, Chemical wastes, *Potable water, Public health, *Minnesota, *Survey design, *Hazardous wastes, Duluth(MN), Emergency water supply.

When it was learned that asbestiform fibers were present in the drinking water of Duluth, Minnesota, concern was manifested immediately and the Army Corps of Engineers provided filtered water for anyone wanting it. However, it was soon discovered that asbestiform contamination was not unique to Duluth and it was determined to test public attitudes on the use of filtered water where drinking water was reported hazardous. This report of the feasibility study presents a survey design to be used in this determination, and includes suggestions for sampling techniques and measurement considerations. The recommended questionnaire was pretested in Duluth, and a pilot study was undertaken there, with a total of 50 completed questionnaires resulting from the pilot study; the results indicate that such a feasibility study can be successfully pursued. (Zayac-NC)
W78-06779

WASHINGTON COUNTY PROJECT WORK PLAN: DEVELOPMENT AND IMPLEMENTATION OF SEDIMENT CONTROL ORDINANCE OR OTHER REGULATORY MECHANISM: INSTITUTIONAL ARRANGEMENTS NECESSARY FOR IMPLEMENTATION OF CONTROL METHODOLOGY ON URBAN AND RURAL LANDS,
Wisconsin Board of Soil and Water Conservation Districts, Madison.
For primary bibliographic entry see Field 4D.

W78-06780

TRIANGLE J 208 AREAWIDE WATER QUALITY MANAGEMENT PLAN.
Triangle J Council of Governments, Research Triangle Park, NC.
September 1977, 279 p, 32 tab, 4 maps, 2 fig.

Descriptors: *Water quality, *Management(Applied), *Planning, *Water management(Applied), *Water pollution sources, Land use, Institutions, Administration, Regulation, Administrative costs, Governments, *North Carolina, Waste treatment, *Federal Water Pollution Control Act Amendments, Triangle J Region(NC), 208 planning, Raleigh(NC), Durham(NC), Chapel Hill(NC), Point sources, Nonpoint sources, Waste management.

This plan identifies the ways in which the goals of the 1972 Federal Water Pollution Control Act Amendments (P.L. 92-500) will be achieved in the vicinity of Raleigh, Durham, and Chapel Hill, North Carolina. The Plan first quantifies the goals. The general goals are translated into a more specific set of numerical water characteristic goals. The quantified goals are compared with existing water quality in order to develop a management plan directed at the area's most important water quality needs. The general strategy is to improve and maintain the area's water quality by: improving existing programs and activities; meshing more effectively the existing programs and activities of state and local governmental agencies; assigning new programs and activities to appropriate governmental units or agencies; and changing organizational structures and management responsibilities where necessary to achieve water quality goals. The regulatory mechanisms capable or achieving the specific goals are identified. These mechanisms vary according to the source (point or nonpoint), the management responsibility of the relevant agency, and the cost. This plan is designed to coordinate efforts to restore and maintain the integrity of the waters in Region J. (Nessa-NC)
W78-06788

ELEVENTH ANNUAL REPORT PROGRAM ACTIVITIES, JULY 1, 1974-JUNE 30, 1975 (MARYLAND WATER RESOURCES RESEARCH CENTER).
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 9D.
W78-06804

RESEARCH NEEDS RELATING TO ON-SITE TREATMENT OF DOMESTIC WASTES.
Maine Univ. at Orono. Land and Water Resources Inst.
For primary bibliographic entry see Field 5D.
W78-06807

WASTEWATER RECYCLING: DEVELOPMENT OF MYCORRHIZAL ROOT SYSTEMS FOR INCREASED EFFICIENCY,
Michigan State Univ., East Lansing. Dept. of Botany.
G. R. Safir, and B. M. Carpenter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 972, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, Institute of Water Research, Michigan State University, May, 1978. 45 p, 9 fig, 10 tab, 36 ref. OWRT A-089-MICH(1), 14-31-0001-6023.

Descriptors: *Vesicular mycorrhizae, Endomycorrhizae, *Micorrhizal water, *Gromus sp, Waste water treatment, *Recycling, *Root systems, Michigan, Olid field soils, *Spores, Irrigation, *Water Quality Management Project(Michigan), Quack grass.

An analysis of the spore populations of the dominant species of vesicular-arbuscular mycorrhizal fungi present in an old field terrestrial ecosystem treated with various levels of liquid wastewater during 1976 and 1977 was conducted. The spore types responded differently to the 4, 2, and 0 inch/week irrigation levels. From July 1976 to October 1977 a spore type, tentatively identified as Glomus mosseae, was dominant in the ecosystem and occurred in the 2 inch/week plots most. The total spore numbers were highest in the 4 inch plots in 1976, however, in 1977 the 2 inch plots contained by far the most spores with G. mosseae contributing the greatest numbers. Old field soil was shown to allow high levels of mycorrhizal infection (field) and significant mycorrhizal plant growth stimulation in the greenhouse for a wide range of plant species. Studies using nutrient solutions with nutrient contents similar to that of the wastewater and applied at field rates indicated that 2 inch/week irrigation rates greatly increased mycorrhizal growth stimulation. Results indicate that during 1976 and 1977 the mycorrhizal systems were probably functioning well, however, since total spore numbers dropped in 1977, further monitoring of the system is necessary before long term predictions can be made.
W78-06808

URBAN CHANNEL EROSION: PRELIMINARY ANALYSIS,
Rutgers - The State Univ., New Brunswick, NJ. Water Resources Research Inst.
For primary bibliographic entry see Field 4D.
W78-06810

GUIDELINES FOR THE DESIGN, CONSTRUCTION AND OPERATION OF TAILING PONDS AND DAMS,
Chafet (Arthur B.) and Associates, Denver, CO.
For primary bibliographic entry see Field 8A.
W78-06813

PACIFIC SOUTHWEST INTER-AGENCY COMMITTEE MINUTES OF THE 77-3 MEETING, 13-14 DECEMBER 1977, LAS VEGAS, NEVADA.
Pacific Southwest Inter-Agency Committee, San Francisco, CA.
For primary bibliographic entry see Field 6E.
W78-06815

WATER QUALITY STANDARDS AND COMMUNITY VIABILITY,
Iowa State Univ., Ames. Dept. of Economics.
R. A. D. Beck.
Paper presented at the 'Iowa Academy of Sciences, ' April 28-29, 1972. 16 p, 2 fig, 5 ref. OWRT A-999-IA (13).

Descriptors: *Mathematical model, *Mathematical studies, *Computer models, *Iowa, *Water management(Applied), *Water quality, Water supply, Planning, Management, Human population, Simulation analysis, *Des Moines River(Iowa), Demographics.

A quantitative model that was developed as a basis for computer simulation of a multi-county region, provides information and projections for use in planning for agricultural, industrial, and public services development and water management practices along a major portion of the Des Moines River. Procedures were designed to determine the structural characteristics of an 8-county region centered around Ottumwa, Iowa. The model contains a demographic sector; an employment sector; and output sector with structural characteristics of the multi-region economy (presented within the content of input-output analysis); local, state, and federal government sectors; a water quality sector; and a final demands sector. Analysis is made of major demographic-economic interactions, the relation of such interactions to present and future water quality and quantity restraints, and the impact of same on specific sectoral reallocation of employment, output, and the supply of public services. (Economic and population growth are interdependent in the dynamic model.) System interdependence facilitates an analysis of the impacts of a given (or desired) change in the hydrologic system on other interlocking aspects of the system: production, employment, migration, incomes, taxes, and government expenditures. The implications for economic efficiency when industrial, municipal, and agricultural pollution control perspectives are combined are determined by the model. (See also W73-06478) (Seip-IPA)
W78-06818

ENVIRONMENTAL RISK OF BEAUFORT SEA OIL SPILLS--A MANAGEMENT TOOL,
Coast Guard Research and Development Center, Groton, CT.
I. M. Lissauer, J. P. Welsh, and G. L. Hufford.
Marine Technology Society Journal, Vol 11, No 1, p 22-25, 1977. 5 fig, 7 ref.

Descriptors: *Oil spills, *Oil pollution, *Water pollution effects, *Baseline studies, Environmental effects, Resources development, Alaska, Outer Continental Shelf, *Beaufort Sea.

Minimum impact time and probability of impact of an oil spill are determined for 15 different potential sites located off the north Alaskan coast. Minimum impact times vary from 6 to 53 hours for the 15 sites that range from 2 to 15 nautical miles offshore. Probability of impact varies from 40 to 96%. A generalized equation is given for calculating minimum impact time for a spill to reach the shoreline from any site offshore of the north Alaskan coast. Large-scale development of the oil resources on the North Slope of Alaska is underway. Offshore drilling on the Beaufort Sea continental shelf is certain to be undertaken within the next few years. Because even the best of planning and the most modern of safety techniques cannot ensure that accidental oil spills will not occur, there is a definite need for an oil spill impact assessment for the north Alaskan coastline. It is the purpose of this paper to examine available environmental data and attempt to incorporate the information into a technique for delineating areas of the coastline which are most susceptible to environmental damage should a spill occur. The technique is appropriate for summer (July-September) coastal conditions when the area is essentially ice free. Future work will consider the effect of isolated ice fragments and the presence of an ice pack edge within the area. (Sinha-OEIS)
W78-06844

IMPROVING LAKE WATER QUALITY BY DESTRATIFICATION,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
R. G. Strecker, J. M. Steichen, J. E. Garton, and C. E. Rice.
Transactions of the American Society of Agricultural Engineers, Vol. 20, No. 4, p 713-720, July-August 1977. 17 fig, 12 ref. OWRT A-052-OKLA(3)and A-065-OKLA(1).

Descriptors: *Destratification, *Lakes, *Water quality control, Mixing, Quality control, Water circulation, Stratification, Equipment, Oxygen, Dissolved oxygen, Temperature, Water temperature, Biochemical oxygen demand, Hydrogen ion concentration, Water quality, Suspended solids, Turbidity, Pumps, Pumping, *Oklahoma, *Hams Lake(Okla).

A low-energy (746 W), high-volume (1.6 cu m/s) axial flow, propeller (1.8 m diameter) pump was designed and operated on a small (40 ha surface area, 9.5 m maximum depth, and 115 ha-m volume) stratified lake. The objectives were: (1) to design and construct a prototype, low-energy, axial-flow propeller pump for use as a destratification device;

(2) to evaluate the performance of the pump when moving water under a small head; and (3) to determine the effect of the pump's operation on the water quality parameters of a stratified lake. Four days of pumping were required to warm the bottom water to the surface water temperature with a resultant destratification efficiency of 3.3% for the period. Dissolved oxygen was maintained above 2.0 mg/l in the lower waters of the reservoir and above 5.0 mg/l in the surface waters. The overall water quality in the reservoir was improved. The fan laws provided an effective means of predicting the performance in water from the available data in air. The angle of divergence for the discharge cone was between 21 and 28 deg, and considerable amounts of water were entrained at the periphery of the discharge cone. (Sims-ISWS)
W78-06852

CONTINGENCY PLANNING FOR THE IMPACT OF OIL SPILLS IN DIFFERENT COASTAL ENVIRONMENTS OF CANADA,
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
E. H. Owens.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 713, Price codes: A02 in paper copy, A01 in microfiche. Technical Report No. 243, Dec 1977. Reprinted from: Proceedings of 1977 Oil Spill Conference held New Orleans, LA, Mar 8-10, 1977. 12 p, 14 fig, 2 tab, 10 ref. ONR-N00014-75-C-0192.

Descriptors: *Oil spills, *Coasts, *Water pollution treatment, Planning, Resources development, Environmental effects, Beaches, *Outer Continental Shelf.

Planning for a cleanup operation of the shore zone requires consideration of the physical nature of the coast (including the sediment types), wave energy levels, and tidal range. Beaches exist in a dynamic state and are continuously changing in response to littoral processes. In addition to these temporal variations, there is frequently considerable variability of shoreline types and process characteristics within a small region. In eastern Canada, contingency planning must cover rocky shorelines, sand beaches, and muddy coasts. There also is a wide range of littoral process environments, from the exposed Atlantic coast to the sheltered Bay of Fundy, which has tidal ranges on the order of 10 to 15 meters. Three examples from eastern Canada illustrate the variability of shorelines and processes in he context of cleanup planning. (Sinha-OEIS)
W78-06856

OIL SPILL: DECISIONS FOR DEBRIS DISPOSAL. VOL I: PROCEDURES MANUAL,
SCS Engineers, Long Beach, CA.
R. P. Stearns, D. E. Ross, and R. Morrison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 832, Price codes: A06 in paper copy, A01 in microfiche. EPA, Office of Research and Development, Environmental Protection Technology Series No. EPA-600/2-77-153a, August 1977. 115 p, 15 fig, 14 tab, 67 ref, 2 append. Contract 68-03-2200.

Descriptors: *Oil spills, *Oil pollution, *Waste disposal, *Oil wastes, *Water pollution, Landfills, Waste dumps, Outer Continental Shelf, Oil transport.

This report was prepared to guide persons responsible for disposing of oil spill debris in selecting suitable methods and sites, and in carrying out effective, environmentally safe disposal operations. Volume I is a procedures manual useful both in office and field. Topics covered include site selection and preparation, method selection, implementation of three alternative disposa methods, site monitoring requirements, and correctional measures for possible environmental problems. All available land disposal methods (other than systems employing incineration) were investigated prior to selecting the three recommended alternatives: land cultivation (also called landspreading), burial, and sanitary landfilling. An outline for a training course on oil spill debris disposal is also included. (See also W78-06806) (Sinha-OEIS)
W78-06859

OIL SPILL: DECISIONS FOR DEBRIS DISPOSAL. VOL II, LITERATURE REVIEW AND CASE STUDY REPORTS,
SCS Engineers, Long Beach, CA.
R. P. Stearns, D. E. Ross, and R. Morrison
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 953, Price codes: A08 in paper copy, A01 in microfiche. EPA Office of Research and Development, Environmental Protection Technology Series No. EPA-600/2-77-153b, Aug 1977. 166 p, 38 fig, 22 tab, 3 ref, 2 append. Contract No. 68-03-2200.

Descriptors: *Oil spills, *Oil wastes, *Bibliographies, *Waste disposal, Environmental effects, Pollution abatement, Water pollution sources, Waste dumps, Landfills, Outer Continental Shelf, Oil transport, Case studies.

This report was prepared to guide persons responsible for disposing of oil spill debris in selecting suitable methods and sites, and in carrying out effective, environmentally safe disposal operations. Volume II presents a bibliography and a summary of the current literature relating to oily waste decomposition, migration through soils, and interaction with the environment. Calculations are provided to indicate the theoretical limitations on degradation. Case studies of two sites where the land cultivation disposal method was used to aerobically decompose the oily debris, and at two other sites where the debris was buried in specially constructed cells, are described and the effectiveness of each operation is evaluated. (See also W78-06859) (Sinha-OEIS)
W78-06860

OIL SPILL AND OIL POLLUTION REPORTS, FEBRUARY-1977 -APRIL 1977,
California Univ., Santa Barbara. Marine Science Inst.
P. Melvin, H. Ehrenspeck, and P. Nordin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 689, Price codes: A15 in paper copy, A01 in microfiche. EPA, Office of Research and Development, Environmental Protection Technology Series No. EPA-600/2-77-111, June 1977. 336 p, append.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Water pollution effects, *Bibliographies, Pollutant identification, Water quality control, Baseline studies, Resources development, Patents, Pollution abatement, Outer Continental Shelf, Petroleum development, Oil transport, Coastal zone.

Oil Spill and Oil Pollution Reports is a quarterly bulletin designed to review current scientific and technical publications and research projects in the field of oil pollution. Subject coverage includes all aspects of aquatic and terrestrial oil pollution. This issue contains summaries of research projects and published information selected from the scientific and technical literature during the period February, 1977 through April 1977. The following sections are included in the report: reports, publications, and patents; current research projects; and current oil-related conferences. (Sinha-OEIS)
W78-06861

A DISTRIBUTED KINEMATIC MODEL OF UPLAND WATERSHEDS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4D.
W78-06876

CONTROL OF TURBIDITY AT CONSTRUCTION SITES.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
Study Team Report. December 1977. E. J. Carlson, Compiler. 189 p, 7 fig, 7 tab, 19 ref, 3 append.

Descriptors: *Turbidity, *Sediment pollution, *Turbidity measuring instruments, Western states standards, Bureau of Reclamation projects, Flocculants, Coagulant aids, NPDES Permit Program, Construction activities, *Water pollution control, *Pollution abatement, *Turbidity Study Team(Bur Reclam).

A research study team investigated construction activities causing turbidity and turbidity control measures used by contractors on recent Bureau of Reclamation projects. Contractors' bids and engineers' estimates are included. Price information is included for two projects. A statistical analysis of turbidity measurements on the Arkansas River during construction of Pueblo Dam showing the number of samples required to yield a certain accuracy of turbidity measurements is included. Turbidity control laws in the western United States are given. Brief statements on policy of water pollution in the United States, Public Law 92-500, and other national documents are included. Available equipment for measuring turbidityf and available flocculants and coagulant aids are also listed. (Bur Reclam)
W78-06904

ENVIRONMENTAL QUALITY ASSESSMENT IN MULTIOBJECTIVE PLANNING,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 6G.
W78-06905

PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON MARINE POLLUTION RESEARCH.
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 601, Price codes: A09 in paper copy, A01 in microfiche. Report EPA-600/9-76-032, January 1976. 171 p. Compiled by S. P. Meyers. 1EA615, R 803141-01-0.

Descriptors: *Conferences, Pollutants, *Marine pollution research, *Water pollution, Path of pollutants, Coasts, Foreign research, Marine life, Marine animals, Marine plants.

Symposium papers discuss how man's activities have affected natural resources of a coastal environment. Participants, representing international aspects of coastal pollution, reviewed current status of research and procedures planned to minimize offshore coastal damage. Subjects included: 'An Overview of the USEPA Program in Marine Pollution Research', Carl R. Gerber; 'Responsibilities for Marine Pollution Research Within Federal Agencies of the United States,' Norman L. Richards; 'Overview of Marine Pollution Research in the Baltic,' K. Rozdzynski, 'Marine Pollution Research in Yugoslavia: An Overview,' V. Pravdic; 'Overview of Marine Pollution Research in Egypt,' Saad El-Wakeel; 'Overview on Pollution in the Coastal Environment of Pakistan and its Possible Implication for the Marine Ecosystem,' S. M. Haq; 'Overviews on Marine Pollution in India,' K Ranga Rao; 'Research Needs Concerning Pollution of the Marine Benthos,' R. C. Swartz; 'Hydrological, Chemical and Physical Processes Affecting Pollution of the Baltic Sea,' A. Trzosinska; 'Investigation of Pollution-Stressed Littoral Communities in the Northern Adriatic,' D. Zavodnik; 'Microbiology and Chemistry of Estuarine Surface Microlayers,' A. W. Bourquin and D. G. Ahearn; 'Survival of Viruses in the Marine Environment,'

George E. Schaiberger, Charles P. Gerba and Enrigue G. Estevez; 'Relationship of Marine Pollution to Human Health,' Ronald Engle; 'Bioassays as Indicators of Pollution Effects,' David L. Coppage. (See W78-06907 thru W78-06972)
W78-06906

AN OVERVIEW OF THE USEPA PROGRAM IN MARINE POLLUTION RESEARCH,
Environmental Protection Agency, Washington, DC. Office of Research and Development.
C. R. Gerber.
In: Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976, Environmental Protection Agency, Office of Research and Development Report No. EPA-600/9-76-032, January 1976. p 3-4.

Descriptors: *Water pollution, *Model studies, *Pollutant identification, *Water pollution effects, Resources development, Baseline studies, Environmental effects, Ecosystem, *Outer Continental Shelf.

Because the waters of the earth know no boundaries, the problem of marine pollution is necessarily global in scope. Tides, currents, atmosphere/ocean interactions and the impact of shipping make marine pollution an international dilemma which will require an international solution. In mounting such an effort, there is a need for identifying proper roles for many (as many as 114) multinational organizations which deal with the oceans. The United States Environmental Protection Agency is in the process of evaluating its research activities. One area of effort is to develop ecosystem models that can test and explain the effects of different classes of pollutants. This is the approach we must take if we are ever to get ahead in the control and abatement of pollution. We also need an integrated understanding so that we can make the necessary trade-offs between use and protection of ocean resources. (See also W78-06906) (Sinha-OEIS)
W78-06907

RESPONSIBILITIES FOR MARINE POLLUTION RESEARCH WITHIN FEDERAL AGENCIES OF THE UNITED STATES,
Environmental Research Lab., Gulf Breeze, FL.
N. L. Richards.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No. EPA-600/9-76-032, January 1976. p 5-11, 4 ref.

Descriptors: *Federal Government, *United States, *Resources development, *Coasts, Exploration, Oil pollution, Water quality control, Pollution abatement, Outer Continental Shelf, Petroleum development.

After giving a cursory overview of the characteristics of the coastal zone of the United States showing the flow patterns of major oceans, rivers, and currents along the 100,000 miles of United States coastline and the distribution of human population along the coastal zone, the author discusses how federal agencies interact even though they have different legislative mandates. The role of federal agencies which have major responsibilities in Outer Continental Shelf exploration and development of offshore oil and gas reserves is discussed specifically. (See also W78-06906) (Sinha-OEIS)
W78-06908

OVERVIEW OF MARINE POLLUTION RESEARCH IN THE BALTIC,
Institute of Meteorology and Water Management, Gdynia (Poland). Sea Dept.
K. Rozdzynski.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 12-17, 2 fig.

Descriptors: *Water pollution, *Models, *Resources development, *Water quality control, Baseline studies, Environmental effects, Pollution abatement, Outer Continental Shelf, *Baltic Sea.

The Baltic Sea is an inland shelf sea of northern Europe and a part of the Atlantic Ocean, connected with the latter through the Danish Sounds and the North Sea. The planned rapid development of human activity in the Baltic area, the anticipated simultaneous industrial and urban development of the coastal area, the evolution of an offshore industry, growth of recreational needs and facilities as well as adaptation of special water areas for maricultural purposes, all serve to heighten the problem of environmental protection of this area. Regarding protection and evaluation of the Baltic Sea area as a task to be effectively realized only through common effort of all Baltic countries, Poland took the initiative to organize a Diplomatic Conference of Baltic countries in September 1973. Its outcome was the signing by all participating countries of the Convention on Fishing and Conservation of Living Resources in the Baltic Sea and the Belts. This act of international law was presented as precedent in the United Nations forum. The Baltic Sea and its drainage area are an outstanding example of a difficult area for scientific studies. On the other hand, it is an excellent, almost universal model basin for the study of pollution problems wherein all problems of twentieth century technical culture are brought into focus. (See also W78-06906) (Sinha-OEIS)
W78-06909

MARINE POLLUTION RESEARCH IN YUGOSLAVIA: AN OVERVIEW,
Institut Rudjer Boskovic, Zagreb (Yugoslavia). Center for Marine Research.
V. Pravdic.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 18-28, 4 fig, 9 ref.

Descriptors: *Water pollution, *Resources development, *Research priorities, *Water quality control, Pollution abatement, Outer Continental Shelf, *Yugoslavia, *Adriatic Sea.

Pollution concern is of recent origin in Yugoslavia, mostly because modest industrial capacity, low per capita energy consumption and low density of motor vehicles have kept pollution at tolerable levels. Pollution is specifically threatening the northern bioproductive part of the Adriatic and the narrow channels between the islands, location of much intensive and economically important tourist industry. The dilemma of the urgent need for fast industrial and urban development and the preservation of the environment has caused pollution research to gain recognition as a vital part of regional development planning. The last few years have produced a wealth of information on dynamics of pollution processes in the area (much of it known from related research done in the Center for Marine Research). (See also W78-06906) (Sinha-OEIS)
W78-06910

OVERVIEW OF MARINE POLLUTION RESEARCH IN EGYPT,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
S. K. El-Wakeel.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida and Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. 28-32.

Descriptors: *Water pollution sources, *Water quality control, *Oil spills, *Industrial wastes, *Sewage, Chemical wastes, Resources development, Pollution abatement, *Egypt, Ocean outfalls, Tar balls, Research programs.

Several Egyptian institutions are involved with aquatic pollution problems, especially the Water Pollution Laboratory at the National Research Centre, Cairo. Their main areas of interest are water quality and industrial waste in the Nile and its tributaries. The untreated sewage of central Alexandria (over 2 million inhabitants) is discharged into the sea through a pipe constructed in 1954. There are, additionally, several emergency openings along the coastline. Thus, it is possible that the Alexandria beaches will be the first national recreation area to be polluted, with the anticipated effect on area seafood. One-third of Egypt's industrial activity is located in the Government of Alexandria where several factory complexes exist, mainly an oil refinery, paper mills, textile and cement manufacture, chemical industries and copper works. An oil pipeline terminal, connecting the Gulf of Suez with the Mediterranean, will reach the sea about 50 km west of Alexandria and will transport about 80 million tons annually, with a possible increase to 120 million tons. Although all precautions have been taken, there is still the possibility of oil spills at this site during loading operations. In view of this situation, two interinstitutional projects on aquatic pollution have been recommended to the Council of Environmental Research. They are: Effect of sewage disposal in the sea on the water quality along the beaches of Alexandria and pollution control in Lake Maryout. (See also W78-06906) (Sinha-OEIS)
W78-06911

OVERVIEW ON POLLUTION IN THE COASTAL ENVIRONMENT OF PAKISTAN AND ITS POSSIBLE IMPLICATION FOR THE MARINE ECOSYSTEM,
Karachi Univ. (Pakistan). Inst. of Marine Biology.
S. M. Haq.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 33-54, 4 fig, 8 tab, 52 ref.

Descriptors: *Water pollution sources, *Water quality control, *Industrial wastes, *Sewage, *Oil pollution, Pollution abatement, Pesticides, Heavy metals, Estuaries, Coasts, *Pakistan, Resources management.

Pakistan has a 550-mile long coastline with more than 20,000 sq mi of area as part of the continental shelf. There is evidence that both natural factors and man's activities in the Karachi region are effecting drastic changes in its environment. To deal with problems of resource conservation and protection of coastal environments, it is imperative that, factors complementing the change be thoroughly examined. The Government of Pakistan, recognizing the importance of all types of pollution on human health and on future resources, has recently established a Man and Biosphere Committee at the national level. The object of this committee is to initiate steps to study various aspects of environmental hazards caused by human activities and to develop measures for controlling future environmental pollution. (See also W78-06906) (Sinha-OEIS)
W78-06912

OVERVIEWS ON MARINE POLLUTION IN INDIA,
University of West Florida, Pensacola. Dept. of Biology.
K. R. Rao.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 54-59, 9 ref.

Descriptors: *Water pollution sources, *Resources development, *Planning, *Water quality control, Environmental effects, Legislation, Outer Continental Shelf, India.

India is the second most populous and the seventh largest country in the world. It has a coastline of 6,083km. Marine pollution is associated with the drainage of domestic and industrial wastes directly into coastal waters or indirectly via river waters. Since independence, India has launched and is making significant progress in programs for socio-economic development. Associated with the progress in industrial development and exploration of new energy reserves and pest control, there is evidence of environmental pollution. The belief that environmental disruption affects less developed countries in a lesser way is not well founded. Highly industrial pockets and overpopulated towns exist in the coastal areas, where marine pollution phenomena often appear with unparalleled intensity unless adequate preventive measures are adopted. Pollution is certainly a symptom of modernity which comes well in advance of other more desirable features of industrialization. Therefore, developing countries such as India have more opportunity to operate on a preventive basis than developed countries. (See also W78-06906) (Sinha-OEIS)
W78-06913

RESEARCH NEEDS CONCERNING POLLUTION OF THE MARINE BENTHOS,
Pacific Northwest Environmental Research Lab., Newport, OR. Marine Science Center.
R. C. Swartz.
In: 'Proceedings of the International Symposium on Marine Pollution Research Held in Gulf Breeze, Florida on Jan 27-29, 1976,' Environmental Protection Agency, Office of Research and Development Report No EPA-600/9-76-032, January 1976. p 60-68, 4 fig, 1 tab.

Descriptors: *Water pollution effects, *Benthos, *Bioindicators, Outer Continental Shelf, *Macrobenthic communities, Population structure, Research programs, Polychaeta.

Several research problems on the effects of pollution on the structure of macrobenthic communities are identified. Research needs are divided into two categories: (1) those associated with the development of methods for asssessing the 'health' of benthic ecosystems, and (2) those resulting from a lack of fundamental information concerning the relationship between community structure and pollutional stress. Obviously these research areas are closely related and individual projects can make contributions to both. (See also W78-06906) (Sinha-OEIS)
W78-06914

HYDROLOGICAL, CHEMICAL AND PHYSICAL PROCESSES AFFECTING POLLUTION OF THE BALTIC SEA,
Institute of Meteorology and Water Management, Gdynia (Poland).
For primary bibliographic entry see Field 5B.
W78-06915

INVESTIGATION OF POLLUTION-STRESSED LITTORAL COMMUNITIES IN THE NORTHERN ADRIATIC,
Institut Rudjer Boskovic Inst Zagreb (Yugoslavia). Center for Marine Research
For primary bibliographic entry see Field 5C.
W78-06916

RELATIONSHIP OF MARINE POLLUTION TO HUMAN HEALTH,
Environmental Protection Agency, Washington, D.C. Office of Research and Development
For primary bibliographic entry see Field 5C.
W78-06918

DEVELOPMENT OF METHODS FOR RAPID DETECTION OF TRACE METALS IN SEA WATER,
Institut Rudjer Boskovic, Zagreb (Yugoslavia). Center for Marine Research.
For primary bibliographic entry see Field 5A.
W78-06919

EFFECT OF LEAD ON DINOPHYCEAE,
Biologische Anstalt Helgoland (West Germany).
For primary bibliographic entry see Field 5C.
W78-06920

BIOASSAYS AS INDICATORS OF POLLUTION EFFECTS,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5A.
W78-06921

GLOBAL MONITORING OF MARINE POLLUTANTS,
Scripps Institution of Oceanography, La Jolla, CA.
For primary bibliographic entry see Field 5A.
W78-06922

APPLICATION OF DIGITAL PROFILE MODELING TECHNIQUES TO GROUNDWATER SOLUTE TRANSPORT AT BARSTOW, CALIFORNIA,
Geological Survey, Lakewood, CO. Water Resources Div.
For primary bibliographic entry see Field 5B.
W78-06931

STRESS AND RECOVERY OF AQUATIC ORGANISMS AS RELATED TO HIGHWAY CONSTRUCTION ALONG TURTLE CREEK, BOONE COUNTY, WEST VIRGINIA,
Geological Survey, Charleston, WV. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-06933

EVALUATION OF HYDROGEOLOGIC ASPECTS OF PROPOSED SALINITY CONTROL PROGRAM IN PARADOX VALLEY, COLORADO,
Geological Survey, Denver, CO. Water Resources Div.
L. F. Konikow, and M. S. Bedinger.
Open-file report 78-27, January 1978. 23 p, 4 fig, 1 tab, 5 ref, append.

Descriptors: *Saline water intrusion, *Groundwater, *Effluents, *Seepage control, *Colorado River basin, Colorado, Streams, Planning, Aquifer management, Brines, Evaporation, Ponds, *Salinity control, *Paradox Valley(Colo), Dolores River.

The salt load in the Dolores River increases by about 200,000 tons per year where it crosses Paradox Valley, Colorado, because of the discharge of a sodium chloride brine from an underlying aquifer. A ground-water management program to nearly eliminate this major source of salt, which eventually enters the Colorado River, can be designed on the basis of an accurate description of the hydrogeologic framework of Paradox Valley. Probably the most economical plan would involve storage in an evaporation pond. The reservoir site must be large enough to provide an adequate evaporative surface over the life of the project, and be located and constructed to prevent brine contamination of other ground or surface waters either by seepage losses from the reservoir or by flood overflows. The proposed Radium Reservoir, located approximately 10 mi east of the Dolores River and between Paradox Valley and Gypsum Valley, would apparently serve as a satisfactory site for an evaporation pond. (Woodard-USGS)
W78-06942

OVERVIEW OF FEDERAL GROUNDWATER PROTECTION LEGISLATION AIDS ENVIRONMENTALISTS,
Office of Radiation Programs, Washington, DC. Div. of Criteria and Standards.
R. K. Ballentine.
Water and Sewage Works, Vol. 125, No. 4, p 68-70, April, 1978. 1 fig.

Descriptors: *Federal Water Pollution Control Act, *Toxic Substances Control Act, *Resource Conservation and Recovery Act, *National Environmental Policy Act, Water pollution control, Legislation, Groundwater, Waste disposal, Hazardous wastes.

In reviewing the federal statutes on the topic of ground water quality protection, statutes other than the Safe Drinking Water Act which relate to this subject must also be identified. These statutes include: (1) Federal Water Pollution Control Act Amendments of 1972--ground water control not extensively includes. Sections 201, 208, 303, 304, and 402 have indirect bearing upon ground water pollution in their requirements for waste disposal planning and management. (2) Toxic Substances Control Act--provides framwork for regulation of hazardous waste disposal in or on land. (3) Resource Conservation and Recovery Act of 1976--further regulation of transport, storage, and disposal of hazardous wastes. (4) National Environmental Policy Act of 1969--indirect consideration of ground water via Environmental Impact Statements. Additional federal protection of ground water resources has come by way of Executive Orders 11514 and 11752. (Eberle-NWWA)
W78-06956

A SURVEY OF PRACTICES AND REGULATIONS FOR REUSE OF WATER BY GROUNDWATER RECHARGE,
SCS Engineers, Long Beach, CA.
For primary bibliographic entry see Field 5D.
W78-06958

HYDROGEN SULFIDE CONTROL,
Gulf South Research Inst., New Iberia, LA.
For primary bibliographic entry see Field 8G.
W78-06960

SICK WELLS REQUIRE WELL DEVELOPED CURE.
Irrigation Age, Vol. 12, No. 6, p 60-64, March, 1978. 3 tab.

Descriptors: *Irrigation, *Iron bacteria, *Incrustation, *Specific capacity, Maintenance, Rehabilitation, Chlorination, Acids, Water yield, Water wells.

Irrigators can save time and money by keeping accurate records of their wells and by taking remedial measures as soon as they notice decreases in specific capacity. Iron bacteria and mineral incrus-

tation are the two main problems causing decreases in irrigation well yield. The former can be minimized by chlorinating a well in the spring and fall. High-test dry calcium hypochlorite (H-T-H) or common household bleach can be used in quantities which can be calculated from tables in this article. Chlorine is introduced into the well, let stand, surged, then pumped out. After 24 hours, the well is surged and pumped once again. Incrustation is commonly treated wit sulfamic acid. The acidizing procedure is somewhat similar to chlorination, and it is suggested that chlorination both precede and follow an acid treatment. Enlisting the services of a well driller is recommended for treating wells with a decline in specific capacity greater than 20%. (Eberle-NWWA)
W78-06963

GEOTHERMAL DOWN-WELL PUMPING SYSTEM,
Sperry Research Center, Sudbury, MA.
For primary bibliographic entry see Field 8C.
W78-06969

LEGISLATIVE ASPECTS OF GROUNDWATER QUALITY,
A. H. Goodman, and M. J. Beckett.
In: Groundwater Quality--Measurement, Prediction and Protection. Proc. of the Water Research Centre Conference, September 6-8, 1976, Univ. of Reading, Berks., England, p 744-758. (1976) 1 ref.

Descriptors: *United Kingdom, *Legislation, *Water quality control, Groundwater, Waste disposal, Sewage disposal, Regulation, Permits, Water wells, Cemeteries.

Ground water legislation in Great Britain is discussed. Although approximately one third of public water supply in the U.K. is derived from ground water sources, little legislation is concerned directly with ground water protection, perhaps because serious incidents of subsurface contamination over the years have been surprisingly few. The Cemeteries Clauses Act of 1847 and the Public Health Acts of 1875, 1879, 1925 and 1936 regulated the construction of wells near burial grounds, specified sewage disposal practices, and delegated public well ownership and well closing authority to local levels. The Water Acts of 1945 and 1948, along with the Water Resources Act of 1963, laid down rules on licensing of wells and discharges to underground strata. Protection of ground water against pollution by waste disposal has been legislated more recently by the Deposit of Poisonous Wastes Act (1972) and the Control of Pollution Act (1974). Major provisions of the latter are the licensing of waste disposal sites and the accompaning mechanisms for site supervision by appropriate government authorities. The CP Act also provides for statutory consultations between waste disposal and water authorities where protection of water is concerned. (Eberle-NWWA)
W78-06974

MEASURES FOR THE PROTECTION AND REHABILITATION OF AQUIFERS IN THE UNITED KINGDOM,
H. G. Headworth, and W. B. Wilkinson.
In: Groundwater Quality--Measurement, Prediction and Protection. Proc. of the Water Research Centre Conference, September 6-8, 1976, Univ. of Reading, Berks., England, p 760-817. (1976) 12 fig, 3 tab, 77 ref.

Descriptors: *United Kingdom, *Aquifers, *Water pollution control, Rehabilitation, Water pollution sources, Sewage disposal, Agricultural chemicals, Industrial wastes, Spills, Coasts, Saline water intrusion, Mine wastes.

Although the groundwater resources of the United Kingdom have proved to be good quality water supplies over the years, it is likely that the increased environmental pressures of industrial development and latent effects of current polluting activities will mean an increase of reported well contaminations. In general, ground water pollution sources in Britain are the same as in the U.S. More stringent legal regulation of waste disposal activities and wider use of hydrogeological studies in assessing environmental impacts are obvious pollution control measures that should be implemented. Regarding technology, injection wells are not now used in either the waste water disposal sphere or for control of saline water intrusion via artificial recharge; they may, however, need to be employed in the future. Short general discussions of various sources of pollution are presented in this paper. Control and rehabilitation measures that may be adopted for existing and potential pollution situations are illustrated by a number of case histories. (Eberle-NWWA)
W78-06975

OIL SPILL AND OIL POLLUTION REPORTS, MAY 1977 - JULY 1977,
California Univ., Santa Barbara. Marine Science Inst.
P. Melvin, H. Ehrenspeck, and P. Nordin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 691, Price codes: A17 in paper copy, A01 in microfiche. Environmental Protection Agency, Office of Research and Development, Environmental Protection Technology Series No EPA-600/2-77-243, November 1977. 387 p, append. Grant R805052.

Descriptors: *Oil spills, *Oil pollution, *Water pollution sources, *Water pollution effects, *Bibliographies, Pollutant identification, Water quality control, Baseline studies, Resources development, Patents, Pollution abatement, *Outer Continental Shelf, Petroleum development, Oil transport, Coastal zone.

The May, 1977 - July, 1977 issue of Oil Spill and Oil Pollution Reports is a quarterly compilation of oil pollution publications and ongoing project summaries. Presented in the report are: (1) summaries and citations of published literature and patents; (b) summaries and status of current research projects; and (c) current oil-related conferences. (Sinha-OEIS)
W78-06980

EVALUATION OF TECHNIQUES FOR ALGAE REMOVAL FROM WASTEWATER STABILIZATION PONDS, REVIEW PAPER,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 5D.
W78-06995

RECREATIONAL REUSE OF MUNICIPAL WASTEWATER--PHASE II,
Texas Tech Univ., Lubbock. Water Resources Center.
J. T. Bandy, D. M. Wells, and R. M. Sweazy.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 497, Price codes: A04 in paper copy, A01 in microfiche. Report No. WRC 77-2, June, 1977. 56 p, 13 fig, 17 tab, 61 ref. Supplement to Completion Report. OWRT C-6053(No 5205)(2).

Descriptors: *Water reuse, Planning, Texas, *Lubbock(Tex), *City planning, *Recreational lakes, Management, Water pollution control, Phosphorus, *Cycling nutrients, Eutrophication, *Model studies, *Algal growth control, Water pollution effects.

The city of Lubbock, Texas has long been a leader in the conception and implementation of water reuse plans. For more than 51 years the city's treated municipal effluent has been used for irrigation. Now it is planning to use recovered percolated effluent as makeup water for a series of small recreational lakes built within the city. To insure that this second beneficial reuse of the water will be successful, model studies have been conducted in which nine common-wall concrete ponds simulated the proposed lakes and in which a similar source of percolated reused effluent servied as makeup water. These model studies determined that the lakes will be suitable for fish life and for recreational contact but that careful management will be necessary if objectionable blooms of algae are to be avoided. Studies were also undertaken which established the critical phosphorus concentration for algal growth as well as the availability and probable manner of cycling of phosphorus within the lakes. These results will be valuable not only to the city of Lubbock in its operation of the lakes but also other municipalities which wish to derive maximum benefits from their limited water supplies. (See also W77-01824.)
W78-06997

EVALUATION OF FACTORS PROMOTING THE PRESERVATION OF AQUATIC ECOSYSTEMS IN RECLAIMED STRIP MINE AREAS,
Grover City Coll., PA. Dept. of Biology.
F. J. Brenner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 393, Price codes: A07 in paper copy, A01 in microfiche. Completion Report, January, 1978. 130 p, 4 tab, 31 fig, 47 ref. Institute for Research on Land and Water Resources, University Park, PA. OWRT A-044-PA(1), 14-34-0001-6039.

Descriptors: Preservation, Water chemistry, Plankton, *Algae, *Chlorophyll, Hydrogen ion concentration, Wildlife habitats, *Ecological surveys, Ecology, *Phytoplankton, Ecosystems, *Biomass, Seasonal, Zooplankton, *Productivity, C-14 uptake, Eutrophication, Water pollution, Aquatic ecosystems, *Reclaimed strip mines, Chemical parameters, Fish habitats.

An ecological survey was conducted on 82 different strip-mine areas including 132 different aquatic areas located within these lands. A detailed survey of the water chemistry, plankton population, algae biomass and chlorophyll concentration was conducted on 60 mines of various ages. Seasonal changes in these parameters in addition to light and dark bottle productivity and C-14 uptake studies were conducted on three aquatic areas located on the same mine operation. The results indicate that the seasonal changes in productivity were similar between these mines even though they differed in pH and other chemical parameters. The mathematical relationship between phytoplankton populations, algae biomass, chlorophyll and C-14 uptake indicate that the productivity of these areas may be predictable within a good degree of confidence. These unique ecosystems should be managed in order to enhance their potential as fish and wildlife habitats. (Sink-Penn St)
W78-06998

EFFECTS OF FUNGI AND BACTERIA ON THE DECLINE OF ARTHROPOD-DAMAGED WATERHYACINTH,
Florida Univ., Gainesville. Dept. of Plant Pathology.
For primary bibliographic entry see Field 4A.
W78-07002

BIOLOGICAL CONTROL OF WATER POLLUTION.
Pennsylvania Univ., Philadelphia. Center for Ecological Studies in Planning and Design.
For primary bibliographic entry see Field 5D.
W78-07003

PLEINS FEUX SUR LES EAUX ROUGES DE MONT-WRIGHT (RED WATER AND THE MOISIE RIVER).
Quebec Cartier Mining Co., Fermont.

Atlantic Salmon Journal, No. 1, p 21-32, 1978. (Text in both languages).

Descriptors: *Mine wastes, *Mine water, *Industrial wastes, *Suspended solids, Water quality, Salmon, *Atlantic salmon, Fry, *Growth stages, *Fish food organisms, Water pollution sources, Bioassay, *Moise River, Quebec, Canada.

The mining company responsible for the release of large quantities of suspended solids into the Moise River watershed presents an overview of methods it is utilizing to correct the problem. A new water treatment facility which will be capable of removing the suspended particles is presently under construction. The impact on salmon populations is also under investigation. (Deal-EIS)
W78-07023

EXPERIENCE WITH THE 303-208-201 STUDY RELATIONSHIPS,
Clinton Bogert Associates, Fort Lee, NJ.
F. Dobrowolski, and L. Grillo.
Water Resources Bulletin, Vol. 13, No. 3, p 455-460, June 1977.

Descriptors: *Water quality standards, *Costs, *Estimating, *Planning, *Non-point source control, Sewerage, *New Jersey, Regulation, Alternative evaluation, Process selection, Funding, NPDES permit, Municipal wastes.

The current 201 study by the Bergen County Sewer Authority illustrates possibilities for improving the currently defined relationships between 201, 208 and 303 studies. The Bergen County Sewer Authority serves 115 square miles in northeast New Jersey, providing sewerage service to 507,000 people in 43 municipalities. Its STP discharges to the Hackensack River, a tidal estuary recently classified as Water Quality Limited and which receives significant non-plant loading. The subject 201 study is concurrent with 208 and 303 planning by NJDEP. Preliminary evaluations show that detailed 201 work can affect the conclusions of 303 and 208 studies, and that a wider (environmental and social, as well as economic) interpretation of cost-effectiveness can demand reexamination of prior assumptions and decisions, a task not typically part of 208-303 work. Increased flexibility is needed in applying 303 and 208 recommendations to defining 201 studies and NPDES permit criteria, particularly in analysis of water use objectives, water quality parameters and future flows, loading and facility costs. Further, perception of alternatives can be clarified by broadening analysis of costs and control and plant strategies. Inclusion of 201 planning at all stages of regional planning can synergistically improve the total planning process. (Bell-Cornell)
W78-07038

PLANNING DIFFUSE POLLUTION CONTROL: AN ANALYTICAL FRAMEWORK,
Williams Coll., Williamstown, MA. Dept. of Economics.
R. R. Schneider.
Water Resources Research, Vol. 14, No. 2, p 322-336, April 1978. 4 fig, 2 tab, 39 ref.

Descriptors: *Planning, *Water pollution control, *Nonpoint pollution, *Analytical techniques, *Benefits, *Costs, Agriculture, Optimum development plans, Evaluation, Systems analysis.

Determination of an optimal nonpoint pollution control strategy demands information relating to (1) costs of pollutant reduction; (2) transport of pollutants, (3) water quality impact of pollutants, and (4) the economic impact of water quality changes. This paper briefly reviews the literature in each of these areas and suggests an analytical framework useful in the development of an optimal nonpoint pollutant control strategy. (Bell-Cornell)
W78-07042

WATER QUALITY SIMULATION AND PUBLIC LAW 92-500 CASE STUDY: SOUTHWESTERN ILLINOIS,
Hydrocomp Inc., Chicago, IL.
N. U. Schultz, and A. Wilmarth.
Water Resources Bulletin, Vol 14, No 2, p 275-287, April 1978. 5 fig, 4 tab, 2 ref.

Descriptors: *Water pollution control, Simulation analysis, *Comprehensive planning, *Regions, *Illinois, Stream, Reservoirs, Pollutants, Hydrologic aspects, Mathematical models, Systems analysis.

Section 208 of the Federal Water Pollution Control Act Amendments of 1972 has provided the Southwestern Illinois Metropolitan and Regional Planning Commission (SIMAPC) with a unique opportunity for comprehensive planning of the region's water quality. SIMAPC inititated the 208 study by researching available technology for the analysis of point and nonpoint sources of pollution and establishing criteria by which to judge the various techniques. This led to SIMAPC's choice of continuous simulation of stream and reservoir water quality as the most appropriate analytical tool for their needs. A continuous simulation model was calibrated and verified on three basins in the SIMAPC region. It was then used to produce load source analysis, pollution event frequency analysis, and pollution event duration analysis for ten pollutants under existing stream conditions and then under alternative future conditions. These results enabled the weighting of pollutant sources, analysis of the effectiveness of control measures, and quantitaive analysis of the marginal benefit of each alternative. (Bell-Cornell)
W78-07045

PLANNING MODELS WITH ALTERNATIVE COOLING SYSTEMS,
Middle East Technical Univ., Ankara (Turkey). Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6A.
W78-07048

WATER RESOURCES AND NEGENTROPY,
National Research Center for Disaster Prevention, Tokyo (Japan).
For primary bibliographic entry see Field 2A.
W78-07054

BASIN-WIDE PLANNING FOR URBAN STORM-WATER MANAGEMENT,
Jorden (W. L.) and Co., Inc., Decatur. GA.
W. L. Jorden, and K. R. Jones.
In: Proceedings of the National Symposium on Urban Hydrology, Hydraulics, and Sediment Control, July 1976. UKY BU111, College of Engineering, University of Kentucky, Lexington, December 1976, p 11-23. 7 fig, 3 tab.

Descriptors: *River basins, *Storm water, *Management, *Drainage, *Programs, *Alternative planning, Georgia, Evaluation, Economics, Citizen attitudes, Legal complications, Regional analysis, Simulation analysis, Mathematical models.

With the acquisition of UROS-4, an urban runoff simulation computer program, Dekalb County, Georgia has initiated a program of basin-wide planning for stormwater management and drainage improvements. To gain experience in this planning process, a Pilot Sub-basin Drainage Program has been undertaken. Citizen attitudes, legal complications, funding alternatives, development of a coordinated drainage system, and implementation costs have been addressed under this program. A discussion of the study process is supported by the experience of DeKalb County and provides ideas for conducting similar programs elsewhere. (Bell-Cornell)
W78-07058

OVERFLOW ABATEMENT ALTERNATIVES SELECTED BY COMBINING CONTINUOUS AND SINGLE EVENT SIMULATIONS,
Dorsch Consult, Munich (Germany).
W. F. Geiger, S. A. LaBella, and G. C. McDonald.
In: Proceedings of the National Symposium on Urban Hydrology, Hydraulics, and Sediment Control, July 1976. UKY BU111, College of Engineering, University of Kentucky, Lexington, December 1976, p 71-79. 9 fig, 2 tab, 28 ref.

Descriptors: *Urban runoff, *Storm water, *Overflow, *Simulation analysis, *Pollution abatement, Urban drainage, Evaluation, Combined sewers, Statistical methods, Comparison, Alternative planning, Cost effectiveness, Waste water(Pollution), Land use, Networks, Mathematical models, Systems analysis.

A comparison of concepts and benefits of continuous and single event simulation models for urban runoff pollution analysis are briefly discussed and a procedure for relating continuous and single event simulations is presented. The procedure allows the evaluation and ranking of alternatives in an urban storm or combined sewer network study based on more detailed single event simulations while still utilizing the benefits of continuous simulations. Runoff and overflow characteristics for single event simulations are related to the statistical analysis of th continuous simulation, allowing a quick comparison of effectiveness and costs for the alternatives being considered. (Bell-Cornell)
W78-07059

PENN STATE RUNOFF MODEL FOR THE ANALYSIS OF TIMING OF SUBWATERSHED RESPONSE TO STORMS,
Weston (Roy F.), Inc., West Chester, PA.
D. F. Lakatos.
In: Proceedings of the National Symposium on Urban Hydrology, Hydraulics, and Sediment Control, University of Kentucky, July 1976. UKY BU111, College of Engineering, University of Kentucky, Lexington, December 1976, p 177-185. 5 fig, 1 tab, 4 ref.

Descriptors: *Runoff, *Timing, *Mathematical models, *Water pollution control, *Simulation analysis, Networks, Watersheds(Basins), Pollution abatement, Storm water, Computer programs, Systems analysis, Subarea runoff, Runoff combinations, Peak flow.

A runoff model has been developed to be used primarily for the analysis of subarea flow combinations, and more importantly for analyzing their effect on total runoff from an area. A significant savings can be realized with the logical placement of a network of small-scale runoff abatement devices in a watershed as opposed to the construction of one large reservoir at the watershed mouth for reducing the peak flow rate from the entire area. These smaller abatement devices can be functional or they can be in the form of, for example, dry ponds which can be used as small parks, except in times of flooding. Described is the Penn State Runoff Model, the most useful tool for performing a runoff timing study. This computer program was developed specifically for analyzing and illustrating subarea runoff combinations. The Peak Flow Presentation Table furnished as output from this model illustrates these runoff combinations. (Bell-Cornell)
W78-07060

ECONOMIC IMPLICATIONS OF ENVIRONMENTAL LEGISLATION FOR WETLANDS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6E.
W78-07080

TO MINE OR NOT TO MINE GROUNDWATER,
Illinois State Water Survey, Urbana.

For primary bibliographic entry see Field 4B.
W78-07102

INDUSTRIAL POLLUTION CONTROL: VOLUME 1: EXECUTIVE SUMMARY.
Stone (Ralph) and Co., Inc., Los Angeles, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 178, Price codes: A06 in paper copy, A01 in microfiche. April 1977. 105 p, 5 fig, 11 tab, 20 ref. AID-ta-C-1091.

Descriptors: *Industrial wastes, *Water pollution sources, *Water pollution control, *Waste water treatment, *Water quality control, *Cost-benefit analysis, *Cost analysis, Planning, Management.

Background information and reference sources are presented for the facilitation of general policy decisions relating to the control of industrial pollutants. Topics include (1) the social and economic costs of industrial pollution; (2) the ways in which society pays these costs; (3) the strategies government and industry can utilize to control polluting discharges; (4) the respective cost-benefits of industrial freedom to pollute and consequences of mandatory pollution control; and (5) public agency environmental information sources. The two-volume study is intended for use by government leaders, industrialists, and other concerned individuals who may have widely differing technical and national backgrounds. Volume 2 is concerned with the technical application and comparative costs of pollution abatement in manufacturing operations. The general principles and control methods discussed will generally be applicable to pollutants from both industrial and non-industrial sources. (See also W78-07120) (Seip-IPA)
W78-07119

INDUSTRIAL POLLUTION CONTROL: VOLUME 2: TECHNOLOGICAL STRATEGIES.
Stone (Ralph) and Co., Inc., Los Angeles, CA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 179, Price codes: A20 in paper copy, A01 in microfiche. April 1977. 451 p, 184 fig, 83 tab, 114 ref. AID-ta-C-1091.

Descriptors: *Industrial wastes, *Water pollution sources, *Water pollution control, *Waste water treatment, *Water quality control, *Air pollution, *Cost-benefit analysis, *Cost analysis, Analytical techniques, Equipment, Pollutant identification, *Technology.

Information on technologies commonly used for reducing the environmental impact of industrial air and water pollutants is presented and relative costs for removing different quantities of pollutants from industrial waste streams are indicated. Topics include: (1) pollution abatement approaches, which may supplement, facilitate, or replace end-of-pipe treatment processes; (2) the potential adverse effects of major air and water pollutants generated by industrial sources; (3) available techniques, processes, and equipment, which may be used separately or as parts of a system for removing or reducing pollutants in industrial discharges to the air and water environment; (4) pollutants generated by selected basic industries, and examples of suitable treatment systems for their control; (5) actual pollution abatement practices used by specific industrial plants in three case study industries; and (6) related economic data and cost curves. The two-volume study is intended for use by government leaders, industrialists, and other concerned individuals who may have widely differing technical and national backgrounds. Volume 1 provides background information and reference sources to facilitate general policy decisions relating to the control of industrial pollutants. The general principles and control methods discussed will usually be applicable to pollutants from both industrial and nonindustrial sources. (See also W78-07119) (Seip-IPA)
W78-07120

DESIGN GUIDE FOR METAL AND NON-METAL TAILINGS DISPOSAL,
Bureau of Mines, Spokane, WA. Spokane Mining Research Center.
For primary bibliographic entry see Field 5E.
W78-07123

1977 INTENSIVE WATER QUALITY SAMPLING PROGRAMS IN NORTH CENTRAL TEXAS.
North Central Texas Council of Governments, Arlington.
For primary bibliographic entry see Field 5A.
W78-07127

A SUMMARY OF THE 1977 ANNUAL WATER QUALITY MANAGEMENT PLAN FOR NORTH CENTRAL TEXAS.
North Central Texas Council of Governments, Arlington.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-271 173, Price codes: A03 in paper copy, A01 in microfiche. 1977. 32 p.

Descriptors: *Water quality, *Management, *Planning, *Sewage treatment, *Waste disposal, *Texas.

The North Central Texas Council of Governments is a 170-member voluntary association of cities, counties, school and special purpose districts in a 16-county metropolitan region, centered around Dallas and Fort Worth, with a population of 2.9 million and an area of 12,627 sq. mi. The 1977 Annual Water Quality Management Plan focuses on the management and planning activity of the region's vast network of waste collection and sewage treatment facilities. Also described are: (1) plan recommendations, (2) the 1977 Sewerage Improvements Program, (3) implementation of the Upper Trinity River Basin Comprehensive Sewerage Plan, (4) implementation of state treatment levels, (5) findings from the Waste Treatment Management Program, (6) impact analysis, (7) natural/environmental resources, (8) costs management and financing, and human activities, (9) public participation, (10) committees, (11) annual review process, and (12) ongoing planning during 1977-78. The 1977 Annual Plan consists of three volumes: I - Waste Treatment Management Program - assesses the degree to which the adopted regional sewerage plan recommendations and the state and national effluent quality goals are being implemented; II - Impact Analysis of the Waste Treatment; and III - Public Participation/Review Process - summarizes the public participation activities during 1976-77. (Seip-IPA)
W78-07128

QUALITY ASSURANCE PRACTICES AND PROCEDURES,
Environmental Protection Agency, Chicago, IL. Central Regional Lab.
For primary bibliographic entry see Field 5A.
W78-07129

ENVIRONMENTAL IMPACT OF LAND USE ON WATER QUALITY (PROGRESS REPORT), BLACK CREEK PROJECT, ALLEN COUNTY, INDIANA,
Allen County Soil and Water Conservation District, Fort Wayne, IN.
For primary bibliographic entry see Field 6G.
W78-07131

AN UNUSUAL PUMP TEST NEAR ESTERHAZY, SASKATCHEWAN,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
A. Vandenberg.
Technical Bulletin No. 102, 1978, 25 p, 17 fig, 3 tab, 10 ref.

Descriptors: *Pump testing, Solid wastes, *Liquid wastes, Sodium chloride, Groundwater, Freshwater, Aquifers, Brines, Hydrogeology, Geology, Stratigraphy, Piezometry, *Canada, Water pollution, *Esterhazy(Saskatchewan).

As part of a program to study possible contamination of the environment by leaching of waste brine from storage basins at a potash mine near Esterhazy, Saskatchewan, a series of pump tests was conducted in March 1971. A pump test of approximately 20 hours duration was run on each of seven test wells and the piezometric head recorded simultaneously in the other six wells; the length of the intervening nonpumping periods was between 27 and 75 h. The aquifer in which the observation wells were completed can be described as a semiconfined, buried bedrock-channel aquifer, with sand and gravel channel fill forming the aquifer body, and till forming the overlying, semiconfining bed. The location and thickness of the aquifer in the vicinity of the wells have been defined by the drilling of 91 stratigraphic test holes. The results of the comparison show that there is a large range of uncertainty in the expected drawdown after a prolonged period of pumping. Real drawdown in the test holes exhibited a sustained downward trend which was much stronger than in the model solutions. Reasons for this trend could be (1) a seasonal downward trend owing to causes extraneous to the pumping, or (2) strongly reduced permeability or absence of the buried valley deposits to the east of the study site or (3) less leakage than was assumed on the basis of the pump-test analysis. (WATDOC)
W78-07172

POTATO PROCESSING PLANT LIQUID EFFLUENT REGULATIONS AND GUIDELINES.
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate.
Regulations, Codes and Protocols Report EPS 1-WP-77-4, November, 1977. In English and French, 33 p., 38 p., 8 append.

Descriptors: *Liquid wastes, *Effluents, *Industrial wastes, *Potatoes, Industrial plants, Toxicity, Aquatic life, Fishkill, Water pollution effects, Water pollution control, Regulation, Water quality standards, *Canada.

This document contains potato processing plant liquid effluent regulations and guidelines, toxicity guidelines for potato plants and explanatory notes for the regulations and guidelines. The notes discuss the intent, meaning and basis of authority for the regulations and guidelines. Details of best practicable process and treatment technology and internal water use practices are outlined. Water usage, acute lethality limits, interpretation, offsite treatment facilities, deposit limits, composite sampling and analysis, flow measurement, testing frequency, effluent discharge, acute toxicity testing and production information are discussed. (WATDOC)
W78-07174

AN INVENTORY OF THE FRUIT AND VEGETABLE PROCESSING INDUSTRY IN CANADA,
Stanley Associates Engineering Ltd., Edmonton (Alberta).
Water Pollution Control Directorate, Environmental Protection Service, Fisheries and Environment Canada, Ottawa, Canada. Economic and Technical Review Report EPS 3-WP-78-2, February, 1978, 121 p., 2 fig, 66 tab, 2 append.

Descriptors: *Industrial production, *Industrial wastes, *Economic impact, *Environmental effects, *Surveys, Waste water treatment, Reduction(Chemical), Effluents, Technology, Analysis, Aerated lagoons, Anaerobic digestion, On-site

tests, Data collections, Evaluation, *Canada, Attitudes, *Fruits, *Vegetables, *Processing industries, Questionnaires.

Basic information on the economic and environmental aspects of the fruit and vegetable industry, excluding potato processing, was collected through questionnaires sent to all known fruit and vegetable processing plants in Canada, literature sources, and contacts with key members of the industry. The questionnaire responses have been analysed and combined with data obtained from Statistics Canada and other sources to present a total Canadian picture with respect to production, waste treatment techniques, and effluent loadings. Fruit and vegetable processing plants were divided into three categories according to size, based on annual production rates. These categories have been assessed separately in terms of environmental control methods and costs. The economic impact of upgrading wastewater treatment in each category has been evaluated in relation to the reductions in waste loadings that would result. (WATDOC)
W78-07177

ALGAL NUTRIENT LIMITATION IN LAKE ONTARIO AND TRIBUTARY WATERS,
Texas Univ. at Dallas, Richardson. Inst. for Environmental Sciences.
For primary bibliographic entry see Field 5C.
W78-07189

HYGIENIC CHARACTERISTICS OF A NEW FLOCCULATION AGENT POLYETHYLENIMINE AND ITS STANDARDIZATION IN BODIES OF WATER (IN RUSSIAN),
Moskoviskii Gosudarstvennyi Meditsinskii Inst. (I) (USSR). Dept. of Public Hygiene.
For primary bibliographic entry see Field 5C.
W78-07196

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

AN ITERATIVE ALGORITHM FOR INTERACTIVE MULTIOBJECTIVE PROGRAMMING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
S. P. Neuman, and R. Krzysztofowicz.
Advances in Water Resources, Vol 1, No 1, p 1-14, September 1977. 4 fig, 3 tab, 34 ref. OWRT B-051-ARIZ(1).

Descriptors: *Algorithms, *Multiobjective programming, *Optimization, *Lagrange multiplier, Decision making, Reservoir operation, Cost minimization, Water loss, Volume capacity, Equations, Mathematical models, Systems analysis.

A new iterative algorithm for interactive multiobjective programming is proposed. The algorithm is based on the Lagrange multiplier technique of generating noninferior solutions, and it is shown to converge under certain conditions. It reduces a complex multiobjective problem into a sequence of two-objective problems which the decision maker can more easily handle. The number of two objective problems with which the decision maker is confronted, as well as the total number of noninferior solutions that must be generated, increase more or less linearly with the number of objectives. Computational efficiency is further enhanced by avoiding the need for regression. The decision maker interacts with the model directly in the functional space, and he is not required to translate his judgment of relative worth into numbers. Due to the iterative nature of the algorithm, the decision maker can articulate his preferences in a progressive manner. Furthermore, he may modify his attitude at any stage of the computation, based on partial results, without adversely affecting the quality of the solution. An example problem involving efficient reservoir operation, previously solved by other methods, including the surrogate worth trade-off approach, is used to illustrate the new algorithm; the objective is to maximize volume capacity and to minimize capital cost and water loss. (Bell-Cornell)
W78-06739

COAL GASIFICATION AND WATER RESOURCES DEVELOPMENT,
Ohio State Univ., Columbus. Dept. of Civil Engineering.
For primary bibliographic entry see Field 3E.
W78-06740

SEASONAL AND STOCHASTIC FACTORS IN WATER PLANNING,
Utah Water Research Lab., Logan.
A. B. Bishop, and R. Narayanan.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol. 103, No. HY10, p 1159-1172, October 1977. 3 fig, 9 tab, 12 ref. OWRT B-097-UTAH(4), 14-31-0001-4133.

Descriptors: *Water resources, *Water costs, *Long-term planning, *Stochastic processes, *Water allocation(Policy), *Water supply, Optimization, Computer programs, Constraints, Waste water treatment, Treatment facilities, Seasonal, Annual, Economies of scale, Water requirements, Water utilization, Municipal water, Irrigation water, Industrial water, Environment, Equations, Mathematical models, Systems analysis, Cost minimization.

A transshipment model of water resources in a region is formulated. Three contrasting formulations of the water allocation model have been developed: linear versus nonlinear costs; annual versus seasonal time frame; and deterministic versus stochastic water supplies. The basic model is structured using nonlinear costs (by separable programming) for the objective function and solved for various combinations of annual or seasonal periods for water supply and demand, and deterministic or stochastic water supplies. Two levels of wastewater treatment are also specified corresponding to 1977 and 1983 requirements of PL 92-500. The results of the model runs give optimal allocations of water from available sources to meet use sector requirements over a planning horizon from 1975 to 2020. The total minimum cost of water supply and wastewater treatment is reduced by taking into account seasonality of water requirements. Incorporating the stochastic nature of supplies generally results in a shift to more reliable but higher cost sources. A comparison of the model solutions indicates that improved sizing and timing of facilities can be achieved considering the stochasticity of water supplies and seasonality of water uses. (Bell-Cornell)
W78-06741

NEW REQUIREMENTS FOR LOCAL UNITS OF GOVERNMENT IN WATER RESOURCES PLANNING: INSIGHTS FOR IMPLEMENTATION FROM RECENT WATER RESOURCES PLANNING RESEARCH,
Say (E. W.) and Associates, Inc., Chelsea, MI.
For primary bibliographic entry see Field 6E.
W78-06742

SENSITIVITY, RESPONSIVITY, STABILITY AND IRREVERSIBILITY AS MULTIPLE OBJECTIVES IN CIVIL SYSTEMS,
Case Western Reserve Univ., Cleveland, OH.
Y. Y. Haimes, and W. A. Hall.
Advances in Water Resources, Vol. 1, No. 2, p 71-81, December 1977. 3 fig, 1 tab, 28 ref. OWRT C-7047(6221)(2), 14-34-0001-6221.

Descriptors: *Water resources, *Risk, *Optimization, *Multiple objectives, Surrogate Worth Trade-off method, Management, Planning, Decision making, Hydrology, Constraints, Economics, Costs, Error, Sensitivity, Mathematical models, Systems analysis, Equations.

Recommended is the consideration of sensitivity, stability, risk, and irreversibility as objective functions in water resource management models within the framework of multiobjective analysis. Six major sources of uncertainties and errors in systems modeling are identified. They are associated with the following model characteristics: model structure (topology), model parameters, model scope or focus, data, optimization technique, and human subjectivity. In particular, the major objective is to set the stage for the development of an analytical and operational multiobjective framework which will provide decision-makers and planners with alternatives that consider systems' sensitivity, responsivity, stability and irreversibility along with cost and other performance indices as multiple objectives. This type of a framework should have a very wide spectrum of applications in water and related land resources, environmental studies, energy, and others. The Surrogate Worth Trade-off method is proposed for the solution of the resulting multiobjective optimization problem. (Bell-Cornell)
W78-06743

INCOMMENSURABLES AND TRADEOFFS IN WATER RESOURCES PLANNING,
Florida Univ., Gainesville. Dept. of Food and Resources Economics.
G. D. Lynne.
Water Resources Bulletin, Vol. 12, No. 6, p 93-105, December 1976. 3 fig, 3 tab, 14 ref. OWRT B-022-ORE(2).

Descriptors: *Planning, *Multiple purpose, *Multiple objective problem, *Water resource development, *Analytical techniques, Alternative planning, Tradeoffs, Model studies, Resource allocation, Neoclassical economic model, Prices, *North Dakota, Dams, Reservoirs.

The neoclassical purely-competitive economic model is proposed as the correct framework for analyzing the problem which arises from lack of a common unit for measuring achievement of multiple objectives in water resource development. Tradeoffs can be calculated on the production side and provided to decision-makers; when a decision has been made, estimates of the relative value of non-monetary goods can be provided. A hypothetical example of the correct approach to the multiple objective problem is given, based in part of actual data for the proposed Bronco dam and reservoir complex in western North Dakota. Several authors have apparently misunderstood the true nature of tradeoff analysis, which has resulted in errors. The Marglin (1967), Major (1969-1970), Marshall (1973), and Water Resources Council (1971) approaches are evaluated and found inconsistent with the conceptual model presented here. Models presented by DeVine (1966) and McKean (1958), on the other hand, are acceptable. It is concluded that distortion in estimates will occur until the conceptual lessons of this paper are learned and applied. Among these are that (1) the relevant tradeoffs in multiple objective planning are, in fact, price ratios; and (2) tradeoffs cannot be calculated between and among alternative plans for development that have different costs and still be used to reflect relative values. (Lynch-Wisconsin)
W78-06746

AN ANALYSIS OF FEDERAL WATER RESOURCE PLANNING AND EVALUATION PROCEDURES,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 6B.
W78-06772

ECONOMIC AND TECHNICAL CONSIDERATIONS OF REGIONAL WATER SUPPLY,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 6B.
W78-06784

STUDIES OF PUBLIC PREFERENCES AND GROUP INTERACTIONS TO GUIDE LAND-USE PLANNING AND CONTROL,
Iowa State Univ., Ames. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W78-06812

WATER QUALITY STANDARDS AND COMMUNITY VIABILITY,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-06818

BUREAU OF RECLAMATION ECONOMIC ASSESSMENT MODEL (BREAM), TECHNICAL DESCRIPTION.
Mountain West Research, Inc., Tempe, AZ.
Bureau of Reclamation, Engineering and Research Center, Denver, Colorado. Technical Report, January 1978. 94 p, 6 fig, 14 tab, 10 ref, append. Bur Reclam 7-07-DR-50180.

Descriptors: Cohort-survival, Economics, *Economic simulation, Construction impact assessment, Water resource development projects, Local-nonlocal construction workers, Labor market, Migration(Labor), Bureau of Reclamation, *Evaluation, *Model studies, *Economic models.

A technical description is provided of the Bureau of Reclamation Economic Assessment Model (BREAM). The description presumes familiarity with the discussion of methodological issues and recommended procedures in the Economic/Demographic Assessment Manual published by the Bureau in November 1977. (See W78-02274) The purpose of this document is to provide the potential user with a sufficiently detailed description of the logic of the model and of the quantitative relationships on which it is based so that its usefulness can be realistically evaluated. (Bur Reclam)
W78-06903

WATER QUALITY SIMULATION AND PUBLIC LAW 92-500 CASE STUDY: SOUTHWESTERN ILLINOIS,
Hydrocomp Inc., Chicago, IL.
For primary bibliographic entry see Field 5G.
W78-07045

WATER RESOURCES MODELING AND OPTIMIZATION BASED ON CONSERVATION AND FLOODING POOLS,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
E. S. Lee, and G. Nadimuthu.
Water Resources Bulletin, Vol 14, No 2, p 404-408, April 1978. 5 equ, 8 ref.

Descriptors: *Water resources, *Optimization, *Multiple-purpose reservoirs, *Constraints, *Material balance, Lagrange multiplier, Conservation pool, Flood pool, Water storage, Benefit maximization, Equations, Mathematical models, Systems analysis.

A new and practical concept in water resources modeling and optimization is introduced. Instead of unrealistically assuming a multipurpose reservoir to be composed of a single lumped pool of water, it is treated as two different pools, namely conservation and flood pools. Based on this treatment, the optimization problem is stated using the concepts of Lagrange multipliers and parameter optimization. The optimization problem of the material balance equation, the constraints on control and state variables, and the objective function of benefit maximization. (Bell-Cornell)
W78-07046

PLANNING MODELS WITH ALTERNATIVE COOLING SYSTEMS,
Middle East Technical Univ., Ankara (Turkey). Dept. of Environmental Engineering.
S. G. Velioglu, and E. D. Brill.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 104, No P02, p 141-156, April 1978. 5 fig, 3 tab, 22 ref, append.

Descriptors: *Water resources, *Powerplants, *Energy, *Mathematical programming, Optimization, Cost minimization, Linear programming, Nonlinear programming, Equations, Computer models, Parametric analysis, Rivers, *Cooling systems, Regions, Planning, Natural resources, Systems analysis, *Illinois.

Two approaches are presented for incorporating alternative cooling technologies into mathematical programming models for use in planning energy and water resources systems. The first approach allows a constant water requirement per unit power output for each cooling alternative; simple linear relationships result, and they can easily be incorporated into any linear allocation-location model, and this is demonstrated for Illinois. The second approach allows the water requirement to vary for each of the different cooling alternatives. A nonlinear model is produced, and a pratical separable-programming method is suggested for solution; this method is demonstrated for a 14-county region in Illinois. The objective function used in each approach is cost minimization. (Bell-Cornell)
W78-07048

A METHODOLOGY FOR OUTDOOR RECREATION ANALYSIS IN A STATE WATER RESOURCES PLANNING STUDY,
Geological Survey, Menlo Park, CA. Environmental and Safety Section.
For primary bibliographic entry see Field 6B.
W78-07049

BASIN-WIDE PLANNING FOR URBAN STORMWATER MANAGEMENT,
Jorden (W. L.) and Co., Inc., Decatur, GA.
For primary bibliographic entry see Field 5G.
W78-07058

6B. Evaluation Process

OPERATION OF THE NATIONAL WILDLIFE REFUGE SYSTEM (FINAL ENVIRONMENTAL STATEMENT).
Fish and Wildlife Service, Washington, DC.
For primary bibliographic entry see Field 6G.
W78-06703

AN ITERATIVE ALGORITHM FOR INTERACTIVE MULTIOBJECTIVE PROGRAMMING,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 6A.
W78-06739

SEASONAL AND STOCHASTIC FACTORS IN WATER PLANNING,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6A.
W78-06741

SENSITIVITY, RESPONSIVITY, STABILITY AND IRREVERSIBILITY AS MULTIPLE OBJECTIVES IN CIVIL SYSTEMS,
Case Western Reserve Univ., Cleveland, OH.
For primary bibliographic entry see Field 6A.
W78-06743

INCOMMENSURABLES AND TRADEOFFS IN WATER RESOURCES PLANNING,
Florida Univ., Gainesville. Dept. of Food and Resources Economics.
For primary bibliographic entry see Field 6A.
W78-06746

A GUIDE TO ENVIRONMENTAL BENEFITS ASSESSMENT IN ECONOMIC IMPACT STUDIES.
Governors State Univ., Park Forest South, IL. Environmental Management Program.
Illinois Institute for Environmental Quality IIEQ Document No. 77/32, October, 1977. 450 p, 57 fig, 16 tab, 170 ref, 14 append. 80.042.

Descriptors: *Environmental effects, *Economic impact, *Pollution abatement, *Illinois, Benefits, Regulation, Standards, *Economic impact studies, *Benefits assessment, Illinois Public Act 79-790.

Environmental benefits of pollution control are considered. Two audiences are addressed: (1) those generally interested and/or involved in the benefits assessment process, but with little or no technical background, and (2) those involved in the preparation and evaluation of economic impact studies. A systematic organizing framework for benefits assessment was developed. Chapters summarize key aspects of each major stage in the process. Detailed technical material is provided in the appendices. (Seip-IPA)
W78-06755

ECONOMIC IMPACT OF PROPOSED AMENDMENTS TO MERCURY EFFLUENT STANDARDS IN ILLINOIS (R 76-17) (R 76-21),
Southern Illinois Univ. at Carbondale.
For primary bibliographic entry see Field 5G.
W78-06759

MISSOURI RIVER BASIN, STATE AND FEDERAL WATER AND RELATED LAND RESOURCE PROGRAMS, FISCAL YEARS 1978-1982.
Missouri River Basin Commission, Omaha, NE.
For primary bibliographic entry see Field 6E.
W78-06771

AN ANALYSIS OF FEDERAL WATER RESOURCE PLANNING AND EVALUATION PROCEDURES,
Michigan Univ., Ann Arbor. School of Natural Resources.
G. Schramm, and R. E. Burt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 498. Price codes: A06 in paper copy, A01 in microfiche. June 1970, 105 p, 12 tab, 1 fig, 4 append.

Descriptors: *Water resources, *Planning, *Projects, *Evaluation, *Formulation, Benefits, Costs, Environmental impacts, Income, Economics, Regional income, Multiple-purpose planning, Keelersburg Project(PA).

The study tests a set of new water resources plan and project evaluation procedures published under the title: Report to the Water Resources Council by the Special Task Force, Procedures for Evaluation of Water and Related Land Resource Project, U.S. Water Resources Council, Washington, June 1969. Broader objectives for water resources planning are developed by a four-account display system showing: (1) national income benefits and costs; (2) regional income benefits and costs; (3)

environmental objectives and consequences; and (4) social well-being objectives and consequences. Ways and means are suggested to permit trade-offs between the various accounts and objectives. Finally plan formulation is addressed, including: a discussion of multiple-purpose-multiple means planning; basic planning elements; space and time dimensions; income maximization; goal formulation; and the impact accounting system. A discussion of the environmental alternatives for the Keelersburg Project on the Susquehanna River, Pennsylvania, is presented as part of the Environmental Account appendix. The project was used as a focal part of the investigation but because the project was never seriously considered and there was the investigation but because the project was never seriously considered and there was therefore a lack of detailed data, no attempt was made to use it as a specific case study approach for the analysis in the report. (Zayac-NC)
W78-06772

A METHODOLOGY FOR PREPARING ENVIRONMENTAL ASSESSMENTS,
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 6G.
W78-06775

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE, SPECIAL REPORT IV: INSTITUTIONAL IMPACT OF ALTERNATIVE COASTAL ZONE MANAGEMENT SYSTEMS,
Lyndon B. Johnson School of Public Affairs, Austin, TX.
K. E. Haynes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 191, Price codes: A04 in paper copy, A01 in microfiche. Report No 12, (1977). 63 p, 2 fig, 8 append. (NSF/RA-760260).

Descriptors: *Coasts, *Resources development, *Institutional constraints, *Legal aspects, *Texas, Planning, Land use, Legislation, Monitoring, Management, Permits, Institutions, Jurisdiction, *Coastal management program, Enforcement, Regional planning, Citizen participation, National Oceanographic and Atmospheric Administration.

This study's main objective was to gather data which would reveal present and potential problems concerning: coastal resource users such as industry, commerce, utilities, developers, and tourists; and the agencies, institutions, and organizations operating in or having an impact on the coast, including questions of jurisdiction, legislation and legal requirements, planning and coordination, monitoring, and enforcement policies and procedures. The study recommends that Texas should implement a coastal management program; should adopt a one stop permit procedure for coastal developments; should facilitate public participation in decisions which affect the coastal zone; must accommodate responsibilities of federal, state, and local agencies in any coastal zone plan or program; should meet the federal criteria set forth by National Oceanographic and Atmospheric Administration (NOAA) in a coastal zone management plan; should adopt a regional approach to coastal management due to the interdependencies of the coastal environment; and must assess alternative institutional arrangements in terms of their relative abilities to mesh with the political realities of the state, as well as with state and federal requirements. This report is part of a larger study designed to develop a methodology for evaluation of the economic and environmental impacts of alternative coastal zone management policies. (Nessa-NC)
W78-06777

PUBLIC BEHAVIOR AND ATTITUDES IN RESPONSE TO REPORTED HAZARDOUS DRINKING WATER. A FEASIBILITY STUDY,
Minnesota Univ., Duluth. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 5G.
W78-06779

RECREATIONAL POTENTIAL ALONG THE LOUISIANA COAST: PROPOSED NEW AND EXPANDED SITES FOR RECREATION.
Burke and Associates, Inc., New Orleans, LA. Environmental Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 938, Price codes: A03 in paper copy, A01 in microfiche. Prepared for National Oceanic and Atmospheric Administration, Office of Coastal Zone Management, and Louisiana State Planning Office, Coastal Resources Program, February, 1977, 9 p.

Descriptors: *Recreation facilities, *Louisiana, *Outdoor recreation, *Coasts, Levees, Piers, Spoil banks, Beaches, Swamps, Access routes, Land use, Coastal zone management.

A tabulation is presented of recommendations, arranged by parish, for both expansion of existing facilities and potential new sites in areas where facilities are nonexistent. Potential new recreational sites include levees and battures, fishing piers, spoil banks along certain waterways, selected private beaches, salt domes, chenier ridges, and swamp parks. Sites have been recommended with the goal of providing additional recreational opportunities to areas that can withstand additional use. Providing access or facilities in previously remote natural areas should be carefully controlled so as not to subject sensitive areas to overuse. No sites have been recommended that would encourage development in remote areas. The list identifies the recommended sites by name, describes the type of facility proposed, and refers to the source and corresponding map number on the accompanying map of Potential Recreation Areas. The sources for these recommendations are the Statewide Comprehensive Outdoor Recreation Plan for 1975-80, field investigations, the Governor's Commission on the Atchafalaya Basin, future recreation sites projected by the coastal Regional Planning Commissions, U.S. Army Corps of Engineers, New Orleans District, and questionnaires set to parish officials. (Nessa-NC)
W78-06783

ECONOMIC AND TECHNICAL CONSIDERATIONS OF REGIONAL WATER SUPPLY,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
G. Aron, and S. P. Coelen.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 105, Price codes: A10 in paper copy, A01 in microfiche. Prepared for U.S. Army Engineer Institute for Water Resources, IWR Contract Report 77-7, July 1977, 199 p, 32 fig, 23 tab, 68 ref, 2 append. DACW31-75-C-0018.

Descriptors: *Water supply, *Regional analysis, *Methodology, *Inter-basin transfers, Efficiencies, Equity, Econometrics, Land use, Reservoirs, Economics, Delaware River, Model studies, *Extension regionalization, Integration regionalization, *Regional water supply, Land values, Reservoir integration, Susquehanna River.

The concept of regionalization was studied in view of the growing belief that it is the key solution of American water supply (and wastewater treatment) problems. Believing that too little research has been devoted to the questions of regionalization, the study attempts to provide a methodological background for those considering regionalization in practice. Two tools of regionalization implementation are identified: integration and extension. Because regionlization by integration does not spill over into other markets, while regionalization by extension involves both water and property markets, thus making analysis of integration regionalization much less complex than that of extension regionalization, the study concentrates on two themes: (1) efficiency of plans for regional integration; and (2) the distributional interbasin water transfers and introduces an econometric model as a tool for evaluating changes in land value arising from water supply regionalization. The report finds that most regionalization plans have failed, not only because of political and institutional difficulties, but also because problems of efficiency and equity were not resolved. (Zayac-NC)
W78-06784

EVALUATION OF PLANNING FOR FISH AND WILDLIFE: JOHN REDMOND RESERVOIR PROJECT.
Sport Fishing Inst., Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A034 136, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Army Corps of Engineers, Chief of Engineers Office, Interim Report, June 1976, 41 p, 8 tab, 1 fig, 27 ref. DACW73-74-0040.

Descriptors: *Evaluation, *Fish, *Wildlife, *Project planning, *Management, Hunting, Fishing, Forecasting, Land use, Multiple-purpose projects, Water resources development, Kansas, *Projections, *John Redmond Reservoir(KA), Lyon County(KA), Coffey County(KA), Grand River(KA).

This study's purpose was to compare the original projections of activities associated with fish and wildlife with the actual activities. The study area involves the John Redmond Reservoir and surrounding lands in Lyon and Coffey Counties, Kansas. The total project area is 12,829 hectares (ha), and the Reservoir itself is 3,804 ha. Post-impoundment surveys indicate that the project annually supports waterfowl hunting in excess of the prediction by 300% and upland game hunting 400% in excess of the prediction. Use of the project by migratory waterfowl was as expected for ducks, but was only 20% of the expected level for geese. The qualitative fisheries predictions were generally accurate. The predicted volume of angling was about 38% higher than the actual angler presure of 1974. The post-impoundment angling use in the Grand (Neosho) River below the Reservoir was four times the predicted value. The project evaluation prepared by the Fish and Wildlife Service (FWS) in 1961 was perfunctory. Reports prepared in 1963 by the FWS to justify authorization of the national wildlife refuge on the reservoir land were more comprehensive. (Nessa-NC)
W78-06789

EVALUATION OF PLANNING FOR FISH AND WILDLIFE: LITTLEVILLE RESERVOIR.
Sport Fishing Inst., Washington, DC.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 823, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Army Corps of Engineers, Chief of Engineers, October 1976, 29 p, 3 tab, 1 fig, 16 ref. DACW73-74-C-0040.

Descriptors: *Fish, *Wildlife, *Project planning, *Management, *Multiple purpose projects, Water resources development, *Reservoirs, *Reservoir fisheries, Evaluation, Projections, Hunting, Fishing, Forecasting, Land use, *Massachusetts, *Littleville Reservoir(MA), *Middle Branch Westfield River(MA), Chester(MA), Huntington(MA).

This study's purpose was to compare the original projections of activities associated with fish and wildlife with the actual activities. The Littleville Reservoir study area is located on the Middle

Branch of the Westfield River within the towns of Chester and Huntington, Massachusetts. The reservoir, built to provide flood control and water supply benefits, covers 111 hectares (ha) at water supply elevation and 206 ha at full flood pool. The total project includes 680 ha of land and water. In their 1961 planning report, the Fish and Wildlife Service (FWS) recommended that hunting be permitted on project lands without recommending alternative action if the lands should be closed to hunting. Thus, the closing of the project lands by the city of Springfield resulted in an uncompensated loss of hunting potential. It was anticipated that the locally important trout fishery on the Middle Branch would be replaced by a reservoir trout fishery. The Corps of Engineers (CE) estimate of angling pressure averaged 2.7 times greater than the state estimates and 2.2 times greater than actual use. The FWS report did not adequately consider the downstream fishery resource, except for a cold water release request that the CE did not provide. Cooperation and coordination between state and Federal agencies were inadequate before and after the reservoir's construction. (Nessa-NC)
W78-06790

RECREATIONAL ADEQUACY OF BEACH ACTIVITY AND COMPARATIVE REGULATING INFLUENCES,
Rhode Island Univ., Kingston. Sea Grant Program; and Rhode Island Univ., Kingston. Dept. of Sociology.
I. A. Spaulding.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 426, Price codes: A03 in paper copy, A01 in microfiche. Marine Technical Report 47, November 1977, 48 p, 13 tab, 3 appendices, 17 ref.

Descriptors: *Beaches, *Recreational facilities, *Psychological aspects, *Behavior, Attitudes, Planning, Recreation demand, Social aspects, *Euphoria-tension index, *Regulating influences, Beach activities, Beach development, Occupation classification.

The report seeks to summarize people's experiences on a beach that might prove useful in designing beaches and to planning for their use and management. Two characteristics are studied: the difference between tension levels at work and tension levels while engaged in beach activity; and influences that natural events, other people, personal feelings and mechanistic devices have both on work and on beach activities. The first has a bearing on the recreation adequacy of the beach experience, and the second has relevance for the use of space. An undeveloped beach provides the setting for user interviews. The data are analyzed for respondents classified by occupation. Measurements show tension levels to be lower during beach activity; and that work tends to be more influenced by personal feelings and other people than by mechanistic devices and natural events. Also, the influences of personal feelings and natural events are greater on beach activity than on work, while the influences of mechanistic devices and other people are greater on work than on beach activity. The report's results should provide a basis for comparing beaches of varying types and degrees of development. Implicit in the study is the assumption that beach development is capable of varying environmental influences on activity and of modifying the recreational effectiveness of beach experience. (Zayac-NC)
W78-06791

DESIGN AND METHOD OF THE SOCIOLOGICAL RESEARCH IN THE GRAND CANYON RIVER CONTACT STUDY. PART I,
Human Ecology Research Services, Inc., Boulder, CO.
B. Shelby, and J. M. Nielson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 760, Price codes: A06 in paper copy, A01 in microfiche. Prepared for Grand Canyon National Park, AZ, June 1976, 91 p, 5 ref, 6 tab, 4 appendices. CX821040104.

Descriptors: *Colorado River, *Recreation, *Social aspects, Management, National recreation areas, Boating, Psychological aspects, Behavior, *Use rates, *Grand Canyon, *River use alternatives, Rafting, Management alternatives, *Wilderness use.

The aim of this study, reported in 4 volumes, was to assess the effects of different management alternatives on the nature and quality of the river experience on the Colorado River through the Grand Canyon. This volume, Part I, has as its focus methods for collecting sociological data for analysis of private/commercial and motor/oar raft trips of the river. Data used included random selection of the following sources: user interviews and questionnaires; trip reports; and park service records of use. Response rates for each data source are discussed and analyzed for their applicability. Three variables are then isolated as crucial for further analysis in subsequent volumes: use level, mode of propulsion, and trip type (private or commercial). (See also W78-04151 and W78-06794) (Zayac-NC)
W78-06793

USE LEVELS AND CROWDING IN THE GRAND CANYON. RIVER CONTACT STUDY. PART III,
Human Ecology Research Services, Inc., Boulder, CO.
B. Shelby, and J. M. Nielsen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 745, Price codes: A04 in paper copy, A01 in microfiche. Prepared for Grand Canyon National Park, Arizona-Colorado River Research Program, June 1976, 51 p, 25 tab, 1 fig, 8 ref.

Descriptors: *Recreation demand, *Colorado River, *Management, *Use rates, Recreation, Simulation analysis, Boating, Behavior, Psychological aspects, Reasonable use, Social aspects, *Grand Canyon, *Wilderness use, *River use alternatives, Rafting.

This volume is part of a study initiated by the National Park Service in 1974 to assess the sociological effects of different management alternatives on the nature and quality of the river experience in the Grand Canyon. This report investigates the question of how wilderness users affect one another. Since the opportunity for solitude is of primary import for wilderness users, the study attempts to determine the number of people for whom a high quality experience can be provided. The study found that most river travelers (90%) define the Grand Canyon and their trip in terms of wilderness, with satisfaction levels running to 85%. No consensus was found as to how crowded the Canyon should be. Variables of trip satisfaction were found to be personal benefits, social atmosphere and wilderness character. Conclusions were: management should control contacts among groups; an effort should be made to define 'appropriate' contact levels; and that since use tends to be concentrated by area and time, scheduling through the help of a simulation model would aid in maximizing total use while minimizing crowding. (See also W78-04151 and W78-06793) (Zayac-NC)
W78-06794

PUBLIC PARTICIPATION IN WATER RESOURCES PLANNING: A CASE STUDY AND LITERATURE REVIEW,
Massachusetts Univ., Amherst. Water Resources Research Center.
M. O. Ertel, and S. G. Koch.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-280 968, Price codes: A04 in paper copy, A01 in microfiche. WRRC Publication No 89, July 1977, 55 p, 4 tab, 1 fig, 58 ref. OWRT B-050-MASS(1).

Descriptors: *Planning, Public opinion, Reviews, New England, Decision making, *Social participation, *Attitudes, *Citizen participation, *Connecticut River, Social values, River Basin Commissions, *Interstate Commissions, *Literature reviews, *New England River Basins Commission, *Public participation.

Results are presented of the concluding phase of a four-year project that has analyzed and evaluated the public participation programs of three Level B Planning Studies conducted by the New England River Basins Commission. In this phase, the members of the Citizen Advisory Group to one of those Studies, the Connecticut River Basin Program, were surveyed to determine what modifications in attitudes toward the advisory process and the planning objectives had occurred since a similar survey was conducted in the first phase of the project. The first section includes the findings of this survey plus a discussion of other developments related to the activities of this advisory group. The second section is a review and assessment of significant literature on the theory and practice of public participation in water resources planning. (Idoine-Mass)
W78-06809

STUDIES OF PUBLIC PREFERENCES AND GROUP INTERACTIONS TO GUIDE LAND-USE PLANNING AND CONTROL,
Iowa State Univ., Ames. Dept. of Sociology.
G. L. Bultena, and D. L. Rogers.
Report Presented at the Iowa State University Faculty Symposium on Land-Use Planning and Control, 1973. 29 p, 45 ref. OWRT B-020-IA(4).

Descriptors: *Land use, *Planning, *Administration, *Decision making, Model studies, Attitudes, Social participation, *Public interest groups, Analytical models, *Citizen participation.

The role citizen involvement in future land-use planning is discussed. An organizational-expertise decision-making model is characterized by a division of complex activities into smaller operations; these operations are performed by subunits comprised of specialists. Advantages and limitations of the model are detailed. An alternative model, the democratic-participatory model, seeks expanded citizen involvement in public environmental programs; administration is structured so as to optimize input from citizens. Approaches to public participation, including public hearings, citizen advisory panels, and public opinion polls, are outlined. The power relationships between agencies and interest groups are analyzed; the need for cohesive, organized group efforts by public interests groups is stressed. A brief historical perspective of public interests groups is stressed. A brief historical perspective of public sentiment toward and citizen's priorities in the management of resources is presented. (Seip-IPA)
W78-06812

CONSIDERATIONS IN DETERMINING THE PUBLIC INTEREST,
Iowa State Univ., Ames. Dept. of Sociology and Anthropology.
G. L. Bultena, and D. L. Rogers.
Journal of Soil and Water Conservation, Vol. 29, No. 4, p 168-173, July - August 1974. 2 tab, 18 ref. OWRT B-020-IA(7).

Descriptors: *Reservoir construction, *Economic impact, Social aspects, *Iowa, Economics, *Cost analysis, Cost-benefit analysis, Surveys, Attitudes, *Pre-impoundment, *Public opinion, *Ames Reservoir(Iowa), Public interest.

Citizens' opinions toward construction of the Ames Reservoir, proposed by the Army Corps of

Engineers, were examined. Social and economic factors influencing varying opinions toward the project are assessed. The public opinion data suggest a different conclusion about the public interest in this project than would be drawn from the benefit-cost ratio or from political commitments; the perceived personal and collective costs of the reservoir were the most important of the several factors that affected respondents' opinion. (Seip-IPA)
W78-06817

WATER QUALITY STANDARDS AND COMMUNITY VIABILITY,
Iowa State Univ., Ames. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W78-06818

VOLUNTARY ASSOCIATION MEMBERSHIP AND POLITICAL PARTICIPATION: AN EXPLORATION OF THE MOBILIZATION HYPOTHESIS,
Iowa State Univ., Ames.
For primary bibliographic entry see Field 6E.
W78-06819

GUIDELINES FOR DEVELOPING STATE AND NATIONAL PUBLIC LAND USE POLICIES,
Iowa State Univ., Ames, Dept. of Economics.
J. F. Timmons.
Report presented at the conference 'Toward an Effective Land Use Policy for Michigan,' Kellogg Center, Michigan State University, East Lansing, May 17, 1973. 27 p, 12 ref. OWRT B-020-IA (6).

Descriptors: *Land use, *Land management, *Public lands, *Planning, *Land use policy, Policy making.

Guidelines for the development of state and public land use policies are presented. Subjects include: (1) the need for land use policies resulting from current land use and environmenta problems, (2) the nature and scope of land use policy and its objectives, (3) recommended shifts toward state initiatives in developing land use policy, (4) recommended shifts in the control of land resources -- from public interest, and (5) suggested guidelines for developing land use policies as a continuing process. The inter-relationships between land use, environmental quality, and public interest goals are emphasized. Land use policy development procedures and public interest goals are emphasized. Land use policy development procedures should include: (1) a statement and analysis of goals, economic impact, and trade-offs, (2) provisions of flexibility in regulation and compliance contingent upon an area's regional problems or peculiarities, (3) encouragement for experimentation, innovation, and applied research, (4) evaluation of on-going programs, (5) room for citizen participation in planning and implementation, (6) means efficiently and effectively bringing each level of government into land use policy, planning, programming, and performance, (7) financial incentives, (8) consideration of all current and potential uses of natural resources and their environmental effects, and (9) analysis of the impact of technological advances. (See also W73-12697) (Seip-IPA)
W78-06825

BUREAU OF RECLAMATION ECONOMIC ASSESSMENT MODEL (BREAM), TECHNICAL DESCRIPTION.
Mountain West Research, Inc., Tempe, AZ.
For primary bibliographic entry see Field 6A.
W78-06903

ENVIRONMENTAL QUALITY ASSESSMENT IN MULTIOBJECTIVE PLANNING,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 6G.
W78-06905

VOLUNTARY ASSOCIATIONS AND POLITICAL EQUALITY: AN EXTENSION OF MOBILIZATION THEORY,
Iowa State Univ., Ames. Dept. of Sociology and Anthropology.
D. L. Rogers, and G. L. Bultena.
Iowa Agricultural Home Economies Experiment Station, Ames, Journal Paper No J-8127. (Project No 1858), (1975). OWRT B-020-IA(10).

Descriptors: *Political aspects, Iowa, Social participation, Attitudes, Socioeconomic analysis, *Mobilization theory, *Organizational membership, *Political activity, Social classes, Economic classes, Political participation.

Utilizing a data sample of 390 adult persons in three Iowa counties, an assessment was made of the extent to which high- and low-status persons are differentially mobilized to political participation through their voluntary association memberships. The impact of the combined effects of selective class recruitment to organizational memberships and the differential rates of mobilization experienced by social classes on political participation was also examined. The specific goal was to determine whether or not the rate of mobilization differs by class standing, and, if so, whether the rate for low-status persons is sufficiently greater than for high-status persons to offset their proportionately smaller representation in associational memberships. Results indicate that levels of organizational affiliation are related to the political participation rates of both high- and low-status individuals; political activities of high-status persons are increased more by mobilization and associational memberships than those of low-status persons. Class differences in mobilization rates and in organizational memberships concurrently increased political disparities between high- and low-status groups over the circumstances of inoperative mobilization. The analysis suggests that upper class interests will be most well-represented through social organizations. (Seip-IPA)
W78-06924

INVESTOR OWNED VS. PUBLICLY OWNED WATER AGENCIES: AN EVALUATION OF THE PROPERTY RIGHTS THEORY OF THE FIRM,
California Univ., Santa Barbara. Dept. of Economics.
For primary bibliographic entry see Field 6E.
W78-07035

A COMPARISON OF MULTIVARIATE AND TREND FORECASTING ESTIMATES WITH ACTUAL WATER USE,
Waterloo Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 6D.
W78-07037

MISSOURI RIVER DEVELOPMENT POLICY AND RURAL COMMUNITY DEVELOPMENT,
Nevada Univ., Reno. Renewable Natural Resources Div.
B. Shanks.
Water Resources Bulletin, Vol. 13, No. 2, p 255-263, April 1977. 6 ref.

Descriptors: *Water resources development, *Water policy, *Missouri River, *Community development, *Northern Great Plains, Social costs, Planning evaluation, Federal projects.

Federal planners, in proposing the massive main stem Missouri River water developments in Montana and North Dakota, promised economic and social benefits to the local residents. Five main stem dams--Fort Peck, Garrison, Oahe, Big Bend, and Fort Randall--were evaluated for community and rural development effectiveness. Thirty-seven development factors were examined and improvements noted. Only small differences were noted between areas with water developments and the control area. Further analysis revealed that water development benefits moved downstream and to existing urban areas. The Missouri River's rural areas and small communities were not developed significantly by the water projects. Several problems associated with water development policy were illustrated by the study. Cultural differences between planners and the population impacted were ignored. Second, the allocation of social costs was not considered, and related to this, serious geograhic maldistribution of benefits and costs resulted. The differences between predevelopment promises and development performance were dramatic. While the large dams remain as landmarks to engineering prowess, the projects needs to be evaluated for their success in meeting humanistic development objectives. Major redevelopment may be warranted by such an ex-post evaluation. (Bell-Cornell)
W78-07041

ECONOMIC IMPACT OF MEXICO'S 200-MILE OFFSHORE FISHING ZONE ON THE UNITED STATES GULF OF MEXICO SHRIMP FISHERY,
Texas A and M Univ., College Station. Dept. of Agricultural Economics.
W. L. Griffin, and B. R. Beattie.
Land Economics, Vol. 54, No. 1, p 27-38, February, 1978. 3 fig, 3 tab, 12 ref, append.

Descriptors: *Economic impact, *Mexico, *Fisheries, *Shrimp, Gulf of Mexico, Fishing, Costs, Prices, Yield functions, Equations, Estimating.

Explored is the expected economic impact of Mexico's 200-mile extended jurisdiction limit on the U.S. Shrimp fleet in the Gulf of Mexico. Specifically, the average annual reduction in shrimp landings from Mexican waters by the U.S. fleet is estimated, and an assessment is made of the consequent expected increase in effort that will be exerted off the U.S. coast. Finally, the impact of this shift in effort is explored in terms of rent loss to the fishery and break-even product prices required to achieve open-access equilibrium. Given the present shrimp price and cost-of-production situation, it appears that adjustment to Mexico's 200-mile extended jurisdiction will not result in negative rents for the U.S. Gulf shrimp fleet. (Bell-Cornell)
W78-07043

WATER SUPPLY FEASIBILITY STUDIES IN PHILIPPINES,
Camp, Dresser and McKee, Inc., Boston, MA.
For primary bibliographic entry see Field 5F.
W78-07047

A METHODOLOGY FOR OUTDOOR RECREATION ANALYSIS IN A STATE WATER RESOURCES PLANNING STUDY,
Geological Survey, Menlo Park, CA. Environmental and Safety Section.
S. L. Chiang, and W. A. Gast.
Water Resources Bulletin, Vol 13, No 4, p 677-689, August 1977. 2 fig, 3 tab, 6 ref.

Descriptors: *Recreation, *Methodology, *Water resources, *Planning, Fishing, Boating, Swimming, Picnicking, Camping.

Presented is a methodology for outdoor recreation analysis in a comprehensive State water resources planning study. This methodology applies to determination of recreation participation desires among the population, allocation of those desires to areas of potential resources within which they must be satisfied, comparison of the areal potential resources against the allocated desires to identify areas having recreational resource deficits or

needs, and exploration of alternative solutions to the identified needs. Major elements discussed are: market area, inflow-outflow, resources desire determination and projection, resource desire allocation, facility inventory, resource desire-resource analysis and alternative solutions to identified needs of water-oriented outdoor recreation. In conclusion, this methodology provides for a wide area outdoor recreational analysis, provided that applicable for distributing population-based desires to resource-based supply facilities. (Bell-Cornell)
W78-07049

MAN-MADE LAKES: ATTITUDE SURVEYS OF THEIR VALUE IN RESIDENTIAL AREAS,
Hydrocomp, Inc., Atlanta, GA.
T. N. Debo.
Water Resources Bulletin, Vol 13, No 4, p 665-676, August 1977. 1 tab.

Descriptors: *Lakes, *Surveys, *Land use, *Urban planning, *Urban development, *Attitudes, Parks, Real estate, Recreation facilities, Residential areas, Water quality, Water resources, Economic enhancement.

Attitudinal surveys of residents living near four small residential lakes were conducted to determine how people perceived the advantages and disadvantages associated with the lakes. The survey results indicate that lakes can be used as a tool for land development, creating a variety of benefits and problems. Most people felt that lakes: have a positive economic impact on the value of their home, are a positive factor in their decision to purchase a home, and provide them with some benefits. They were also aware that lakes create continual maintenance and water quality problems, but they were willing to pay for the maintenance if they had access to and could utilize the facilities associated with the lakes. Based on survey results, recommendations are formulated pertaining to the planning development and utilization of residential lakes. Among these are: (1) make the lake as large as possible; (2) develop community part and recreation facilities adjacent to the lake; and (3) establish an ongoing maintenance program to care for the lake and its asociated facilities. (Bell-Cornell)
W78-07050

A CASE HISTORY TO EVALUATE THE PERFORMANCE OF WATER-SPREADING PROJECTS,
Agricultural Research Service, Fresno, CA. Water Management Research.
For primary bibliographic entry see Field 4B.
W78-07105

ENVIRONMENTAL ORIENTATIONS: CONTENT AND SOCIAL CLASS CORRELATES,
Iowa State Univ., Ames. Dept. of Sociology.
S. E. Wright, and G. L. Bultena.
1973. 18 p, 3 tab, 25 ref. OWRT B-020-IA(3).

Descriptors: *Social aspects, *Social values, *Social participation, *Education, *Occupations, *Income, *Iowa, Environment, *Environmental movement participation, *Socioeconomic status, *Social class.

In a study of socioeconomic correlates of environmental movement participation, 390 persons from 3 counties in Iowa were interviewed. Environmental orientations were measured, using 9 items with a Likert-type response format. The items were constructed to reflect: (1) commitment to preservationist versus development goals in natural resource management; and (2) commitment to governmental actions versus individual solutions in dealing with environmental issues. Consistent with previous research, significant correlations were obtained for occupation, socioeconomic index, and education, with education being the most salient. As hypothesized, significant correlations were found among these measures and Government Involvement Scales and Growthist-Preservationist Scales; however, the relationship between these scales and family income was rejected. Regression analysis revealed that a total of less than 9% of the variance in the Growthist-Preservationist Scale was accounted for by social class variables, with 8.34% of that 9% explained by education alone. The social class variables explained only 5.6% of the total variance in Government Involvement responses, with 4.7% accounted for by education. Thus over 90% of the variance in scores obtained on the two scales could not be accounted for by social class dimension. The conclusion: class differences in environmental orientations have been overemphasized. (Seip-IPA)
W78-07125

CHARACTERISTICS AND CORRELATES OF PUBLIC KNOWLEDGE ABOUT A WATER RESOURCE DEVELOPMENT ISSUE,
Iowa State Univ., Ames. Dept. of Sociology and Anthropology.
G. L. Bultena, D. L. Rogers, and K. A. Conner.
(1975). 28 p, 4 tab, 27 ref. OWRT B-020-IA(9).

Descriptors: *Social participation, *Social values, *Social aspects, Water resources, *Reservoirs, *Iowa, *Public knowledge, *Public participation.

Public knowledge about an environmental (reservoir) project proposed by the Army Corps of Engineers was examined. Study objectives were: (1) to determine how knowledgeable local citizens were about the proposed reservoir, for the purpose of assessing their ability to meaningfully respond to the Corp's proposal, and (2) to test the importance of several variables which were hypothesized as affecting the knowledge levels of individual respondents. The variables which were hypothesized as affecting knowledge of environmental issues included: social class, age, personal attitudes, perceptions of likely impacts of a reservoir, and amount of social interaction and group involvement of persons regarding community issues. Although the project proposal had become a prominent local issue, a relatively low level of public knowledge about the reservoir existed. As hypothesized, the best informed persons were those who were (1) younger in age, (2) of higher socio-economic status, (3) more strongly opinionated on environmental issues, (4) more convinced of the efficiacy of citizen actions in public affairs, (5) more conscious of likely community impacts of a reservoir, and (6) most often convinced they were benefactors, rather than beneficiaries, of the project. The strongest explanatory variable for such knowledge was extensive previous political involvement in activities designed to influence agency decision making. Respondents who were receiving greatest personal benefits from a reservoir were no better informed about the project than those who were anticipating few, if any, benefits. Relatively few respondents perceived themselves deriving personal benefits from the reservoir. (Seip-IPA)
W78-07126

ESTIMATING THE ECONOMIC VALUE OF NATURAL COASTAL WETLANDS: A CAUTIONARY NOTE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6C.
W78-07146

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

COSTS OF WASTEWATER TREATMENT BY LAND APPLICATION, MCD-10,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W78-06760

HOUSEHOLD WATER CONSERVATION AND WASTEWATER FLOW REDUCTION,
Energy Resources Co., Inc., Cambridge, MA.
For primary bibliographic entry see Field 3D.
W78-06782

ESTIMATING THE ECONOMIC VALUE OF NATURAL COASTAL WETLANDS: A CAUTIONARY NOTE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
L. A. Shabman, and S. S. Batie.
Sea Grant Research Report A.E. 30, August, 1977. 21 p, 29 ref.

Descriptors: *Wetlands, *Economics, *Land resources, *Property values, Coastal marshes, Marsh management, Decision making, Economic justification, Monetary benefits, Natural resources, Productivity, Value, Water values, Conservation.

This is a critique of the methodology used by Gosselink, Odum, and Pope (GOP) in 'The Value of the Tidal Marsh,' the most cited study which evaluates the economic values of wetlands. It identifies the major conceptual errors in methodology and demonstrates that there is reason to be skeptical of the value estimates. There are two fundamental problems with the GOP approach. GOP failed to recognize the nature of the process by which economic values are determined and incorrectly combined the principles of systems ecology with economic theory. This failure makes the values calculated for 'total life-support' meaningless for conceptually correct economic comparisons for development and preservation. Second, where GOP attempted to apply proper economic principles, they made numerous errors which resulted in estimates of economic values that are in error. GOP's estimates of the values of marsh services are inaccurate and misleading. (Steiner-Mass)
W78-07146

6D. Water Demand

ESTIMATING LIVESTOCK WATER USE RATES IN RURAL WATER SYSTEMS,
Burns and McDonnell, Kansas City, MO.
For primary bibliographic entry see Field 3F.
W78-06820

DEVELOPING COMPETITION FOR WATER IN THE URBANIZING AREAS OF COLORADO,
Colorado State Univ., Fort Collins. Dept. of Economics.
R. L. Anderson, and N. I. Wengert.
Water Resources Bulletin, Vol 13, No 4, p 769-773, August 1977. 2 tab, 1 ref.

Descriptors: *Irrigation, *Municipal water, *Agricultural production, *Water resources development, Water supply, Water rights, Costs, Competition, Denver(Colo), Condemnation, Land use change.

Rapid population growth in the metropolitan area of Denver, Colorado is causing conflicts over water use. Two cities, Thornton and Westminster, have begun condemnation proceedings against three irrigation companies to secure agricultural water rights for municipal use. This is the first condemnation proceeding against irrigation water rights for municipal use. Should the suit succeed, over 30,000 acres of presently irrigated land will lose its water supply. There are about four hundred landowners in the area; two hundred of these are commercial farmers, including truck, dairy and specialty farms. Total agricultural production

amounts to about $8 million per year. About 561 jobs related to agricultural production amounts to about $4 million in net income. Only 6.4 percent of the farmland along the Front Range is irrigated. Continued urban growth will put pressure on the water supply of much of this land. The interested parties of the region should cooperate to lessen the impact of urban growth on agricultural lands and water by forming a metropolitan water district. Such a district could share costs of development of additional municipal water and develop systems where municipalities would recycle waste water back to the irrigated lands. (Bell-Cornell)
W78-07034

A COMPARISON OF MULTIVARIATE AND TREND FORECASTING ESTIMATES WITH ACTUAL WATER USE,
Waterloo Univ. (Ontario). Dept. of Geography.
B. Mitchell, and P. H. Leighton.
Water Resources Bulletin, Vol. 13, No. 4, p 817-824, August 1977. 2 tab, 1 fig, 9 ref.

Descriptors: *Water demand, *Forecasting, *Multivariate procedure, *Barrie(Ontario), Municipal water, Estimating, Trend forecasting, Metered consumption, Subdivisions, Water utilization.

Described is a multivariate water forecasting procedure that is neither complicated, time-consuming, nor expensive to operationalize. The procedure has been used to estimate the water demand for a proposed subdivision in Barrie, Ontario. Reliability is checked by applying the method to two existing subdivisions in Barrie for which metered consumption is available. For comparison, a trend forecasting procedure is also applied to the proposed subdivision and the existing subdivisions. Both the multivariate and trend forecasting techniques provide encouragingly accurate results when compared to actual use. While the multivariate procedure allows more precision, both procedures should be useful in forecasting water demand for smaller municipalities. (Bell-Cornell)
W78-07037

TO MINE OR NOT TO MINE GROUNDWATER,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W78-07102

6E. Water Law and Institutions

NEW REQUIREMENTS FOR LOCAL UNITS OF GOVERNMENT IN WATER RESOURCES PLANNING: INSIGHTS FOR IMPLEMENTATION FROM RECENT WATER RESOURCES PLANNING RESEARCH,
Say (E. W.) and Associates, Inc., Chelsea, MI.
E. W. Say, and A. J. Dines.
Water Resources Bulletin, Vol. 13, No. 5, p 907-915, October 1977. 1 fig, 2 tab, 7 ref. OWRT C-5278(4219)(2).

Descriptors: *Water resources, *Planning, *Water management(Applied), *Governments, *Legislation, *Watersheds(Basins), Projects, Environment, Protection, *Local units of government, Citizen involvement techniques, Preventive measures, Applied research.

Recent Federal and some State legislation have enlarged the scope of permitted or required actions of local units of government in water resources management and protection. Much of the legislation encourages local units of government to introduce water resources planning measures which will be preventive instead of corrective. Extensive public works measures, environmental destruction and the threat to human life can thus be eliminated or reduced. Research has developed and tested a method for identifying the elements of a water resouces protection program for small urbanizing watersheds which was technically adequate and socially acceptable to the communities implementing such programs. Research results suggest that deliberate efforts will be necessary to inform and educate local units of government as to the usefulness of the legislation, and that the program must reflect local natural resource conditions and local preferences for the method of accomplishing the protection. Successful implementation could be restrained by inertia of local units of government, a lack of tradition in such programs, and hostile existing agencies. (Bell-Cornell)
W78-06742

FIFTH ANNUAL REPORT: GREAT LAKES WATER QUALITY.
International Joint Commission-United States and Canada.
For primary bibliographic entry see Field 5G.
W78-06762

MISSOURI RIVER BASIN. STATE AND FEDERAL WATER AND RELATED LAND RESOURCE PROGRAMS, FISCAL YEARS 1978-1982.
Missouri River Basin Commission, Omaha, NE.
December 1977, 11 volumes, including Federal Agency Programs, Colorado, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, Wyoming.

Descriptors: *Missouri River, *Water resources, *Land resources, *Planning, *Programs, Iowa, Kansas, Minnesota, Missouri, Montana, Nebraska, North Dakota, South Dakota, Wyoming, Construction, State government, Federal government, Local governments, Colorado, *Funding, Federal agency programs.

The report is organized in 11 volumes. Volume I contains Federal agency program descriptions followed by a summary of water and related land resource programs within the Missouri River Basin. A series of tables presents the water and related land resources planning activities and funding of the Commission and other special purpose organizations. Finally, summaries of Federal, state and local planning and construction fundings for the basin are included. Volumes II-XI are organized by each state. Presented are: (1) a summary of the funding for state and local planning and construction, followed by specific state and local program activities and their funding; (2) a summary of the funding for Federal agency ongoing planning and construction programs, followed by specific Federal agency ongoing programs and their funding; and (3) a summary of the funding for Federal agency new start or resumption programs, followed by the specific Federal agency new start or resumption programs and their funding. (Zayac-NC)
W78-06771

POLITICS OF SHORE EROSION: WESTHAMPTON BEACH,
State Univ. of New York at Albany. Graduate School of Public Affairs.
J. M. Heikoff.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 213, Price codes: A09 in paper copy, A01 in microfiche. Prepared for National Oceanographic and Atmospheric Administration, Office of Sea Grant, 173 p. Published by Ann Arbor Science Publisher, Inc., Ann Arbor, Michigan, 1976.

Descriptors: *Institutional constraints, *Coasts, *Erosion control, *Management, *Land use, Erosion, Planning, State governments, Local governments, Economic impact, Political constraints, Barrier islands, Geomorphology, New York, Resources, Army Corps of Engineers, Public participation, *Westhampton Beach(NY), Political decision-making.

This study is concerned with the problem of structuring governmental institutions and decision-making for coastal zone management. This problem is analyzed through the detailed example of a specific environmental problem--beach erosion and hurricane protection at Westhampton Beach, Long Island. The economic and political factors surrounding the problem and its causes are examined. The study's method involves: introducing the problems of resource management in the coastal zone; describing barrier islands, their formation and how they affect coastal geomorphologic processes; explaining the solution of the U.S. Army Corps of Engineers to shore erosion; analyzing federal, state and local structures for interaction and decision-making in managing coastal resources; and outlining the role of the individual citizen and of groups influencing public decisions. The study had two objectives. One was to find out how scientists and engineers defined the shore erosion problem and what they recommended as a course of action to deal with it. The other was to see how this information was used by the political decision-makers and governmental administrators at the federal, state, and local levels in determining policy and a program of action. The study's conclusions focus on the difficulties and implications for state and local governments trying to analyze and solve coastal resource management problems. (Nessa-NC)
W78-06776

METHODOLOGY TO EVALUATE ALTERNATIVE COASTAL ZONE MANAGEMENT POLICIES: APPLICATION IN THE TEXAS COASTAL ZONE, SPECIAL REPORT IV: INSTITUTIONAL IMPACT OF ALTERNATIVE COASTAL ZONE MANAGEMENT SYSTEMS,
Lyndon B. Johnson School of Public Affairs, Austin, TX.
For primary bibliographic entry see Field 6B.
W78-06777

TRIANGLE J 208 AREAWIDE WATER QUALITY MANAGEMENT PLAN.
Triangle J Council of Governments, Research Triangle Park, NC.
For primary bibliographic entry see Field 5G.
W78-06788

SOUTHEASTERN NEW ENGLAND STUDY OF WATER AND RELATED LAND RESOURCES-URBAN WATER AND RELATED LAND RESOURCES-URBAN WATERS SPECIAL STUDY.
Skidmore, Owings and Merrill, Boston, MA.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 818, Price codes: A09 in paper copy, A01 in microfiche. New England River Basins Commission, Boston, MA, Prepared for Economics Research Associates, January 1975, 179 p, 12 fig, 4 append.

Descriptors: *Land use, *Management, *Planning, Water resources, *New England, Administration, Financing, Institutions, Investment, Economics, Legal aspects, *Urban waterfronts, *Coastal resources, *Coastal development, Coastal management, Coastal policies.

The report incorporates the findings of the Urban Waters Study project for the Southeastern New England (SENE) region. The study aims at the particular issues and problems facing the cities and towns with waterfronts on rivers or coastal waters. At writing, the principal urban waterfront management problems revolved around institutional, administrative and funding issues. These include the need to create public awareness; development of priority land uses; the need for institutional mechanisms to balance governmental concerns and resolve land use conflicts; improving local, regional and state capabilities in land use decision-making; and the need for public and private investment in urban waterfront areas. The report

analyzes the physical, economic, ecological, and legal and institutional issues relating to urban waterfronts of the region. Specific planning and design guidelines are recommended, as well as institutional and legal mechanisms for implementing waterfront control and guiding improvements. (Zayac-NC)
W78-06792

PUBLIC PARTICIPATION IN WATER RESOURCES PLANNING: A CASE STUDY AND LITERATURE REVIEW,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W78-06809

PACIFIC SOUTHWEST INTER-AGENCY COMMITTEE MINUTES OF THE 77-3 MEETING, 13-14 DECEMBER 1977, LAS VEGAS, NEVADA.
Pacific Southwest Inter-Agency Committee, San Francisco, CA.
1978. 161 p, 7 fig, 3 tab, 5 ref.

Descriptors: *Southwest U.S., Water resources, Assessments, Estimating, Water treatment, Research and development, Technology, Colorado River, Great Basin, *Pacific Southwest Inter-Agency Committee, Las Vegas(NV), Meetings, Water institutes.

Included are a report of Water Resources Council activities, executive subcommittee report, progress report on the 1975 national water assessment project, report from the Consortium of Water Institutes and Centers, technical subcommitte reports, approval of amendments to articles of organization and procedures, semiannual reports, future meetings and plans, and consideration of the future role of the PSIAC in water resources assessment, planning, and management. The Water Resources Council activities reported concern principles and standards, cost sharing, Indian water rights, institutions, conservation, water quality, water research, and Federal reserve water rights. Completion of the national assessment of water resources for the upper Colorado region was announced, with progress reports given on the lower Colorado, Great Basin, and California regions. (Wares-IPA)
W78-06815

VOLUNTARY ASSOCIATION MEMBERSHIP AND POLITICAL PARTICIPATION: AN EXPLORATION OF THE MOBILIZATION HYPOTHESIS,
Iowa State Univ., Ames.
D. L. Rogers, G. L. Bultena, and K. H. Barb.
The Sociological Quarterly, Vol. 16, p. 305-318, Summer 1975. 3 tab, 30 ref. OWRT B-020-IA (8).

Descriptors: *Political aspects, *Social aspects, Surveys, *Political participation, *Mobilization theory, Selection theory, *Organizational involvement, Political activity, Political involvement, Socioeconomic status.

Survey data from 390 respondents were analyzed to determine the relative effects of organizational involvement, socioeconomic status, and political attitudes on political participation. Two theoretical perspectives were investigated: mobilization theory and selection theory. Both the mobilization and selection perspectives were supported by the data; however, organizational involvement explained more of the variance in political participation than did social status and political attitudes. The mobilization perspective was further examined to determine if it worked equally well in all types of organizations. The relationship between organizational involvement and political participation was stronger for 'instrumental' than for 'expressive' groups and for organizations characterized by high, as compared to low, levels of political discussion. (Seip-IPA)
W78-06819

THE ADAPTATION OF GROUNDWATER-CONTROL INSTITUTIONS TO THE ARID WEST,
Montana State Univ., Bozeman. Dept. of History.
R. G. Dunbar.
Agricultural History, Vol. 51, No. 4, p. 662-680, October, 1977. 125 ref. OWRT A-059-MONT(3).

Descriptors: *Water management(Applied), *Groundwater, *Prior appropriation, Rocky Mountain Region, Riparian rights, Arid lands, *Appropriation doctrine, *Riparian doctrine, *Western states.

The history of the transformations of institutions governing the use of groundwater in the arid western states is detailed. The transitions from riparian doctrine to English rule of absolute ownership to the appropriation doctrine (now adopted in most western states) are documented. Today, all the Rocky Mountain States (with the exception of Arizona) have adopted a complex of institutions which embody the application of the appropriation doctrine to groundwater, registration of vested rights, acquisition of new rights through the issuance of permits by an administrative officer and the designation of controlled or critical areas. The modification of groundwater doctrines by various western states is outlined. (Seip-IPA)
W78-06822

GUIDELINES FOR DEVELOPING STATE AND NATIONAL PUBLIC LAND USE POLICIES,
Iowa State Univ., Ames, Dept. of Economics.
For primary bibliographic entry see Field 6B.
W78-06825

PROCEEDINGS OF THE INTERNATIONAL SYMPOSIUM ON MARINE POLLUTION RESEARCH.
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.
For primary bibliographic entry see Field 5G.
W78-06906

AN OVERVIEW OF THE USEPA PROGRAM IN MARINE POLLUTION RESEARCH,
Environmental Protection Agency, Washington, DC. Office of Research and Development.
For primary bibliographic entry see Field 5G.
W78-06907

RESPONSIBILITIES FOR MARINE POLLUTION RESEARCH WITHIN FEDERAL AGENCIES OF THE UNITED STATES,
Environmental Research Lab., Gulf Breeze, FL.
For primary bibliographic entry see Field 5G.
W78-06908

OVERVIEW OF MARINE POLLUTION RESEARCH IN THE BALTIC,
Institute of Meteorology and Water Management, Gdynia (Poland). Sea Dept.
For primary bibliographic entry see Field 5G.
W78-06909

MARINE POLLUTION RESEARCH IN YUGOSLAVIA: AN OVERVIEW,
Institut Rudjer Boskovic, Zagreb (Yugoslavia). Center for Marine Research.
For primary bibliographic entry see Field 5G.
W78-06910

OVERVIEW OF MARINE POLLUTION RESEARCH IN EGYPT,
Alexandria Inst. of Oceanography and Fisheries (Egypt).
For primary bibliographic entry see Field 5G.
W78-06911

OVERVIEW ON POLLUTION IN THE COASTAL ENVIRONMENT OF PAKISTAN AND ITS POSSIBLE IMPLICATION FOR THE MARINE ECOSYSTEM,
Karachi Univ. (Pakistan). Inst. of Marine Biology.
For primary bibliographic entry see Field 5G.
W78-06912

OVERVIEWS ON MARINE POLLUTION IN INDIA,
University of West Florida, Pensacola. Dept. of Biology.
For primary bibliographic entry see Field 5G.
W78-06913

VOLUNTARY ASSOCIATIONS AND POLITICAL EQUALITY: AN EXTENSION OF MOBILIZATION THEORY,
Iowa State Univ., Ames. Dept. of Sociology and Anthropology.
For primary bibliographic entry see Field 6B.
W78-06924

REVIEW OF AUSTRALIA'S WATER RESOURCES 1975,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06947

OVERVIEW OF FEDERAL GROUNDWATER PROTECTION LEGISLATION AIDS ENVIRONMENTALISTS,
Office of Radiation Programs, Washington, DC. Div. of Criteria and Standards.
For primary bibliographic entry see Field 5G.
W78-06956

DEPLETION ALLOWANCE FOR GROUNDWATER MINING: PROS AND CONS,
Texas Dept. of Water Resources, Austin.
For primary bibliographic entry see Field 4B.
W78-06957

DEVELOPING COMPETITION FOR WATER IN THE URBANIZING AREAS OF COLORADO,
Colorado State Univ., Fort Collins. Dept. of Economics.
For primary bibliographic entry see Field 6D.
W78-07034

INVESTOR OWNED VS. PUBLICLY OWNED WATER AGENCIES: AN EVALUATION OF THE PROPERTY RIGHTS THEORY OF THE FIRM,
California Univ., Santa Barbara. Dept. of Economics.
W. D. Morgan.
Water Resources Bulletin, Vol. 13, No. 4, p 775-81, August 1977. 2 tab, 8 ref.

Descriptors: *Water costs, *Theory of firm, *Property rights, Water agencies, Evaluation, Multiple regression analysis, Data collections, Equations, Cost functions, Cost structure.

The property rights theory of the firm, based on utility maximization, provides a general framework upon which to predict firm behavior under differing institutional constraints. Herein, the property rights theory of the firm is evaluated by comparing the cost structures of a sample of water agencies under two alternative modes of ownership: public and investor owned agencies. A sample of 143 water supplying firms has been chosen from the states in the American Water Works Association survey that listed four or more investor owned companies. The states are California, Connecticut, Illinois, New Jersey, and Pennsylvania. While all firms in the sample supply water to various classes of users employing similar

technology, the specific source, treatment, or distribution conditions can differ for each firm. A multiple regression model describing the determinants of total operating costs is used to isolate the effects of the form of ownership. Results indicate that investor owned water agencies appear to have lower cost structures. (Bell-Cornell)
W78-07035

EXPERIENCE WITH THE 303-208-201 STUDY RELATIONSHIPS,
Clinton Bogert Associates, Fort Lee, NJ.
For primary bibliographic entry see Field 5G.
W78-07038

WATER SUPPLY FEASIBILITY STUDIES IN PHILIPPINES,
Camp, Dresser and McKee, Inc., Boston, MA.
For primary bibliographic entry see Field 5F.
W78-07047

WATER RIGHTS, EMINENT DOMAIN, AND THE PUBLIC TRUST,
Colorado State Univ., Fort Collins. Dept. of Economics.
G. E. Radosevich, and M. B. Sabey.
Water Resources Bulletin, Vol 13, No 4, p 747-757, August 1977. 12 ref.

Descriptors: *Water rights, *Eminent domain, *Public trust doctrine, Municipal water condemnation, Legislation, Agriculture, Water allocation(Policy), Irrigation companies.

Faced with the necessity of meeting growing muncipal water requirements in areas where available supplies are completely allocated, numerous cities throughout the West are turning to their eminent domain powers to affect a reallocation of water from less preferred uses to municipal uses, thus bringing about a sharp conflict with agricultural interests. As a basis for discussing these eminent domain powers, this paper begins with a brief review of the development of property rights. The existence of both private and public (social) rights in the 'bundle of rights' is noted. In recent years, the Public Trust Doctrine has been used to limit private rights in property, and to protect and strengthen social rights. A case study which focuses on a conflict between individual and social interests in water rights is discussed. The case involves the City of Thorton, Colorado which initiated municipal condemnation proceedings to acquire the water rights and structures of two nearby irrigation companies. The case represents an attempt to incorporate the spirit of the Public Trust Doctrine into legislation which sets forth procedures for resolution of similar water rights conflicts that will inevitably become more numerous throughout the West in the future. (Bell-Cornell)
W78-07051

EXISTING LEGAL FRAMEWORK FOR MANAGEMENT OF VIRGINIA'S COASTAL WETLANDS,
Virginia Polytechnic Inst. and State Univ. Blacksburg. Dept. of Civil Engineering.
W. E. Cox.
Sea Grant Research Report A.E. 31, September, 1977. 25 p.

Descriptors: *Wetlands, *Virginia, *Legal aspects, *Marsh management, *Water policy, Coastal marshes, Marshes, Swamps, Legislation, Water law, Regulation, Administrative decisions, Water resources development, *Coastal wetlands, Virginia Wetlands Act.

Virgnina's coastal wetlands presently are subject to a complex legal framework that controls utilization and establishes the basis for substantial public involvement in managerial decision making. This legal framework can be viewed as consisting of three fundamental components. The most direct of these is governmental regulation of private wetlands alteration. A second closely related component consists of the various environmental and other mandatory review procedures that constrain decision making by the agencies directly involved in regulation. The third component of the legal framework consists of several provisions of law that serve as potential mechanisms for preservation of wetlands through public acquisition or control as sanctuaries. All three components are reviewed in this report and discussed in the applicability of the preservation and management of Virginian wetlands. (Steiner-Mass)
W78-07075

ECONOMIC IMPLICATIONS OF ENVIRONMENTAL LEGISLATION FOR WETLANDS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
S. S. Batie, and W. E. Cox.
Sea Grant Research Report A.E. 29, October, 1976. 16 p.

Descriptors: *Wetlands, *Legal aspects, *Marsh management, *Economics, Virginia, Legislation, Permits, Planning, Water law, Building codes, Cost-benefit analysis, Rivers and Harbors Act, Army Corps of Engineers, Wetland legislation.

Three types of environmental legislation are reviewed: (1) the U.S. Army Corps of Engineers controls over work in navigable waters, (2) the Virginia and Maryland Wetlands Programs, and (3) various legislation for creating sanctuaries. The intent of each of these pieces of legislation is to reduce the number of wetlands conversions over what might have been without legislation. The economic implications of such legislations are difficult to quantify. Some development services of altered wetlands. Preservation benefits attributable to wetlands include production of fish, wildlife and flora, protection against shore erosion, absorption of silt and pollutants that enhance the recreational and aesthetic enjoyment. The social costs of obtaining these benefits for the public domain are those of the costs of devising, implementing, and policing the land use controls; the loss the society of the development foregoes; and the loss associated with reduction of individual choice concerning land use decisions. The balancing of the benefits gained versus the benefits lost is the key issue in managing wetlands. (Steiner-Mass)
W78-07080

RIPARIAN RIGHTS WITHIN INDIAN RESERVATIONS, CONFEDERATED SALISH AND KOOTENAI TRIBES V. NAMEN; UNITED STATES V. FINCH.
Montana Law Review, Vol. 38, No. 2, p 424-26, Summer 1977.

Descriptors: *Reservation doctrine, *Montana, *Navigable waters, *Indian reservations, *Riparian rights, Trespass, Riparian land, Treaties, River beds, Judicial decisions, Land tenure, Public access, Recreation, Water law, Legal aspects, Banks, Beds, Navigable rivers, Fishing, Stream beds, Public lands.

Two recent federal court decisions clarify the rights of persons who own land adjacent to navigable waters on the Flathead and Crow Indian Reservations. Confederated Salish and Kootenai Tribes v. Namen and United States v. Finch together establish that the owners of waterfront property on these reservations possess the common law rights of access and wharfage to the navigable water but do not have an unregulated right to recreational fishing. Defendant landowners in Namen were successors-in-interest to an Indian who had received the land under the Indian Allotment Act of 1904. The court applied federal common law and held that contrary to the Indians' contentions, the non-Indian waterfront landowners were entitled to rights of access and wharfage. In Finch, authority asserted by the Crow tribe to control fishing within their reservation was upheld by the court under a federal statute. The court conceded that the defendant had a right to fish from the bank where he was arrested but held that the right was subject to the exclusive regulation of the Crow tribe due to their ownership of the riverbed under past treaties. (Hammersley-Florida)
W78-07198

IMPLEMENTATION OF THE TRANSFER PROCESS UNDER THE APPROPRIATION DOCTRINE,
L. M. Hartman, and D. Seastone.
In: Water Transfer: Economic Efficiency and Alternative Institutions, p. 15-62, Johns Hopkins Press, Baltimore, 1970. 2 fig, 17 tab.

Descriptors: *Water transfer, *Water policy, *Water supply development, *Institutions, *Water distribution(Applied), Inter-basin transfers, Water law, Coordination, Economic efficiency, State governments, Judicial decisions, Transfer, Water rights, Beneficial use, Administrative agencies, Water supply, Water districts, Legal aspects, Water importing, Appropriation, Water conservation, Water management(Applied), Administrative decisions.

Changing demands for water use require states to discover the best institutional procedures for the legal implementation of water transfers. Because professional engineers in administrative agencies are better qualified for decision-making on water transfers, the author argues that this procedure is better than the alternative of a state court determination. He feels that judges are unable to understand fully the technical difficulties involved since they only receive information in an adversary setting. Although institutional restraints may hamper water transfer, a study of a mutual ditch company revealed no obvious institutional restraint on the operation of competitive market forces for allocating water resources within a company. A final organizational form studied was the water conservancy district. The district, a public agency, developed water projects and allocated water to individuals and corporations which contracted with the district. After studying a Colorado water district where the project supplied twenty-five percent of the water used in the district, the author concludes that reallocation can be secured on a large-scale institutional basis. (See also W78-036011) (Cocheu-Florida)
W78-07199

6F. Nonstructural Alternatives

FLOOD HAZARD IN THE UNITED STATES: A RESEARCH ASSESSMENT,
Colorado Univ., Boulder. Inst. of Behavioral Science.
G. F. White.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 023, Price codes: A08 in paper copy, A01 in microfiche. Prepared for Research Applied to National Needs (RANN). National Science Foundation, 1975. Part of a series of volumes assessing the research on natural hazards. 143 p, 11 tab, 20 fig, 1 append. GI-32942.

Descriptors: *Floods, *Flood forecasting, *Research priorities, *Non-structural alternatives, *Land development, *Land management, Hazards, Flood control, Warning systems, Flood plains, Weather forecasting, Flood warning, Management, Colorado, South Dakota, *Natural hazards, Flood proofing, Rapid City(SD), Boulder(CO).

The Natural Hazards series seeks to develop a basis for judging the social utility of allocating

funds and personnel to the study of natural hazards; and to develop a better appraisal method of research needs. The social and physical impacts of each hazard are discussed in the series. This volume studies flood hazards and addresses floods and their distribution, changes on the nation's flood plains, how the nation is affected, how national forces are shaping adjustments to floods; and reviews the 1972 Rapid City, SD, flood experience. Potential effects of changes in the mix of adjustments to the flood hazard suggest that new research could reveal changes in the uses of flood plains that would reduce costs resulting from improper, unwise use. Five major new lines of research into flood hazards are recommended: (1) improving control and protection; (2) warnings and flood-proofing; (3) land management; (4) insurance, relief and rehabilitation; and (5) basic data and methods, with a discussion of budgets and institutions for each of the suggested lines of research. A future disaster for Boulder, Colorado is presented. (Zayac-NC)
W78-06786

FLOOD PLAIN INFORMATION: OHIO RIVER, CABEL COUNTY/WAYNE COUNTY, WEST VIRGINIA.
Army Engineer District, Huntington, WV.
For primary bibliographic entry see Field 4A.
W78-06795

FLOOD PLAIN INFORMATION: LITTLE PAPILLION CREEK AND SOUTH BRANCH, VOLUME II, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06796

FLOOD PLAIN INFORMATION: PAPILLION, BIG PAPILLION AND WEST PAPILLION CREEKS, VOLUME I, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06797

FLOOD PLAIN INFORMATION: THOMAS CREEK, COLE CREEK, HELL CREEK, WEST BRANCH PAPILLION CREEK EXTENSION, BIG PAPILLION CREEK EXTENSION, VOL. III, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06798

FLOOD PLAIN INFORMATION: ASHLAND, NEBRASKA, SALT CREEK, WAHOO CREEK.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06799

FLOOD PLAIN INFORMATION: PLATTE RIVER, WARM SLOUGH, TROUBLE CREEK, CENTRAL CITY, NEBRASKA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06800

FLOOD PLAIN INFORMATION: GREAT FALLS, MONTANA, VOLUME I - SUN RIVER.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06801

SPECIAL FLOOD HAZARD INFORMATION REPORT: GALLATIN RIVER, GALLATIN COUNTY, MONTANA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06802

FLOOD PLAIN INFORMATION: BIG THOMPSON RIVER, LOVELAND TO THE LARIMER-WELD COUNTY LINE, COLORADO, LITTLE THOMPSON RIVER, BOULDER AND LARIMER COUNTIES NEAR BERTHOUD, COLORADO.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06803

6G. Ecologic Impact Of Water Development

THE ENVIRONMENT OF AMCHITKA ISLAND, ALASKA.
Department of Energy, Washington, DC. Div. of Military Application.
Available from the National Technical Information Service, Springfield, VA 22161 as TID-26712, Price codes: A00 in paper copy, A01 in microfiche. ERDA Report, 1977. 682 p, 288 fig, 140 tab, 1211 ref, 2 append. Edited by M.L. Merritt and R.G. Fuller.

Descriptors: *Nuclear explosions, *Nuclear wastes, *Testing, *Environmental effects, *Ecology, *Alaska, Aquatic animals, Bibliographies, *Amchitka Island(AL), Aleutian Islands(AL), Nuclear weapons test program.

Results of studies on the environmental, biotic, and ecological impacts of a 1967 Atomic Energy Commission nuclear weapons test program, conducted on Amchitka Island in the Aleutian archipleago of Alaska, are compiled. The Amchitka Bioenvironmental Program was conducted from 1967 to 1973 under the auspices of the Commission. Report topics include: geographic setting, geologic history, hydrology, weather and climate, prehistoric human occupation of the Rat Islands, history (1741-1967), previous scientific investigations, geomorphology, soils, terrestrial plant ecology, avifaunal investigations, status of the Norway Rat, limnology, aquatic ecology, fishery resources of the Western Aleutians, oceanography, ecology of marine algae, marine invertebrates in rocky intertidal communities, marine fish communities, resources and population of sea mammals, population estimates and feeding behavior of sea otters, ecological interactions involving the sea otter, sea otter metabolism and heat economy, radionuclides in air, water, and biota, polychlorinated biphenyls in the ecosystems, and ecological consequences of nuclear testing. (Seip-IPA)
W78-06702

OPERATION OF THE NATIONAL WILDLIFE REFUGE SYSTEM (FINAL ENVIRONMENTAL STATEMENT).
Fish and Wildlife Service, Washington, DC.
November, 1976. 697 p, 31 fig, 58 tab, 28 append.

Descriptors: *National Wildlife Refuges, *Environmental effects, *Cost analysis, Social aspects, Recreation, Programs, Project planning, Planning.

Continued operation of the National Wildlife Refuge System is examined from approximately the FY 1974 level of activity projected to 1985. Annual funding requirements are estimated at $22 million, with 883 permanent personnel. Increased costs resulting from inflation and establishment of new refuge areas are anticipated. A description of the Program activity includes a statement of purpose and action, the Refuge mission objectives, current program output and cost assessment, action to implement the program (wildlife population, land, and people management, refuge functions, and land acquisition and disposition), Fish and Wildlife Service Program management, budgeting and funding, and interrelationships with other projects. Environment is discussed in terms of historical perspective; physical and biological resources; classification of refuge types; cultural, social, and economic environment; and probable future environments (without the National Wildlife Refuge System). Environmental impacts and mitigative measures are assessed for: (1) biological and physical environment; (2) wildlife and nonwildlife recreation; (3) visitor safety; and (4) cultural and economic conditions. The impact on topography and natural features and the relationship between short-term uses and long-term productivity are assessed. Alternatives to the current Program are analyzed and cost-assessed. Appendices address such topics as revenue sharing, program planning, system policies, research, and current and projected program activity. (Seip-IPA)
W78-06703

WEST ANTARCTIC ICE SHEET AND CO2 GREENHOUSE EFFECT: A THREAT OF DISASTER,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
For primary bibliographic entry see Field 5B.
W78-06721

A GUIDE TO ENVIRONMENTAL BENEFITS ASSESSMENT IN ECONOMIC IMPACT STUDIES.
Governors State Univ., Park Forest South, IL. Environmental Management Program.
For primary bibliographic entry see Field 6B.
W78-06755

ENVIRONMENTAL ASPECTS OF WATER SPREADING FOR GROUND WATER RECHARGE,
Agricultural Research Service, Fresno, CA. Water Management Research.
For primary bibliographic entry see Field 4B.
W78-06764

A METHODOLOGY FOR PREPARING ENVIRONMENTAL ASSESSMENTS,
Little (Arthur D.), Inc., Cambridge, MA.
D. I. Hellstrom.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-040 113, Price codes: A03 in paper copy, A01 in microfiche. Prepared for Air Force Civil Engineering Center, FL, Report AFCEC-TR-76-9, November 1976. 34 p, 1 fig, 2 tab. JON: 21033E25. F29601-74-D-0027.

Descriptors: *Environmental effects, *Methodology, *Evaluation, *Assessments, Planning, Management, Land use, Legislation, *Environmental impacts, *Environmental assessment, National Environmental Policy Act of 1969, Air Force.

This technical report is prepared as a guide for the preparation of environmental assessments. To be used by Air Force field personnel, the report presents methodologies to be used in assaying important environmental impacts resulting from operations, construction and other actions. Reviewed are the environmental assessment process and relevant federal environmental laws and regulations. The report then discusses the nexus between environmental considerations and planning; presents an inventory procedure; recommends an evaluation methodology outlines various ways of assessing impacts; and ends with recommendations for data collection, referencing and the establishment of an environmental data bank. (Zayac-NC)
W78-06775

WATER QUALITY ASSESSMENT FOR THE KANAWHA RIVER BASIN (NORTH CAROLINA, VIRGINIA, WEST VIRGINIA),
Environmental Protection Agency, Wheeling, WV. Surveillance and Analysis Div.
For primary bibliographic entry see Field 5G.
W78-06778

ENVIRONMENTAL IMPACT AND RESOURCE MANAGEMENT PROBLEMS CAUSED BY RESERVOIR PROJECTS,
Iowa State Univ., Ames, Dept. of Botany and Plant Pathology.
R. Q. Landers, Jr.
Report presented at the Water Resources Engineering Conference, American Society of Civil Engineers, Washington, DC, Jan. 29 - Feb. 2, 1973. 18 p, 2 tab, 22 ref. OWRT A-039-IA(4), DACW 25-72-C-0033.

Descriptors: *Vegetation effects, *Reservoir construction, *Environmental effects, *Iowa, *Pre-impoundment, Skunk River(Iowa).

The proposed Ames Reservoir on the Skunk River near Ames, Iowa was the subject of an in-depth environmental resource and impact study, under which the impact of reservoir on the vegetation of the area is assessed. Reservoir construction would result in the introduction of an entirely new set of environmental conditions. Fifty plant community and land surface categories applicable to the central Iowa landscape were used in describing the general distribution of vegetation in the study area; vegetation was inventoried. Initial impact on vegetation during reservoir construction, changes in land use, effects of inundation, recovery processes of inundated areas (including successional changes and woody debris), and management of vegetation in the reservoir are discussed. (See also W74-02666) (Seip - IPA)
W78-06826

THE METULA OIL SPILL,
National Oceanic and Atmospheric Administration, Boulder, CO. Environmental Research Lab.
For primary bibliographic entry see Field 5B.
W78-06862

ENVIRONMENTAL QUALITY ASSESSMENT IN MULTIOBJECTIVE PLANNING,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
K. M. Duke, N. Dee, D. C. Fahringer, B. G. Maiden, and C. W. Moody.
Final Report, November 1977. 148 p, 15 fig, 1 tab, 10 ref, 2 append. Bur Reclam 6-07-DR-50150.

Descriptors: *Environmental quality assessment, *Environmental evaluation, Water resource planning, Recreation, Ecology, *Multiobjective planning, Environmental effects, Water Resources Council, Bureau of Reclamation, Methodology, *Water quality standards.

A methodology for environmental quality assessments is described which has been developed to implement the Principles and Standards developed by the Water Resources Council and Bureau of Reclamation Planning guidelines. A four level heirarchical structure for environmental quality account is described with 4 components, 15 categories, and 75 evaluation factors used to organize environmental measurements into a standard procedure for displaying the beneficial and adverse effects of water resource development projects on environmental quality. Examples of appropriate measurements for each evaluation category are provided along with suggested tables that might be used to display and summarize data used in the evaluation. The report also compares a number of other methodologies with the principles and standards previously developed by Bureau of Reclamation guidelines. (Bur Reclam)
W78-06905

STRESS AND RECOVERY OF AQUATIC ORGANISMS AS RELATED TO HIGHWAY CONSTRUCTION ALONG TURTLE CREEK, BOONE COUNTY, WEST VIRGINIA,
Geological Survey, Charleston, WV. Water Resources Div.
For primary bibliographic entry see Field 4C.
W78-06933

OFFSHORE OIL AND GAS EXTRACTION: AN ENVIRONMENTAL REVIEW,
Battelle Columbus Lab., OH.
For primary bibliographic entry see Field 5B.
W78-06983

THE ECOLOGY OF WYBUNBURY MOSS, CHESHIRE. II. POST-GLACIAL HISTORY AND THE FORMATION OF THE CHESHIRE MERE AND MIRE LANDSCAPE,
Wye Coll., Ashford (England).
B. H. Green, and M. C. Pearson.
Journal of Ecology, Vol 65, p 793-814, 1977. 8 fig, 33 ref.

Descriptors: *Bogs, *Peat, *Succession, *Submerged vegetation stage, *Marsh plants, *Stratigraphy, Wetlands, Fen, Lakes, Soil formation, Lake basins, Muck soils, Pollen, Distribution patterns, Lake stages, Pioneer stage, Emerging vegetation stage, Temporary pond stage, Environmental effects, Land subsidence, Salt, Sedimentary rocks, Aquatic plants, Geologic mapping, Soil profiles, *Peat profiles, Wynbunbury Moss(England).

An investigation was made of the hydroseral development of a deep basin mire of 'schwingmoor' structure with a floating raft of peat. The peat environments of the floating raft and mire system were analyzed by vegetative macro-remains, the chemical composition of several peat profiles, and by examination of a pollen profile. The results suggest that the mire may not have developed by straightforward hydroseral colonization of an open-water lake basin. Instead, subsidence brought about by natural means or by commercial solution of an underground salt strata has probably played a major part in creating and changing the basin and in directing the historic course of peat formation. Such is certainly known to be the case for some recent mere basins located in the nearby area. (Steiner-Mass)
W78-06984

A STUDY OF THE COMMON REEDGRASS (PHRAGMITES COMMUNIS TRIN.) IN THE COASTAL ZONE OF DELAWARE,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W78-06993

ACCELERATION OF DESSICATION AND POPULATION TRAUMA IN SUB-SAHARAN AFRICA,
Indiana Univ., Bloomington. Dept. of Geography.
J. J. Hidore.
Water Resources Bulletin, Vol 13, No 4, p 783-794, August 1977. 6 fig, 23 ref.

Descriptors: *Africa, *Droughts, *Human population, Effects, Starvation, Colonization, Land use, Climatic regime, Precipitation(Atmospheric), Environmental degradation, Animals.

Drought has been a hazard in parts of Africa throughout historic times, and in all likelihood prior to that time as well. In recent years, the hazard of drought has been increasing in frequency and areal extent. A drought that occurred from 1968 to 1974 in Sub-Saharan Africa directly affected millions of people, directly or indirectly costing the lives of tens of thousands. The mechanism involved in the widespread problem is the manner of adjustment of the human population to climatic cycles of short duration in the face of rapidly growing human and animal numbers. A rapid collapse of the grasslands and an expansion of the Sahara Desert southward into more humid areas has resulted from the increasing pressure on the land from largely subsistence farming and herding. Present social, economic, and political conditions indicate that the process is going to continue to accelerate, affecting ever-increasing numbers of people in the Sub-Saharan Africa region. (Bell-Cornell)
W78-07036

A MANUAL OF MARSH AND AQUATIC VASCULAR PLANTS OF NORTH CAROLINA WITH HABITAT DATA,
North Carolina Agricultural Experiment Station, Raleigh.
For primary bibliographic entry see Field 2I.
W78-07062

EFFECTS OF GRASS CARP INTRODUCTION ON WATERFOWL HABITAT,
Florida State Game and Fresh Water Fish Commission, Lake Wales.
R. D. Gasaway, and T. F. Drda.
In: Trans. 42nd Wildl. Nat. Res. Conf., March 5-9, 1977, Atlanta, Georgia, p 73-85. 3 fig, 3 tab, 49 ref.

Descriptors: *Wildlife habitat, *Waterfowl, *Florida, Fish, Benthic fauna, *Carp, Submerged plants, Rooted aquatic plants, *Grass carp, *Habitat deterioration, Exotic species, Waterfowl foods.

Four sites in Florida were studied for three years. The first year served as a control (without grass carp), then the sites were stocked with 60 lbs. of grass carp per acre '67 kg/ha). Control exclosures were constructed in each pond. Submerged vegetation was eliminated in three of the four sites. Corresponding reductions in aquatic invertebrate populations, valuable as waterfowl food, also occurred. The quality of waterfowl habitat deteriorated after grass carp introduction in three of the four sites; trends in data indicate that the fourth site would have suffered extreme adverse effects if the study were continued over a longer period of time. (Sühler-Mass)
W78-07068

PHYSICAL MANAGEMENT OF COASTAL FLOOD PLAINS: GUIDELINES FOR HAZARDS AND ECOSYSTEMS MANAGEMENT.
Conservation Foundation, Washington, DC.
Task One Report, Prepared for the Council on Environmental Quality, December, 1977. 179 p, 86 ref.

Descriptors: *Coastal plains, *Conservation, *Water resources development, *Watershed management, Wetlands, Coastal engineering, Beaches, Dunes, Natural resources, Developed waters, Land management, Marsh management, Development guidelines, Conservation guidelines.

Focusing primarily on water systems and water-related aspects of the shoreline, development and conservation guidelines are developed for nine generalized 'places of concern.' All nine are distinguishable natural featurs of the coastal zone: (1) coastal watersheds, (2) shoreland water systems, (3) coastal floodlands, (4) saltwater wetlands, (5) bluffs, (6) dunes, (7) beaches, (8) basin floors, and (9) coastal waters. In each subsection are discussed, in sequence: characteristics and boundaries, ecological functions, and conservation guidelines and restoration techniques. The subsections are illustrated with examples that augment the text or illustrate special technical issues or processes. (Steiner-Mass)
W78-07077

ECONOMIC IMPLICATIONS OF ENVIRONMENTAL LEGISLATION FOR WETLANDS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6E.
W78-07080

ABUNDANCE AND PRODUCTION OF MACROINVERTEBRATES FROM NATURAL AND ARTIFICIALLY ESTABLISHED SALT MARSHES IN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 2L.
W78-07084

REVIEW OF ENVIRONMENTAL ISSUES OF TRANSPORTATION OF ALASKAN NORTH SLOPE CRUDE OIL,
MITRE Corp., McLean, VA. METREK Div.
R. D. Brown, and R. M. Helfand.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 088, Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-600/7-77-046, May 1977. 123 p, 19 fig, 26 tab, 84 ref. 68-01-3188.

Descriptors: *Environmental engineering, *Environmental effects, *Oil transportation, Air pollution, Water quality, Oil spills, Alaska, *Crude oil.

A summary of information on transportation of Alaskan North Slope crude oil to U.S. markets focuses upon various factors contributing to the need for transporting the crude to areas outside of the West Coast; various alternatives proposed to distribute the excess oil; environmental issues related to such distribution; and the research and development needs in areas where data are incomplete with respect to environmental issues. Proposals for the eastward transport of crude oil in excess of West Coast demand are: (1) Canadian and U.S. pipelines to carry crude to Northern Tier States which face a decline in Canadian exports; (2) pipelines from California to midwestern states; (3) tanker traffic through a canal in Central America or around Cape Horn; and (4) exchange of oil with foreign countries. Environmental issues center on effects on air and water quality. Air pollution resulting from offloading, venting, purging, ballasting, and oil storage may require stringent mitigating measures or emissions tradeoffs. The water pollution level is dependent upon the risk of oil spills and probable oil spill trajectory associated with a particular alternative. Information is needed on: (1) how present decisions regarding pipeline routes may preclude future flexibility in meeting unanticipated supply and demand patterns; (2) how decisions related to the distribution of natural gas supplies affect the movement of crude oil; (3) the resolution of localized supply issues; (4) the need for well-documented air quality models describing impacts of marine oil terminals; (5) the development of a regulated West coast vessel traffic control system; and (6) how present decisions requiring measures to mitigate air impacts may shape future ventures. (Seip-IPA)
W78-07121

ENVIRONMENTAL ORIENTATIONS: CONTENT AND SOCIAL CLASS CORRELATES,
Iowa State Univ., Ames. Dept. of Sociology.
For primary bibliographic entry see Field 6B.
W78-07125

ENVIRONMENTAL IMPACT OF LAND USE ON WATER QUALITY (PROGRESS REPORT), BLACK CREEK PROJECT, ALLEN COUNTY, INDIANA,
Allen County Soil and Water Conservation District, Fort Wayne, IN.
J. Lake, and J. Morrison.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-270 963, Price codes: A04 in Paper copy, A01 in Microfiche. 1976. 53 p, 1 fig, 10 tab. EPA G005103.

Descriptors: *Water quality, *Environmental effects, *Land use, Planning, Sediment control, Agricultural chemicals, Sediment transport, Economics, Social aspects, *Indiana, Agricultural pollutants, *Black Creek Project(Ind).

The status of the Black Creek sediment control project, designed to determine the environmental impact of land use on water quality, is updated. The project is directed toward a determination of the role that agricultural pollutants play in the degradation of water quality in the Maumee River Basin and ultimately in Lake Erie. Topics include: (1) land treatment in Black Creek watershed - 1976 progress; (2) planning and application - changes in philosophy; (3) simulated rainfall status report; (4) conservation tillage trials; (5) nutrient transport during 1975; (6) sediment basins and channel stability studies; (7) filtering capacity of biota; (8) data acquisition processing and simulation; and (9) economic and social aspects. (Seip-IPA)
W78-07131

HABITAT DEVELOPMENT ASPECTS OF THE DREDGED MATERIAL RESEARCH PROGRAM,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
H. K. Smith.
In: Trans. 42nd Wildlife Natural Resources Conference, March 5-9, 1977, p 93-101, Atlanta, Georgia. 1 fig, 1 tab.

Descriptors: *Spoil banks, *Dredging, *Habitats, Coastal marshes, Wetlands, Wildlife, Marshes, Waste disposal, *Marsh development, *Dredged material research program, Spoil islands, Aquatic habitat development.

Habitat development using dredged materials offers an alternate disposal method which could, with careful implementation, significantly increase the extent of wetland and wildlife resources in many parts of the United States. Marsh development has received more attention than other alternatives, and techniques have been developed to enable careful planning, design, and propagation of these systems. Terrestrial habitat development consists primarily of estiblished wildlife management and soil reclamation procedures. Development of aquatic habitats on dredged materials appears to offer significant potential for the cretion of highly productive biological communities. Wildlife use and vegetative succession on dredged-material islands are currently being studied. (Stihler-Mass)
W78-07158

WATERFOWL POPULATIONS AS RELATED TO HABITAT CHANGES IN BOG WETLANDS OF THE MOOSEHORN NATIONAL WILDLIFE REFUGE,
Maine Cooperative Wildlife Research Unit, Orono.
For primary bibliographic entry see Field 4A.
W78-07164

7. RESOURCES DATA

7A. Network Design

CHICAGO AREA PROGRAM: A MAJOR NEW ATMOSPHERIC EFFORT,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 2B.
W78-06885

7B. Data Acquisition

PASSIVE MICROWAVE MAPPING OF ICE THICKNESS,
Ohio State Univ., Columbus. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 2C.
W78-06728

SNOW BACKSCATTER IN THE 1-8 GHZ REGION,
Kansas Univ./Center for Research, Inc., Lawrence. Remote Sensing Lab.
For primary bibliographic entry see Field 2C.
W78-06731

THE USE OF LANDSAT DIGITAL DATA AND COMPUTER-IMPLEMENTED TECHNIQUES FOR AN AGRICULTURAL APPLICATION,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
A. T. Joyce, and R. H. Griffin, II.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA RP-1016, Price codes: A04 in paper copy, A01 in microfiche. Report No NASA RP-1016, 1978. 42 p, 9 fig, 6 tab, 10 ref, 3 append. 177-52-89-00-72.

Descriptors: *Satellites(Artificial), Data collections, Data transmission, Computer programs, Soil investigations, Soil classification, *Mississippi, Data processing, Agriculture, Estimating, Mapping, Crops, Wildlife, Reforestation, Sites, *LANDSAT, *Washington County(MS).

Agricultural application of a resource inventory system that combines Landsat-acquired data and soils information is described. The system was developed to aid county agents in routine work, to assess overall agricultural potential of a region, and to estimate upcoming harvest for major crops. The demonstration area was Washington County, Mississippi. The data processing flow involves: installing and operating the image display device; performing classification of Landsat raw data; performing rectification of information; mapmaking; applying the information (for acreage compilation, change detection, spatial analysis, and theme inventory); building the data base; digitizing other information (on soils, slope, elevation, rainfall, and accessibility); and making applications of the data base and materials to estimate crop production, assess wildlife habitat, inventory reforestation needs, and select sites for various projects. The results of the application are shown in production estimates for cotton and soybeans in the areas surveyed. Examples of output products in both line printer and map formats are included, and a product adequacy assessment is made. The appendices contain data forms, coding diagram and density plots, and computer requirements. (Wares-IPA)
W78-06767

RED RIVER CHLORIDE REMOTE SENSING STUDY: FINAL REPORT.
Army Engineer District, Tulsa, OK.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-11503, Price codes: A03 in paper copy, A01 in microfiche. Final Report, December 31, 1975. 47 p, 39 fig, 1 tab. NASA SR/T W-13,557.

Descriptors: *Remote sensing, *Aerial photography, *Radar, *Hydrogeology, *Saline water, *Water pollution, Texas, Oklahoma, Rivers, *Chlorides, *Red River(Tex-Okla), *Army Mohawk Group, *Saline river pollution, *Aerial sensing, Side looking radar, Infrared thermal imagery.

The results of a remote sensing program, conducted to augment the hydro-geologic investigation of a natural saline pollution problem that ex-

ists in the Red River (Texas and Oklahoma) and in its principal tributaries, are reported. The mission was flown for Tulsa District by the Army Mohawk Group out of Fort Huachuca, Arizona in July, 1973. The project was partially funded by NASA, with the concurrent goal of testing and evaluating remote sensing application to the District's mission according to the capabilities of Mohawk OV-1. The Program product consists of side looking radar, infrared thermal imagery, and color photography, with a few examples of black and white panoramic photos. The study area was explored by ground methods, and field data collections were also made. Analysis of both remote sensing and ground data had yielded a comprehensive picture of the hydro-geologic conditions. Examples of the remote sensing products acquired, their interpretation, and their use techniques are included. (Seip-IPA)
W78-06768

DIGITAL COMPUTER PROCESSING OF LANDSAT DATA FOR NORTH ALABAMA,
Computer Sciences Corp., Huntsville, AL.
For primary bibliographic entry see Field 7C.
W78-06770

REMARKS ON THE DETERMINATION OF THE UNSATURATED HYDRAULIC CONDUCTIVITY BASED ON FIELD MEASUREMENTS, (IN GERMAN),
For primary bibliographic entry see Field 2G.
W78-06774

THE UTILITY OF SKYLAB PHOTO-INTERPRETED EARTH RESOURCES DATA IN STUDIES OF MARINE GEOLOGY AND COASTAL PROCESSES IN PUERTO RICO AND THE VIRGIN ISLANDS,
Geological Survey, San Juan, PR.
For primary bibliographic entry see Field 5B.
W78-06867

GEOLOGICAL APPLICATIONS OF NIMBUS RADIATION DATA IN THE MIDDLE EAST,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
L. J. Allison.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-22584, Price codes: A05 in paper copy, A01 in microfiche. NASA Technical Note D-8469, April 1977. 82 p, 59 fig, 4 tab, 55 ref.

Descriptors: *Geologic investigations, *Satellites(Artificial), *Geological surveys, Water resources, *Geologic formations, Remote sensing, Data collections, Deserts, Geologic mapping, Geology, Limestones, Dolomite, *Nimbus satellite applications, *Egypt, *Middle Eastern deserts, *Ground radiation characteristics, *Saudi Arabia, *Nile Valley, Microwave radiation technique, Electrically scanning microwave radiometer, Temperature-humidity infrared radiometer.

Large plateaus of Eocene limestone and exposed limestone escarpments in Egypt and Saudi Arabia, respectively, were indicated by cool brightness temperatures (T sub B) (less than 240 to 265 K) recorded by the Nimbus-5 electrically scanning microwave radiometer (ESMR), over a 2-year period. Nubian sandstone, desert eolian sand, and igneous-metamorphic rock of the Pliocene, Miocene, Oligocene, and Cretaceous periods were differentiated from these limestone areas by warm T sub B values (more than 265 to 300 K). The brightness temperature differences are results of seasonal in-situ ground temperatures and differential emissivity of limestone (0.7) and sand, sandstone, and granite (0.9), whose dielectric constants are (6 to 8.9) and (2.9 and 4.2 to 5.3), respectively, at 19.35 GHz. Cool T sub B values in the form of a 'V' were found oriented N/S over broad areas of the Nile Valley, southward to Lake Nasser and NW/SE from the Kharga Oasis to the Baharia Oasis in the Western Desert of central Egypt. Surface moisture from subsurface leakage from the Aswan Dam and three Western Desert oases could be a secondary cause for this T sub B value drop. Similar cool T sub B values were shown over limestone-dolomitic hills of the Interior Homocline and the Hadramawt Plateau of Saudi Arabia. Nimbus-5 and -6 ESMR T sub B values selectively identified intermediate, dense rock types (limestone versus sandstone/granite) in the Lake Nasser region whose thermal inertia ranged from 0.035 to 0.06 ca/sq cm/degree C/sq root of time in sec. Space albedo was determined from spatially average (1-km resolution) LANDSAT-1, MSS-7(018 to 1.1 micrometer) data, and day-night ground brightness temperature differences from Nimbus-5 temperature-humidity infrared radiometer (THIR) 11 micrometer data (9-km resolution) under clear sky conditions. (Henley-ISWS)
W78-06869

SOIL MOISTURE GROUND TRUTH, STEAMBOAT SPRINGS, COLORADO, SITE, AND WALDEN, COLORADO, SITE, MARCH 8-10, 1976,
Bittinger (M.W.) and Associates, Inc., Fort Collins, CO.
For primary bibliographic entry see Field 2G.
W78-06870

INTERPRETATION OF THE TENSILE STRENGTH OF ICE UNDER TRIAXIAL STRESSES,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-06884

A FILTRATION UNIT FOR USE WITH CONTINUOUS AUTOANALYTICAL SYSTEMS APPLIED TO HIGHLY TURBID WATERS,
Institute for Marine Environmental Research, Plymouth (England).
For primary bibliographic entry see Field 5A.
W78-06894

CONTRIBUTION OF REMOTE SENSING TO HABITAT EVALUATION AND MANAGEMENT IN A HIGHLY ALTERED ECOSYSTEM,
Great Dismal Swamp National Wildlife Refuge, Suffolk, VA.; and Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06935

DRAINAGE MAP OF ARIZONA SHOWING PERENNIAL STREAMS AND SOME IMPORTANT WETLANDS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W78-06950

ELECTRODRIL DEMONSTRATION PROGRAM SHOWS PROMISE,
General Electric Co., Houston, TX.
For primary bibliographic entry see Field 8C.
W78-06961

APPLICATION OF BOREHOLE GEOPHYSICS TO SELECTION OF POTENTIAL SITES FOR DEEP-WELL DISPOSAL OF LIQUID WASTES,
For primary bibliographic entry see Field 5E.
W78-06972

SATELLITE REMOTE SENSING STUDY OF THE TRANS-BOUNDARY MOVEMENT OF POLLUTANTS,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 5A
W78-06979

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS,
Ecosystems International, Inc., Gambrille, Md
For primary bibliographic entry see Field 2A
W78-07013

COMPARISON OF TWO METHODS USED BY DIVERS FOR SAMPLING BENTHIC INVERTEBRATES IN DEEP RIVERS,
Maine Univ. at Orono. Dept. of Entomology
C. F. Rabeni, and K. E. Gibbs.
Journal of the Fisheries Research Board of Canada, Vol 35, p 332-336, 1978. 1 fig, 2 tab, 10 ref.

Descriptors: *Invertebrates, *Sampling, *Bottom sampling, *On-site data collections, *Benthos, *Benthic fauna, *Water quality, *Artificial substrates, *Bottom sediments, Rivers, Animal groupings, *Hess sampler.

A modified Hess sampler was developed to estimate standing crop and was compared with rock-filled basket samplers. The baskets, although biased for some invertebrates, consistently collected samplers. The baskets, although biased for some invertebrates, consistently collected more individuals and taxa. Both methods showed high efficiency as measured by the coefficient of variation, which generally decreased with increasing pollution. The relative proportions of each invertebrate group collected by each method were similar in many instances and each method was shown to be appropriate in deepwater situations, depending upon the goal of the study. (Deal - EIS)
W78-07025

THE RAIN PARAMETER DIAGRAM: METHODS AND APPLICATIONS,
Clemson Univ., SC. Dept. of Physics and Astronomy.
For primary bibliographic entry see Field 2B.
W78-07106

REMOTE SENSING DETECTS GROUNDWATER IN ENGLAND,
Institute of Hydrology, Wallingford (England).
A. G. P. Debney.
Water and Sewage Works, Vol. 125, No. 4, p 32-34, April 1978. 3 fig, 8 ref.

Descriptors: *Remote sensing, *Groundwater, *Aircraft, Infrared radiation, Springs, Seepage, Aquifers, Coasts, Shores, Lakes, Rivers, Discharge(Water), Water temperature, *England.

In England, remote sensing has been used successfully to detect aquifers and to determine the presence of groundwater. Successful detection has been achieved only where groundwater emerges from an aquifer to the surface. Thermal scanners operating in the middle infrared wavebands at 3 to 5 micrometers and 8 to 14 micrometers sense temperature differences between spring water and the surrounding water body. Remote sensing of groundwater is not yet a routine occurrence, and it probably will be some time before river surveys are used extensively in hydrogeological mapping. In the future, better ground resolution from satellites would promote this application, but the detection of groundwater bodies is still a long way off. (Sims-ISWS)
W78-07112

SCHEDULING OF NON-STATIONARY HOURLY PRECIPITATION,
Iowa Univ., Iowa City. Inst. of Hydrological Research.
For primary bibliographic entry see Field 2B.
W78-07124

APPLICATION OF LANDSAT SYSTEM FOR IMPROVING METHODOLOGY FOR INVENTORY AND CLASSIFICATION OF WETLANDS,
Fish and Wildlife Service, Jamestown, ND. Northern Prairie Wildlife Research Center.
D. S. Gilmer.
Available from the National Technical Information Service, Springfield, VA 22161 as N77-21503, Price codes: A02 in paper copy, A01 in microfiche. Prepared for NASA Goddard Space Flight Center, Greenbelt, MD., April, 1977. 6 p, 2 fig, 2 ref.

Descriptors: *Ponds, *Surveys, *Remote sensing, Wetlands, Aerial photography, Water holes, Data collections, Satellites(Artificial), Analytical techniques, Sampling, Waterfowl, *North Dakota, *Stratum 46(ND), *LANDSAT, Breeding bird survey.

This project was an analysis of both LANDSAT and aircraft MSS data in a doubling sampling experiment designed to provide an estimate of the total number of water bodies within a 36,876 sq km area (Stratum 46, U.S. Fish and Wildlife Service Waterfowl Breeding Ground Survey) in southeastern North Dakota. Data collection involved the recording of aircraft MSS data in near synchronism with overpasses made by LANDSAT. LANDSAT provided an overall view of the entire stratum, whereas the aircraft data was obtained on a sampling basis. Standard statistical procedures were used to adjust the LANDSAT pond counts to actual pond numbers based on regression relationships established between the two sampling methods. Using the LANDSAT pond data the corrected pond numbers for Stratum 46 would be 168,813 (May) and 155,565 (July). These figures are 108 and 97 percent, respectively, of FWS pond number estimates which were based upon visual observations by low-flying aircraft. (Steiner-Mass)
W78-07143

USE OF LANDSAT DATA TO ASSESS WATERFOWL HABITAT QUALITY,
Environmental Research Inst. of Michigan, Ann Arbor.
J. E. Colwell, D. S. Gilmer, E. A. Work, Jr., D. L. Rebel, and N. E. G. Roller.
Environmental Research Institute of Michigan, Ann Arbor, January, 1978. 83 p, 28 fig, 6 tab, 1 append, 34 ref.

Descriptors: *Remote sensing, *Wetlands, *Ponds, *Wildlife management, *Waterfowl, *Reproduction, *Marshes, Freshwater marshes, Mapping, Census, Wildlife habitats, Satellites(Artificial), Productivity, Breeding, Brood stock, North Dakota, Landsat, Waterfowl habitat.

The feasibility of using Landsat data is examined for (1) the analysis of annual waterfowl production by monitoring the number of breeding and brood ponds that are present, and (2) the ability to assess waterfowl habitat based on various relationships between ponds and surrounding upland terrain types. A large coarse Landsat census can improve the estimate of the number of ponds in a population with respect to an accurate small sample done by low-flying aircraft. One reason is the large semi-random variability in pond area per small sample unit. In a multitemporal Landsat classification map, marsh categories were reasonably well recognized, although there was some misclassification between shallow and deep marsh. Bare soil was generally well recognized as were the other upland terrain classes. Landsat data may also determine waterfowl habitat quality, as related to pond and terrain conditions. A discussion of Landsat determination of pond area is included in an appendix. Some effects of size and shape are also indicated. (Steiner-Mass)
W78-07147

A TECHNIQUE FOR THE DETERMINATION OF LOUISIANA MARSH SALINITY ZONES FROM VEGETATION MAPPED BY MULTISPECTRAL SCANNER DATA: A COMPARISON OF SATELLITE AND AIRCRAFT DATA,
National Aeronautics and Space Administration, Houston, TX.
M. K. Butera.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA THX-58203, Price codes: A04 in paper copy, A01 in microfiche. NASA Technical Memorandum 58203, August, 1977. 50 p, 12 fig, 9 tab, 19 ref.

Descriptors: *Marsh plants, *Louisiana, *Remote sensing, *Aerial photography, *Salinity, *Bioindicators, Wetlands, Natural resources, Marshes, Infrared radiation, Coastal marshes, Vegetation establishment, Distribution pattern, Salt marshes, Zoning, Mapping, Biogeography, Photogrammetry, LANDSAT, Pattern recognition, Salinity zones.

Vegetation in selected study areas on the Louisiana coast were mapped using low-altitude aircraft and satellite (LANDSAT) multispectral scanner data. Fresh, brackish, and saline marshes were then determined from the remotely sensed presence of dominant indicator plant associations. Such vegetational classifications were achieved from data processed through a standard pattern-recognition computer program. The marsh salinity zone maps from the aircraft and satellite data compared favorably within the broad salinity regimes. The salinity zone boundaries determined by remote sensing compared favorably with those interpolated from line-transect field observations from an earlier year. The advantage of the remotely sensed determination of zones is that it offers a greater confidence in product accuracy because of total area coverage with remotely sensed data can be used not only to determine salinity zones but also to derive probability and wildlife habitat maps for management practices and to detect changes. (Steiner-Mass)
W78-07148

APPLICATION OF LANDSAT DATA TO WETLAND STUDY AND LAND USE CLASSIFICATION IN WEST TENNESSEE,
Tennessee Univ. Space Inst., Tullahoma. Remote Sensing Div.
N. L. Jones, and F. Shahrokhi.
In: Proceedings of the Eleventh International Symposium on the Remote Sensing of the Environment, April 25-29, 1977, p 609-613. 3 fig, 1 tab.

Descriptors: *Wetlands, *Tennessee, *Remote sensing, *Land classification, Surveys, Census, Aerial photography, Mapping, Marsh management, Satellites(Artificial), Earth-water interfaces, Land use, Distribution patterns, Photogrammetry, Terrain analysis, Obion-Forked Deer River Basin(Tenn), LANDSAT.

The objective of this study was to demonstrate the application and utilization of LANDSAT data for determing land use of selected watershed areas, concentrating on the determination of wetland boundaries. Using densitometric methods on each of LANDSAT bands 4, 5, and 6, it was determined that wetland boundaries could be easily separated from forest and agricultural lands on band 6. However, urban areas could not be distinguished from wetland areas with this method. Therefore, urban areas as well as wetland boundaries were enhanced by using a multispectral additive color viewer. Mapping and classification techniques were used to determine the accuracy of LANDSAT and NASA high altitude imagery as compared to low altitude control data. LANDSAT can be used as well as high altitude photography for broad Level I classifications burt with a lesser degree of accuracy. High altitude photography has comparable accuracy with low altitude imagery, but does not provide the additional detail of Level II classification. LANDSAT data can be used effectively to determine wetland boundaries and to periodically measure remaining acreages, types of wetlands, and drainage trends. (Steiner-Mass)
W78-07152

REMOTE SENSING OF AQUATIC PLANTS,
Army Engineer Waterways Experiment Station, Vicksburg, MS.
K. S. Long, and L. E. Link, Jr.
In: Proceedings of the Eleventh International Symposium on the Remote Sensing of the Environment, April 25-29, 1977, p 817-825. 3 fig, 3 tab, 4 ref.

Descriptors: *Remote sensing, *Aquatic plants, *Distribution patterns, Wetlands, Aerial photography, Rooted aquatic plants, Aquatic environments, Mapping, Census, Aquatic weeds, Army Corps of Engineers.

This is a synopsis of the work being accomplished by the Army Corps of Engineers' Aquatic Plant Control Research Program on the remote sensing of aquatic plants, Initial study efforts have been to determine the feasibility of acquiring information concerning the extent and composition of aquatic plant assemblages by using currently available remote sensing procedures. Included are a literature review to identify current sensing work by other investigators and a discussion on future study efforts to be done in this field. Results to date have indicated that the sensor types best suited for assessment of aquatic environments are color, color infrared, and black-and-white infrared film, which furnish consistently high contrasts between aquatic plants and their surroudings. (Steiner-Mass)
W78-07153

THREE APPROACHES TO THE CLASSIFICATION AND MAPPING OF INLAND WETLANDS,
Geological Survey, Suffolk, VA.
P. T. Gammon, D. Malone, P. D. Brooks, and V. Carter.
In: Proceedings from the Eleventh International Symposium on the Remote Sensing of the Environment, April 25-29, 1977, p 1545-1555. 2 fig, 1 tab, 10 ref.

Descriptors: *Wetlands, *Aerial photography, *Remote sensing, *Mapping, Marshes, Swamps, Freshwater marshes, Marsh management, Census, Virginia, Tennessee, Florida, Marsh plants, Hydrology, Distribution patterns, Wetland classification, Color-infrared photography, Great Dismal Swamp(Virginia).

Three projects representing three approaches to the classification and mapping of inland wetlands are discussed. In the Dismal Swamp project, seasonal, color-infrared aerial photographs and LANDSAT digital data were interpreted for a detailed analysis of the vegetative communities in a large, highly altered wetland. In western Tennessee, seasonal high-altitude color-infrared aerial photographs provided the hydrologic and begetative information needed to map inland wetlands using a classification system developed for the Tennessee Valley Region. In Florida, color-infrared aerial photographs were analyzed to produce wetland maps using existing classification systems to evaluate the information content and mappability of each system. The methods used in each of the three projects can be extended or modified for use in the mapping of inland wetlands in other parts of the United States. (Steiner-Mass)
W78-07154

7C. Evaluation, Processing and Publication

PASSIVE MICROWAVE MAPPING OF ICE THICKNESS,
Ohio State Univ., Columbus. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 2C.
W78-06728

THE USE OF LANDSAT DIGITAL DATA AND COMPUTER-IMPLEMENTED TECHNIQUES FOR AN AGRICULTURAL APPLICATION,
National Aeronautics and Space Administration, Houston, TX. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 7B.
W78-06767

DIGITAL COMPUTER PROCESSING OF LANDSAT DATA FOR NORTH ALABAMA,
Computer Sciences Corp., Huntsville, AL.
A. D. Bond, R. J. Atkinson, M. Lybanon, and H. K. Ramapriyan.
Available from the National Technical Information Service, Springfield, VA 22161 as NASA-2932, Price codes: A13 in paper copy, A01 in microfiche. NASA Contractor Report No 2932, December, 1977. 276 p, 50 fig, 20 tab, 24 ref. NAS8-21805.

Descriptors: *Satellites(Artificial), *Computer programs, *Data processing, *Alabama, *Remote sensing, *Terrain analysis, *Land use, Analytical techniques, Mathematical studies, *LANDSAT, Computer processing, North Alabama, Mathematical analysis.

The computer processing of LANDSAT satellite data is described. The LANDSAT system is discussed in detail; the origin, type, and handling of its generated data are described. Also included are: (1) a description of the analysis procedures, (2) a description of the mathematical techniques, (3) results achieved for LANDSAT coverage of North Alabama, and (4) documentation of the major computer programs used in the analysis. (Seip-IPA)
W78-06770

FLOOD PLAIN INFORMATION: OHIO RIVER, CABEL COUNTY/WAYNE COUNTY, WEST VIRGINIA.
Army Engineer District, Huntington, WV.
For primary bibliographic entry see Field 4A.
W78-06795

FLOOD PLAIN INFORMATION: LITTLE PAPILLION CREEK AND SOUTH BRANCH, VOLUME II, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06796

FLOOD PLAIN INFORMATION: PAPILLION, BIG PAPILLION AND WEST PAPILLION CREEKS, VOLUME I, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06797

FLOOD PLAIN INFORMATION: THOMAS CREEK, COLE CREEK, HELL CREEK, WEST BRANCH PAPILLION CREEK EXTENSION, BIG PAPILLION CREEK EXTENSION, VOL. III, OMAHA METROPOLITAN REGION, NEBRASKA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06798

FLOOD PLAIN INFORMATION: ASHLAND, NEBRASKA, SALT CREEK, WAHOO CREEK.
Army Engineer District, Omaha, NE
For primary bibliographic entry see Field 4A
W78-06799

FLOOD PLAIN INFORMATION: PLATTE RIVER, WARM SLOUGH, TROUBLE CREEK, CENTRAL CITY, NEBRASKA.
Army Engineer District, Omaha, NE
For primary bibliographic entry see Field 4A.
W78-06800

FLOOD PLAIN INFORMATION: GREAT FALLS, MONTANA, VOLUME I - SUN RIVER.
Army Engineer District, Omaha, NE
For primary bibliographic entry see Field 4A.
W78-06801

SPECIAL FLOOD HAZARD INFORMATION REPORT: GALLATIN RIVER, GALLATIN COUNTY, MONTANA.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06802

FLOOD PLAIN INFORMATION: BIG THOMPSON RIVER, LOVELAND TO THE LARIMER-WELD COUNTY LINE, COLORADO, LITTLE THOMPSON RIVER, BOULDER AND LARIMER COUNTIES NEAR BERTHOUD, COLORADO.
Army Engineer District, Omaha, NE.
For primary bibliographic entry see Field 4A.
W78-06803

UTILIZING CLIMATIC DATA TO APPRAISE POTENTIAL WATER YIELDS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2B.
W78-06850

GENERAL PURPOSE COMPUTER-AIDED ANALYSIS AND DESIGN OF TAINTER GATES; VOLUME I, THEORETICAL MANUAL,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 8C.
W78-06874

THE APPLICATION OF THE DIGITAL SIMULATION LANGUAGE PDEL TO SUBSURFACE HYDROLOGY PROBLEMS,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 2F.
W78-06923

COMPUTER MODELING OF CUMULUS CLOUDS DURING PROJECT CLOUD CATCHER,
South Dakota School of Mines and Technology, Rapid City. Inst. of Atmospheric Sciences.
For primary bibliographic entry see Field 3B.
W78-06927

MEAN ANNUAL RUNOFF IN THE UPPER OHIO RIVER BASIN, 1941-70, AND ITS HISTORICAL VARIATION,
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W78-06932

DIRECTORY OF LOCAL ASSISTANCE CENTERS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX),
Geological Survey, Reston, VA. Water Resources Div.
M. D. Edwards.
Open-file report 78-162, 1978, 10 p.

Descriptors: *Data storage and retrieval, *Water resources, *Bibliographies, *Information retrieval, *Information exchange, Methodology, *National Water Data Exchange(NAWDEX), *Directory, Local assistance centers.

The National Water Data Exchange (NAWDEX), managed by the U.S. Geological Survey, has established a network of Local Assistance Centers throughout the United States and Puerto Rico to assist users of water data in identifying and locating the data they need. This up-dated Directory provides the information needed to contact any of the established Centers. (Woodard-USGS)
W78-06940

DRAINAGE MAP OF ARIZONA SHOWING PERENNIAL STREAMS AND SOME IMPORTANT WETLANDS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AZ. Water Resources Div.
D. E. Brown, N. B. Carmony, and R. M. Turner.
Arizona Game and Fish Department Map, 1977. 1 sheet.

Descriptors: *Maps, *Perennial streams, *Wetlands, *Riparian plants, *Arizona, Soil-water-plant relationships, Riparian waters, Management, Ecosystems, *Riparian habitat inventory.

This state map, scale 1:1000,000, of Arizona's perennial streams and wetlands is based on perennial streams rather than riparian vegetation because the streams are of more direct biotic significance and more readily identifiable. The categories described are (1) unregulated perennial streams, (2) regulated perennial streams, and (3) reaches of streams containing only waste-water discharge. The inventory procedures believed to be applicable to other Southwestern States and should prove useful in the delineation of their aquatic, riparian, and wetland biotic resources. (Woodard-USGS)
W78-06950

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 1. NORTHEAST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 767, Price codes: A25 in paper copy, A01 in microfiche. Water-Data Report FL-76-1, September 1977. 587 p, 23 fig, 1 tab, 48 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Northeast Florida.

Water resources data for the 1976 water year in northeast Florida consist of discharge records for 59 streams, stage-only records for 12 streams, elevations for 67 lakes, and daily water level measurements for 113 wells. Water quality data for approximately 220 surface sites and 700 wells are included; as are 2 miscellaneous measurements, 25 crest-stage partial records, and 8 annual maximum flood profile measurements. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)

W78-06952

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 2. SOUTH FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 898, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report FL-76-2, (Two reports), October 1977. 1140 p, 19 fig, 1 tab, 46 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *South Florida.

Water resources data for the 1976 water year in south Florida consist of discharge records for 76 streams, stage-only records for 74 streams, elevations for 21 lakes, and daily water-level measurements for 353 wells. Water quality data for more than 370 surface-water sites and 500 wells are included. Also, included are miscellaneous measurements and crest-stage partial records. The report is contained under two separate covers: Pages 1 to 634 and pages 635 to 1140. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W78-06953

WATER RESOURCES DATA FOR FLORIDA, WATER YEAR 1976--VOLUME 4. NORTHWEST FLORIDA.
Geological Survey, Tallahassee, FL. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 768, Price codes: A22 in paper copy, A01 in microfiche. Water-Data Report FL-76-4, September 1977. 523 p, 27 fig, 1 tab, 48 ref.

Descriptors: *Florida, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, *Northwest Florida.

Water resources data for the 1976 water year in northwest Florida consist of discharge records for 84 streams, elevations for 27 lakes, daily water level measurements for 110 wells and water-quality data for approximately 220 surface sites and 170 wells. Miscellaneous measurements and crest-stage partial records are included. These data represent the National Water Data System records collected by the U.S. Geological Survey and cooperating local, State and Federal agencies in Florida. (Woodard-USGS)
W78-06954

INVENTORY OF RIPARIAN HABITATS,
Arizona Game and Fish Dept., Phoenix; and Geological Survey, Tucson, AR. Water Resources Div.
For primary bibliographic entry see Field 4A.
W78-06955

MISSISSIPPI FLORA. IV. DICOTYLEDON FAMILIES WITH AQUATIC OR WETLAND SPECIES,
Georgia Univ., Athens. Dept. of Botany.
For primary bibliographic entry see Field 2I.
W78-06985

THE APPLICATION OF REMOTE SENSING TO THE DEVELOPMENT AND FORMULATION OF HYDROLOGIC PLANNING MODELS,
Ecosystems International, Inc., Gambrille, Md.
For primary bibliographic entry see Field 2A.
W78-07013

ON SOME MULTI-SITE MULTI-SEASON STREAMFLOW GENERATION MODELS,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2A.
W78-07014

APPLICATION OF THE KALMAN FILTER TO CYCLONE FORECASTING 3. HURRICANE FORECASTING 4. ADDITIONAL TYPHOON FORECASTING,
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 2B.
W78-07015

OPTIMAL FLOOD LEVEE DESIGNS BY DYNAMIC PROGRAMMING,
Water Resources Center, Budapest (Hungary).
For primary bibliographic entry see Field 8B.
W78-07017

PENN STATE RUNOFF MODEL FOR THE ANALYSIS OF TIMING OF SUBWATERSHED RESPONSE TO STORMS,
Weston (Roy F.), Inc., West Chester, PA.
For primary bibliographic entry see Field 5G.
W78-07060

PUBLIC GROUNDWATER SUPPLIES IN EDWARDS COUNTY,
Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 4B.
W78-07085

A NEW MULTIVARIATE GAMMA DISTRIBUTION AND ITS FITTING TO EMPIRICAL STREAMFLOW DATA,
Technical Univ. of Budapest (Hungary). Dept. of Mathematics.
For primary bibliographic entry see Field 2E.
W78-07089

GEOGRAPHIC INVESTIGATIONS OF SNOW AVALANCHES AND MUDFLOWS,
Moscow State Univ., Moscow (USSR), Lab. of Snow Avalanche and Mudflow Problems.
For primary bibliographic entry see Field 2C.
W78-07117

QUALITY ASSURANCE PRACTICES AND PROCEDURES,
Environmental Protection Agency, Chicago, IL. Central Regional Lab.
For primary bibliographic entry see Field 5A.
W78-07129

MONITORING TO DETECT PREVIOUSLY UNRECOGNIZED POLLUTANTS IN SURFACE WATERS, (TEXT AND APPENDIX: ORGANIC ANALYSIS DATA),
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5A.
W78-07130

USE OF LANDSAT DATA TO ASSESS WATERFOWL HABITAT QUALITY,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7B.
W78-07147

STATUS OF THE NATIONAL WETLANDS INVENTORY,
Fish and Wildlife Service, St. Petersburg, FL.
J. A. Montanari, and J. E. Townsend.
In: Trans. 42nd North American Wildlife Nat. Res. Conference, March 5-9, 1977, Atlanta, Georgia, p 66-72. 4 ref.

Descriptors: *Wetlands, United States, Remote sensing, Maps, Data storage and retrieval, Inventory, *National Wetland Inventory, *Classification system, Wetlands protection guidebook.

The National Wetlands Inventory (WI) will produce a universally applicable system of highly accurate wetland information describing all wetlands of the United States. Pre-operational products include a new wetland classification system; a national survey of existing wetland inventories; a national atlas of recent, high altitude aerial photography; a national series of maps delineating ecoregions, physical divisions and land surface form; and a wetland protection guidebook. The operational phase started in October, 1976, and will take three years to complete. It will produce: the NWI map series; a NWI data bank; regional and national summary reports; and an indexed set of work materials and collateral data available for limited use. (Stihler-Mass)
W78-07159

HISTORICAL STREAMFLOW SUMMARY, ALBERTA, TO 1976.
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
1977. 374 p, in English and French.

Descriptors: *Streamflow, *Water resources, *Hydrologic data, *Data collections, Networks, Surface water, Publications, Surveys, *Canada, *Alberta, Historical data, Hydrometric data, Stream discharge, 1976.

This report contains a summary of monthly and annual mean discharges and annual extremes of discharge for rivers in Alberta. The data covers that collected by the Water Survey of Canada up to 1976. The location of the station, drainage area, and whether the flow is natural or regulated are noted. Besides the monthly and annual means, maximum instantaneous discharges, the extreme for the period of record, and the annual total discharge are provided for most stations. (WATDOC)
W78-07165

GLACIER SURVEYS IN BRITISH COLUMBIA - 1972,
Department of the Environment, Ottawa (Ontario). Water Resources Branch.
For primary bibliographic entry see Field 2C.
W78-07169

8. ENGINEERING WORKS

8A. Structures

SAFETY OF DIKES AGAINST STORM TIDES AND WAVE RUNUP,
Department of Coastal Protection, Aurich (West Germany).
For primary bibliographic entry see Field 8B.
W78-06714

GUIDELINES FOR THE DESIGN, CONSTRUCTION AND OPERATION OF TAILING PONDS AND DAMS,
Chafet (Arthur B.) and Associates, Denver, CO.
A. B. Chafet.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 489.

Price codes: A02 in paper copy, A01 in microfiche. January, 1974. 10 p, 44 ref.

Descriptors: *Design, *Design standards, *Design criteria, *Dams, Damsites, Ponds, Construction, Operation and maintenance, Slurries, Soil dynamics, Hydrology, Sites, Pressure, Planning, Tailings, *Tailing ponds.

The basic principles that apply to the design of any water dam are applied as guidelines for the design, construction, and operation of tailing ponds and dams. In some instances, tailing dams must be designed so that: (1) a slurry with a relatively high density and pressure can be maintained; and (2) gravity dewatering can be accomplished through planned leakage. Principles for selection of site and design of facilities are presented, stressing the need to consider abandonment and final stabilization of the pond and dam area at the time of determining original design criteria. Criteria are described for effluent release and treatment; flooding; proximity to public transportation; aesthetics; topography; geology; hydrology; soil parameters; proximity to mines, geologic faults, and outcrops; provision for inspection; construction materials; earthquakes and liquefaction; water drainage and/or diversion; decanting; pumping; waste deposition and disposal; instrumentation; and consultation on design in accordance with ordinances and regulations. (Wares-IPA)
W78-06813

$70 MILLION FOR DAM INSPECTIONS,
For primary bibliographic entry see Field 8G.
W78-06892

BUREAU OF RECLAMATION ECONOMIC ASSESSMENT MODEL (BREAM), TECHNICAL DESCRIPTION.
Mountain West Research, Inc., Tempe, AZ.
For primary bibliographic entry see Field 6A.
W78-06903

CONTROL OF TURBIDITY AT CONSTRUCTION SITES.
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 5G.
W78-06904

GEOTHERMAL WELL COMPLETION,
Texas Univ. at Austin. Center for Energy Studies.
W. E. Boyd, and M. H. Dorfman.
Drilling DCW, Vol. 39, No. 5, p 30-35, March, 1978. 3 fig, 1 tab.

Descriptors: *Geothermal wells, *Geopressured zone, *Deep wells, *Rotary drilling, Well casings, Cement grouting, Logging(Recording), Drilling equipment, Steel pipes, Sands, Gulf Coastal Plain, Perforation.

Geological assessment studies indicate that commercially attractive geothermal-geopressured resources exist in several areas of the Gulf Coast at depths of 12,000 to 20,000 feet. Drilling machinery, tools and equipment for deep wells have now been developed to the extent that they are considered quite satisfactory for the loads, pressures, and temperatures to be encountered in 20,000 feet geothermal wells. The wellhead assembly for a typical completion would be a 20 x 13 3/8 x 9 5/8 x 5 1/2 inch, 15,000 psi working pressure assembly. Casing would consist of three strings to the surface plus liner plus the 5 1/2 inch tubing. Cement bond logs should be run during completion procedures to locate any channels or gaps in the cement sheath. It is currently deemed preferable to perforate casing at a wellbore pressure somewhat less than formation pressure. Perforation should be started from the lowest producing interval and proceed upwards to enable successive runs at shallower depths. A perforated casing gravel-pack can be used to control sand should sand pumping problems arise. (Eberle-NWWA)
W78-06959

8B. Hydraulics

SAFETY OF DIKES AGAINST STORM TIDES AND WAVE RUNUP,
Department of Coastal Protection, Aurich (West Germany).
J. Kramer.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 104, No WW1, Proceedings Paper 13561, p 1-10, February 1978. 10 fig, 1 tab, 6 ref, 1 append.

Descriptors: *Dikes, *Safety, *Shore protection, *Storms, Tides, Surges, Floods, Waves(Water), Coasts, Coastal structures, Embankments, Engineering structures, Damages, Costs, Construction costs, Design, Coastal engineering, *Germany, Wave runup.

The safety of sea dikes against storm tides was related to the geometric and storm parameters. The parameters were the rising storm tide levels, wave runup, over-topping by waves, repair of damages in the period between storm tides, dimensions of the dike, construction and maintenance features, and costs of the various types of dikes. The analysis showed that the safety of dikes has been continuously increased since 1800 and that the most economical form of a new dike is the dike without foreland. (Sims-ISWS)
W78-06714

ICE SHEET LOADS ON MARINA PILES,
Federal Highway Administration, Springfield, IL. Illinois Div.
J. O. Doud.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW1, Proceedings Paper 13522, p 11-17, February 1978. 7 fig, 6 ref, 1 append.

Descriptors: *Ice, *Michigan, *Ice loads, *Piles(Foundations), *Marinas, Instrumentation, On-site investigations, Loads(Forces), Damages, Ice cover, Ice jams, Uplift pressure, Water levels, Water level fluctuations, Recreational facilities.

Two marina piles were instrumented with steel sleeves. The steel sleeves were fixed rigidly to the top of the piles. The bottoms of the sleeves were free to freeze into the ice sheet. Two transducers were placed on each sleeve above the water level to measure the tension and compression forces imposed on the pile by the ice sheet. The testing took place during two winters at Ontonagon, Michigan. It was found that the fluctuating water level in the lake can produce large cycling loads and that the vertical loading rate that an ice sheet imposes on a marina pile can be significant. (Sims-ISWS)
W78-06715

A LOOK AT COASTAL ENGINEERING STUDY IN JAPAN.
Japan Society of Civil Engineers, Tokyo. Committee on Coastal Engineering.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW1, Proceedings Paper 13532, p 19-38, February 1978. 7 fig, 13 ref, 1 append.

Descriptors: *Coastal engineering, *Reviews, *Conferences, *Foreign research, Waves(Water), Ocean waves, Tsunamis, Sediments, Littoral drift, Beaches, Coastal structures, Breakwaters, Offshore platforms, Harbors, Environment, Environmental effects, Water quality, Coasts, Engineering, *Bibliographies, *Japan.

A review was made of 112 papers presented at the 23rd annual National Conference on Coastal Engineering in Japan, 1976. Papers of interest were introduced briefly according to the subjects of waves, coastal sediment problems, and beach process, coastal and offshore structures, tsunami and harbor oscillations, environmental problems, and miscellaneous problems. (Sims-ISWS)
W78-06716

MODIFIED HAZEN-WILLIAMS FORMULA,
Roorkee Univ (India) Dept of Civil Engineering
A. K. Jain, D. M. Mohan, and P. Khanna.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 104, No EE1, Proceedings Paper 13544, p 137-146, February 1978. 2 fig, 6 tab, 12 ref, 2 append

Descriptors: *Pipe flow, *Pipelines, *Hazen-Williams equation, *Model studies, Mathematical models, Fluid friction, Flow friction, Equations, Flow, Pipes, Hydraulic radius, Velocity, Discharge(Water), Hydraulics.

The limitations of Hazen-Williams formula, which is widely used by the environmental engineers, were identified in quantitative terms. An accurate formula, similar to that of Hazen-Williams, based on explicit relationship for pipe diameter and Colebrook's equation for friction factor, was obtained. A nomograph based on the proposed formula was presented in a readily usable form. (Sims-ISWS)
W78-06717

WAVE RUNUP AROUND LARGE CIRCULAR CYLINDER,
British Columbia Univ., Vancouver. Dept. of Civil Engineering.
M. de St. Q. Isaacson.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW1, Proceedings Paper 13563, p 69-79, February 1978. 5 fig, 13 ref, 2 append.

Descriptors: *Waves(Water), *Coastal engineering, *Structures, *Model studies, Mathematical models, Coastal structures, Offshore platforms, Ocean waves, Laboratory tests, Theoretical analysis, Oceans, Oceanography, Wave runup, Wave theories.

The wave runup around a large circular cylinder was considered. Predictions based on both sinusoidal and cnoidal wave diffraction theories were summarized and compared with experimental data obtained under conditions close to the shallow water range. The cnoidal theory was found to predict the measured runup profiles more closely than does the linear theory, although the measured maximum runups were still significantly greater than either prediction. (Sims-ISWS)
W78-06718

APPROXIMATE METHOD FOR COMPUTING BACKWATER PROFILES IN CORRUGATED METAL PIPES,
Federal Highway Administration, Washington, DC. Hydraulic Research.
P. N. Zelensky.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 915. Price codes: A04 in paper copy, A01 in microfiche. Report No FHWA-RD-76-42, April 1976. 45 p, 14 fig, 3 tab, 14 ref, 2 append.

Descriptors: *Backwater, *Flow profiles, *Culverts, *Pipe flow, *Methodology, Specific head, Hydraulics, Subcritical flow, Slopes, *Corrugated metal pipes, Drainage structures.

Corrugated metal pipes often are used in the construction of highways as drainage structures such as culverts and storm drains. Subcritical backwater curve M2 occurs in a long conduit on a mild slope, terminating abruptly into an enlarged channel cross section. Charts and tables were

presented for certain range of discharge, pipe slope, and relative flow depth. These data can be used in determining the depth of flow, velocity head, and specific head at various points along the backwater curve. The effects of flow parameter variations on the shape and extent of the backwater profile can be assessed. (Singh-ISWS)
W78-06722

HIGHWAYS IN THE RIVER ENVIRONMENT--HYDRAULIC AND ENVIRONMENTAL DESIGN CONSIDERATIONS (TRAINING AND DESIGN MANUAL),
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
E. V. Richardson, D. B. Simons, S. Karaki, K. Mahmood, and M. A. Stevens.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 090, Price codes: A21 in paper copy, A01 in microfiche. Report FHWA-NHI-76-N005, May 1975. 475 p, 159 fig, 31 tab, 113 ref, 3 append. DOT-FH-11-8101.

Descriptors: *Rivers, *Highways, *Hydraulics, *Design, Environment, Flow, Publications, Open channel flow, Unsteady flow, Steady flow, Channel flow, Alluvial channels, Sediments, Sediment transport, Geomorphology, Bank stability, Bank protection, Riprap, Scour, Meanders, River systems.

Through a coordinated effort between the Federal Highway Administration and Colorado State University, a training course was developed (1) to provide training in the practical application of the concepts of open channel flow, fluvial geomorphology, and river mechanics to the planning, location, design, construction, maintenance and operation of highways; and (2) to enable the participants to apply these concepts to environmental problems associated with highway crossings and encroachments. This two-week course was oriented to graduate engineers who have had training in basic hydraulics. This 'Training and Design Manual' was developed to serve as a text for the course. The manual had eight chapters which were titled: Introduction; Open Channel Flow; Fundamentals of Fluvial Geomorphology; River Mechanics; River Stabilization, Bank Protection and Scour; Needs and Sources for Data; and Hydraulic and Environmental Considerations of Highway River Crossings and Encroachments. (Sims-ISWS)
W78-06730

GUIDELINES FOR THE DESIGN, CONSTRUCTION AND OPERATION OF TAILING PONDS AND DAMS,
Chafet (Arthur B.) and Associates, Denver, CO.
For primary bibliographic entry see Field 8A.
W78-06813

GENERAL PURPOSE COMPUTER-AIDED ANALYSIS AND DESIGN OF TAINTER GATES; VOLUME I, THEORETICAL MANUAL,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
For primary bibliographic entry see Field 8C.
W78-06874

A DISTRIBUTED KINEMATIC MODEL OF UPLAND WATERSHEDS,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 4D.
W78-06876

MODULATION OF COHERENT MICROWAVE BACKSCATTER BY SHOALING WAVES,
Naval Research Lab., Washington, DC. Ocean Sciences Div.
For primary bibliographic entry see Field 2L.
W78-06889

ESTIMATING TRANSMISSIVITY AND STORAGE COEFFICIENT FROM ABSTRACTION WELL DATA,
Birmingham Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W78-06897

COMPUTATION OF THE ROUGHNESS OF GRASS COVERS OF DRAINAGE CHANNELS,
V. A. Korneyev, A. F. Dmitriyev, V. A. Pozdin, and P. V. Grindshpun.
Soviet Hydrology: Selected Papers, Vol. 15, No. 2, p 167-168, 1976. 4 fig. Translated from Gidrotekhnika i Melioratsiya, No. 3, p 67-69, 1976.

Descriptors: *Grassed waterways, *Drainage, *Roughness(Hydraulic), *Laboratory tests, Roughness coefficient, Grasses, Flow, Flow friction, Fluid friction, Equations, Data processing, Channels, Channel flow, Hydraulics.

The roughness of the bottom and sides of a channel with a grass cover must differ from that of an earth channel. To determine the range of variation of the roughness coefficient as a function of the depth, velocity, and slope of flow for channels with a grass cover, a grass cover in a laboratory flume was investigated. To simulate the grass cover, grass carpets were used. The roughness coefficients were determined for six different covers of varying length, density, and degree of preservation of the grass cover. Each cover was studied for slopes from 0.0025 to 0.04 and discharges from 5 to 190 liters/sec. It was found that a grass cover offers considerable resistance to water flow in channels. This must be taken into account in planning. The value of the roughness coefficient in channels overgrown with grass depends on the transverse dimensions of the channels and flow velocity. Roughness decreases with increasing velocity. (Sims-ISWS)
W78-06901

IDENTIFICATION OF RELEVANT CRITERIA AND SURVEY OF POTENTIAL APPLICATION SITES FOR ARTIFICIAL HABITAT CREATION, VOLUME II, SURVEY OF POTENTIAL APPLICATION SITUATIONS AND SELECTION AND DESCRIPTION OF OPTIMUM PROJECT AREAS.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 2L.
W78-06902

MODULUS OF SOIL REACTION (E') VALUES FOR BURIED FLEXIBLE PIPE,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8D.
W78-06929

STOCHASTIC ANALYSIS OF PARTICLE MOVEMENT OVER A DUNE BED,
Geological Survey, Bay St. Louis, MS. Water Resources Div.
For primary bibliographic entry see Field 2J.
W78-06948

AN INTRODUCTION TO THE TECHNOLOGY OF SUBSURFACE WASTEWATER INJECTION,
Missouri Univ.-Rolla; and National Water Well Association, Worthington, OH.
For primary bibliographic entry see Field 5E.
W78-06965

GEOTHERMAL RESERVOIR AND WELL TEST ANALYSIS: A LITERATURE SURVEY,
Hawaii Univ.-Hilo Coll., Hilo.
B. Chen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 692, Price codes: A03 in paper copy, A01 in microfiche. Hawaii Geothermal Project Engineering Program Technical Memorandum No 2, September, 1974. 8 fig, 22 ref.

Descriptors: *Geothermal reservoirs, *Well tests, Equations, Permeability, Porosity, Conductivity, Fluid flow, Heat transfer, Viscosity, Pressure, Steam, Thermal water, Mathematics.

Parameters such as formation thickness, permeability, porosity, viscosity, compressibility, thermal conductivity, fluid and rock density, and temperature are crucial in assessing the potential and behavior of a geothermal reservoir. Perhaps even more important are pressure data, which can be used to relate production per unit time to pressure drop and further used in materials-heat balance calculations of geothermal liquid in place. This report deals with the analysis of the temperature, flow, and pressure measurements necessary for reservoir evaluation. Detailed discussion is presented of the equations involved in well interference tests, wellbore storage and skin effects, determination of reservoir boundaries, pressure drawdown and buildup tests, and two phase flow. The assumption of little or no heat transfer in a geothermal reservoir (thus regarding the reservoir as one with isothermal fluid flow) makes petroleum well test analysis techniques applicable with very little modification. (Eberle-NWWA)
W78-06967

OPTIMAL FLOOD LEVEE DESIGNS BY DYNAMIC PROGRAMMING,
Water Resources Center, Budapest (Hungary).
I. Bogardi, A. Casti, J. Casti, and L. Duckstein.
Research Memorandum RM-77-12, International Institute for Applied Systems Analysis, Laxenburg, Austria, March 1977. 13 p, 2 tab, 11 ref.

Descriptors: *Levees, *Design, *Flood protection, *Dynamic programming, *Cost minimization, *Methodology, Optimization, Benefit-risk analysis, Loss minimization, Rivers, Design flood, Flood waves, Stochastic processes, Failure modes, Flood routing, Equations, Mathematical models, Systems analysis.

An economic optimum development of a levee system along a river is investigated and a dynamic programming (DP) approach is used to derive the optima under various conditions. The system consists of a number of levee reaches or stages. A random input of flood wave is regarded at the upstream point of the system. There are two failure modes considered and, consequently, two parameters of the flood wave (state variables) to trigger failure modes in every stage. Stochastic DP is used since the state transition functions (flood routing along the stages) are random functions. Three methods are discussed. In Method I, the expected value of the objective function is taken first, then DP is used as a numerical technique. In Method II, a fixed design flood is chosen as an input under which both least cost and policy are determined. In Method III, the value of the expected optimum objective function is calculated. It is shown that the full power of DP cannot be used if Method I is applied. Future research involves comparing the solutions of the three methods. (Bell-Cornell)
W78-07017

STUDY OF THE INTERMITTENT STREAMFLOW IN AN OPEN CHANNEL,
Gdansk Technical Univ. (Poland).
For primary bibliographic entry see Field 5E.
W78-07053

8C. Hydraulic Machinery

GENERAL PURPOSE COMPUTER-AIDED ANALYSIS AND DESIGN OF TAINTER GATES; VOLUME I, THEORETICAL MANUAL,
Georgia Inst. of Tech., Atlanta. School of Civil Engineering.
L. Z. Emkin.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 854, Price codes: A08 in paper copy, A01 in microfiche. Contract Report K-76-1, August 1976. 161 p, 11 fig, 9 tab, 11 ref, 8 append. DACW39-76-M-0869, DACW39-76-M-2230.

Descriptors: *Radial gates, *Hydraulic structures, *Finite element analysis, *Hoisting machinery, *Structural analysis, *Computer programs, Analytical techniques, Methodology, Mathematics, *Seal friction, Trunnion pin friction.

A method was formulated for analyzing and designing tainter gate hydraulic structures by a general purpose, structural analysis and design computer system. The publication included a discussion of tainter gate design criteria, including the effects of hoisting cables, side seal friction, trunnion pin friction, sideway constraint limit, and their application, followed by the development of a computerized procedure for tainter gate analysis and design. The formulated analysis procedure for the tainter gate involves a superposition of results from a variety of different load cases and even different boundary conditions. The linear combination factors for the superposition are computed by solving highly nonlinear systems of equations. The finite element analysis was used for the design of the skin plate of the tainter gate. (Sinhg-ISWS)
W78-06874

ESTIMATING REVERSIBLE PUMP-TURBINE CHARACTERISTICS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
R. S. Stelzer, and R. N. Walters.
Water Resources Technical Publication, Engineering Monograph No. 39, December 1977. 40 p, 23 fig, 6 tab, 35 ref.

Descriptors: *Pumped storage, *Pump turbines, Powerplants, *Reversible turbines, Francis turbines, Pumps, Power head, Turbine efficiency, Specific speed, Cavitation index, Hydraulic machinery, Design criteria, Flatiron Powerplant(CO), Mt. Elbert Pumped-Storage Powerplant(CO), Grand Coulee Pumping Plant(WA), San Luis Pumping-Generating, Senator Wash Dam(CA).

Guidelines are presented for designers who plan or maintain pump-turbine installations. Data are presented on recent installations of pump-turbines which include figures showing operating characteristics, hydraulic performance, and sizing of the unit. Specific speed, impeller/runner diameter, and the best efficiency head and discharge were selected as the criteria that characterize the unit performance. (Bur Reclam)
W78-06928

ELECTRODRIL DEMONSTRATION PROGRAM SHOWS PROMISE,
General Electric Co., Houston, TX.
B. V. Traynor, Jr.
Oil and Gas Journal, Vol. 76, No. 16, p 108-129, April 17, 1978. 12 fig.

Descriptors: *Drilling, *Downhole motors, *Telemetry, Electric motors, Monitoring, Instrumentation, Prototype testing, Geothermal studies.

General Electric's Electrodril system is based on down-hole electric motor research which began in the late 1950's. A field testing program of the system is not being sponsored by the Geothermal Division as well. The Electrodril is designed as a modular add-on to conventional drilling rigs. Two basic configurations currently exist, a 60-hp motor system designed primarily for use in directional drilling applications, and a 285-hp motor for drilling deep, tough formations. The motor system is combined with a down-hole instrumentation package which provides real-time data acquisition and telemetry of 15 analog plus 11 digital parameters to the surface. System design is considered adequate for depths to 20,000 ft., pressures up to 20,000 psig, and temperatures of as much as 125C. Projected benefits include increased penetration rate over conventional systems, reduced tripping resulting from improved formation sensing and directional control, and greater ability to sense blowout conditions as they ae encountered at the bit face. (Eberle-NWWA)
W78-06961

UPDATE ON GEOTHERMAL DRILLING,
W. A. Glass.
Drilling Contractor, Vol. 34, No. 2, p 81-84, March-April, 1978. 3 tab.

Descriptors: *Geothermal wells, *Drilling, Thermal power, Electric power production, Costs, Economics, Brines, Steam, The Geysers(Calif), Imperial Valley(Calif), *California.

While the cost of geothermal wells is greater than that of oil and gas wells under similar conditions, costs of geothermal wells themselves may vary according to the nature of the thermal resource being tapped. Wells in the Geysers thermal area of California (a dry steam field) are typically in the $1,000,000 range, while wells in the Imperial Valley of Souther California (a hot brine field) generally cost around $550,000. The National Geothermal Energy Program goals of 3,000 megawatts power-on-line by 1985 and 20,000 megawatts by the year 2000 would require an estimated 2,000 new wells by 1985, and additional 6,600 wells by 1990 and 2,000 more wells per year through the year 2000. At present, fewer than one percent of the total energy-development drilling rigs in the U.S. are utilized for geothermal projects. Major environmental, institutional, and legislative barriers need to be removed before thermal energy production can proceed full-scale. (Eberle-NWWA)
W78-06962

COLORADO PUMP TESTS SHOW HOW TO MAKE BIG DOLLAR SAVINGS,
R. Ross.
Irrigation Age, Vol. 12, No. 6, p 8-9+, March, 1978. 2 fig.

Descriptors: *Irrigation operation and maintenance, *Pumping, Energy, Costs, Efficiencies, Electric power costs, Electric power rates, Conservation.

A recent pump testing program in Colorado has demonstrated a huge potential for electrical energy savings in that state if the average efficiency of irrigation pumps could be upgraded. Program researchers have maintained that efficiencies of 65% are readily achievable by proper pump selection and care, and significant number of systems tested were found to perform at this level. However, average efficiencies in approximately 600 systems tested were only about 45% for open discharge systems and 56-60% for sprinklers. Various remedial measures can be taken to improve pump efficiency, such as adjustment of the impeller, replacement of worn parts, proper sizing, improved well construction, and modification of operating procedures. Unfortunately, present electrical rate structures frequently discourage such measures. Net savings in a declining block rate structure, for example, may be to low to offset the capital cost of upgrading the irrigation system, thus the farmer's decision is not to repair the pump. If irrigation power rates were reformulated so that cost to the farmer were closer to the actual average cost per kwh, then the economic incentive to conserve energy would be enhanced. (Eberle-NWWA)
W78-06964

CHARACTERISTICS OF VAPOR FLASHING GEOTHERMAL PLANTS,
Hawaii Univ., Honolulu. Coll. of Engineering.
R. K. Ahluwalia, and J. C. S. Chou.
Available from the National Technical Information Service, Springfield VA 22161 as PB-262 702, Price codes: A04 in paper copy, A01 in microfiche. Hawaii Geothermal Project Engineering Program, Technical Report No 6, November, 1974. 25 fig, 3 tab, 47 ref.

Descriptors: *Geothermal studies, *Thermal power, Electric powerplants, Design, Brines, Steam, Thermal water, Equipment, Pipes, Turbines, Wells, Generators, Water hammer, Corrosion, Flashing, Cavitation, Pressure, Temperature, Sites.

For purposes of thermal power production, the mixture of steam and water from a geothermal well can be transported in a single pipe without problems of water hammer, cavitation, or vibration. The pressure drop of two-phase flow may be determined by using a correlation method developed by Martinelli and Lockhart. When the mixture reaches the generating plant, steam can be separated from water using a cyclone separator. The output and quality of exhaust steam increase with the number of subsequent flashing stages, however, the number of stages may have to be restricted to two for economic reasons. For a typical well, the flow rate decreases as the wellhead pressure increases. The most critical component is the turbine, for which materials must be carefully selected. Steam jet ejectors should be used to handle non-condensable gases when the content is low. For higher content, the use of centrifugal compressors is advantageous. (Eberle-NWWA)
W78-06966

A REVIEW OF PROBLEMS ON SCALING AND CORROSION IN GEOTHERMAL PLANTS,
Hawaii Univ., Honolulu. Coll. of Engineering.
For primary bibliographic entry see Field 8G.
W78-06968

GEOTHERMAL DOWN-WELL PUMPING SYSTEM,
Sperry Research Center, Sudbury, MA.
R. H. Fuller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 857, Price codes: A03 in paper copy, A01 in microfiche. National Science foundation Report No NSF/RA-760342, August, 1976. 30 p, 23 fig, 2 tab, 1 append.

Descriptors: *Geothermal studies, *Pumps, *Heat exchangers, Pump turbines, Brines, Thermal power, Wells, Efficiencies, Temperature.

The Sperry downhole pump obtains its energy to pressurize and pump brine directly from the brine itself. One to two percent of the brine flow is sent down to the pumping unit through a downhole heat exchanger consisting of two annuli formed by the well casing and two concentric lengths of standard oil field tubing. The working fluid flows down the inner annulus and hot brine flows up the outer, thus, heat is transferred across the boiler tube into the working fluid. Working fluid vapor drives a turbine (which in turn drives the pump impeller), is condensed, and is then sent downhole for another cycle. In laboratory tests, such a pump equipped with a 900 gpm impeller had a maximum efficiency of 77 percent at .92 design flow. Field testing has been done at 360 degrees F, 75 degrees below design specifications. Significant efficiency losses under these conditions were noted, thus, an organic vapor is suggested as a working fluid under

such low-temperature conditions. (Eberle-NWWA)
W78-06969

8D. Soil Mechanics

STABILITY CHARTS FOR SIMPLE EARTH SLOPES,
University of Tasmania, Hobart (Australia, Dept. of Civil Engineering.
B. F. Cousins.
Journal of the Geotechnical Engineering Division, American Society of Civil Engineers, Vol. 104, No. GT2, p 267-279, February 1978. 9 fig, 11 ref, 2 append.

Descriptors: *Slopes, *Slope stability, *Effective stress, Safety factors, Stability, Charts, Curves, Pore pressure, Equations, Mathematics, Mathematical studies, Critical circle, Stability analysis, Stability criteria, Stability numbers.

Charts were presented for cohesive-frictonal soil which give safety factors and details of critical slip circles for depth factors of 1, 1.25, and 1.50 as well as toe circles. The charts were drawn for pore pressure ratios of 0, 0.25, and 0.50 and for slopes up to 45 deg. A variation of the friction circle method was used to construct the charts. The format of the charts was similar to Janbu's charts so that the need for so much interpolation, extrapolation, and iteration, a characteristic of earlier charts, has been removed. However, Janbu's method for allowing for pore pressure was found to be unacceptable except for small slope angles and low pore pressure ratios. For high slope angles and pore pressure ratios, Janbu's method gives safety factors that are too high. (Visocky-ISWS)
W78-06719

EROSION RATES OF COHESIVE SOILS,
Nielsen Engineering and Research Inc., Mountain View, CA.
For primary bibliographic entry see Field 2J.
W78-06720

TEST FILLS FOR ROCK-FILL DAMS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
D. P. Hammer, and V. H. Torrey, III.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-035 981, Price codes: A08 in paper copy, A01 in microfiche. Miscellaneous Paper S-73-7, March 1973. 171 p, 61 fig, 12 tab, 3 append.

Descriptors: *Rockfill dams, *On-site tests, *Dam construction, *Arkansas, *California, *Kentucky, *Oregon, *Pennsylvania, *Virginia, Data collections, On-site data collections, On-site investigations, Construction materials, Rocks, Methodology, Soil compaction, Compaction, Mechanical properties, Shales, Limestones, Sandstones, Basalts, Gravels, Gradation.

Data from 14 Corps of Engineers' (CE) rock test fill projects were summarized, and six of these projects were analyzed in detail. Variables most often investigated in the test fills were (1) lift thickness, (2) roller type, (3) number of roller passes, and (4) rock gradation. Measured parameters were (1) compaction, (2) permeability, and (3) grain-size distribution, both before and after compaction. The vibratory roller generally gave the best compaction, but it also caused a substantial amount of surficial breakage for most rock types. It was found in most cases that better results were obtained with a vibratory roller when compacting material with the fines (sizes less than + or - 3 in.) removed. The possibility of using the Los Angeles abrasion test to predict rock breakage was explored. However, no conclusions could be drawn due to the lack of data and to the diversity of testing methods used in the projects studied. Recommended procedures for (1) planning and design, (2) construction, (3) measurements and observations, and (4) evaluation of results of future test fills were given. (Humphreys-ISWS)
W78-06871

$70 MILLION FOR DAM INSPECTIONS,
For primary bibliographic entry see Field 8G.
W78-06892

MODULUS OF SOIL REACTION (E') VALUES FOR BURIED FLEXIBLE PIPE,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
A. K. Howard.
Report REC-ERC-77-1, January 1977. 60 p, 12 fig, 2 tab, 13 ref, 4 append.

Descriptors: Backfills, *Soil mechanics, *Buried pipes, *Flexible pipes, Steel pipes, Deflection, Laboratory tests, Plastic pipes, Cohesionless soils, *Pipes, Pipe bedding, Pipelines, Field tests, *Pipe tests, Bedding materials, Construction methods, Trenches, Compaction, Pipe laying, *Pipe design, Fiberglass reinforced plastic pipe, Reinforced plastic mortar pipe, Thermoplastic pipe, Ductile iron pipe, Iowa formula, Soil-structure interaction, *Modulus of soil reaction.

A table of modulus of soil reaction (E') values for use in the Iowa formula has been empirically developed. Use of the methods and values suggested can reasonably predict the initial (no time effect) deflection of buried flexible pipe under fills up to 15 m (50 ft.). The E' values vary according to the type of soil placed beside the pipe and the degree of compaction. The accuracy of predicted deflections varies according to the degree of compaction. Laboratory soil container tests and data from over 100 field installations were used in the investigation. (Bur Reclam)
W78-06929

8F. Concrete

EVALUATION OF LINER MATERIALS EXPOSED TO LEACHATE: SECOND INTERIM REPORT,
Matrecon, Inc., Oakland, CA.
For primary bibliographic entry see Field 8G.
W78-06766

ASBESTOS-CEMENT PIPES FOR OUTFALL SEWER.
For primary bibliographic entry see Field 5D.
W78-07044

8G. Materials

MODIFIED HAZEN-WILLIAMS FORMULA,
Roorkee Univ. (India). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W78-06717

APPROXIMATE METHOD FOR COMPUTING BACKWATER PROFILES IN CORRUGATED METAL PIPES,
Federal Highway Administration, Washington, DC. Hydraulic Research.
For primary bibliographic entry see Field 8B.
W78-06722

EVALUATION OF LINER MATERIALS EXPOSED TO LEACHATE: SECOND INTERIM REPORT,
Matrecon, Inc., Oakland, CA.
H. E. Haxo, Jr., and R. M. White.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 913, Price codes: A02 in paper copy, A01 in microfiche. Report No EPA - 600/2-76-255, September, 1976. 54 p, 3 fig, 22 tab, append. 68-03-2134.

Descriptors: *Protective linings, *Impervious membranes, *Leachate, *Landfills, *Leakage, *Durability, Polymers, Plastics, Membranes, Asphalts, Cements, Concretes, Testing, Analytical techniques, *Sanitary landfill linings, *Swelling, Polymeric membranes, *Admix liner materials, Chlorinated polyethylene, Chlorosulfonated polyethylene, Polyvinyl chloride, Ethylene propylene rubber, Polyethylene, Butyl rubber, Hydraulic asphalt concrete, Paving asphalt concrete, Soil asphalt, Soil cement, Blown asphalt, Emulsified asphalt.

Information on the first year's exposure of liner materials to sanitary landfill leachate is presented. Descriptions of the monitoring and disassembly of the generators to recover the liner specimens are given. Test results are presented and discussed. A year's exposure did not result in losses of impermeability in any liner. There were losses in the compressive strength of the 4 admix liner materials tested (hydraulic asphalt concrete, paving asphalt concrete, soil asphalt, and soil cement) and some losses in the physical properties of some polymeric membranes. Swelling of most polymeric membranes occurred and the seams of several lost strength. Heat-sealed seams were most durable. Among the polymeric membranes, the crystalline types of polyethylene, polypropylene, and polybutylene sustained the least change during the year; however, these liners (or films) are prone to puncture and tear and are generally difficult to handle in the field. The thermoplastic membranes (chlorinated polyethylene, chlorosulfonated polyethylene (Hypalon), and polyvinyl chloride) tended to swell the most. The vulcanized rubber liner materials, e.g., butyl and ethylene propylene rubber, changed little during the exposure period but had the lowest initial seam strength. Further research and long-range testing are mandated. (Seip-IPA)
W78-06766

TEST FILLS FOR ROCK-FILL DAMS,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Soils and Pavements Lab.
For primary bibliographic entry see Field 8D.
W78-06871

INTERPRETATION OF THE TENSILE STRENGTH OF ICE UNDER TRIAXIAL STRESSES,
Cold Regions Research and Engineering Lab., Hanover, NH.
For primary bibliographic entry see Field 2C.
W78-06884

$70 MILLION FOR DAM INSPECTIONS,
M. J. Bartos, Jr.
Civil Engineering-American Society of Civil Engineers, p 64-68, March 1978. 6 fig.

Descriptors: *Dam failure, *Safety, *Dams, Stability, Maintenance, Maintenance costs, Structures, Engineering structures, Dam design, Inspection, Disasters, Engineering, Civil engineering, Corps of Engineers, Federal laws, Dam inspection, Dam safety, Toccoa Falls Dam(Ga), Non-federal dams.

In 1972, Congress passed the National Dam Inspection Act, requiring the Corps of Engineers to inspect and inventory all dams in the United States. Then in 1976, the Teton Dam in Idaho failed, and the Federal Government began a three-phase study of Federal dam safety. More recently, Toccoa Falls Dam in Georgia failed, prompting Congress to appropriate $15,000,000 for the inspection of 1,800 non-Federal dams by October 1978. The inspections are part of a four-year, $70,000,000 program managed by the Corps to in-

spect 9,000 non-Federal dams. The dams to be inspected were selected because their failures would cause many casualties and/or extensive property damage. For dam safety to become a reality, however, the inspections must be followed by repairs or modifications to dams found deficient. (Sims-ISWS)
W78-06892

ESTIMATING REVERSIBLE PUMP-TURBINE CHARACTERISTICS,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8C.
W78-06928

MODULUS OF SOIL REACTION (E') VALUES FOR BURIED FLEXIBLE PIPE,
Bureau of Reclamation, Denver, CO. Engineering and Research Center.
For primary bibliographic entry see Field 8D.
W78-06929

GEOTHERMAL WELL COMPLETION,
Texas Univ. at Austin. Center for Energy Studies.
For primary bibliographic entry see Field 8A.
W78-06959

HYDROGEN SULFIDE CONTROL,
Gulf South Research Inst., New Iberia, LA.
P. D. May.
Drilling-DCW, Vol. 39, No. 6, p 54-78, April, 1978. 6 fig, 2 tab, 11 ref.

Descriptors: *Drilling fluids, *Hydrogen sulfide, *Corrosion control, *Iron oxides, Laboratory tests, Hydrogen ion concentration, Acidity, Alkalinity.

Hydrogen sulfide is so highly corrosive that a concentration of 50 ppm in drilling mud will cause high-tensile steel to fail within ten minutes. Small concentrations of this gas reduce the life of drill pipes by a factor of 10. This article reports experiments with 'Ironite Sponge' (a patented product consisting mainly of an iron oxide) as an H2S scavenger. High surface area and small particle size make Ironite Sponge much superior to Magnetite which has previously been used as a weighting material in drilling fluids. Laboratory data confirmed field reports of the effectiveness of the Sponge. Experimental results indicate that one lb. of Sponge removes about 0.70 lb. of H2S. Recommended concentrations of the additive are given for various downhole conditions, and a drilling fluid mixture monitoring procedure is outlined at the conclusion of the article. (Eberle-NWWA)
W78-06960

ELECTRODRIL DEMONSTRATION PROGRAM SHOWS PROMISE,
General Electric Co., Houston, TX.
For primary bibliographic entry see Field 8C.
W78-06961

COLORADO PUMP TESTS SHOW HOW TO MAKE BIG DOLLAR SAVINGS,
For primary bibliographic entry see Field 8C.
W78-06964

CHARACTERISTICS OF VAPOR FLASHING GEOTHERMAL PLANTS,
Hawaii Univ., Honolulu. Coll. of Engineering.
For primary bibliographic entry see Field 8C.
W78-06966

GEOTHERMAL RESERVOIR AND WELL TEST ANALYSIS: A LITERATURE SURVEY,
Hawaii Univ.-Hilo Coll., Hilo.
For primary bibliographic entry see Field 8B.
W78-06967

A REVIEW OF PROBLEMS ON SCALING AND CORROSION IN GEOTHERMAL PLANTS,
Hawaii Univ., Honolulu. Coll. of Engineering
A. Bhargava, J. C. S. Chou, and D. H. Kihara.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 708, Price codes: A03 in paper copy, A01 in microfiche. Hawaii Geothermal Project Engineering Program Technical Memorandum No 3, June, 1975. 52 p, 20 fig, 4 tab, 36 ref.

Descriptors: *Geothermal wells, *Scaling, *Chemical precipitation, *Corrosion, Calcium carbonate, Carbon dioxide, Silica, Aqueous solutions, Equilibrium, Hydrogen ion concentration, Chlorides, Hydrogen sulfide, Temperature, Pressure, Brines, Thermal power, Equipment, Equations, Geothermal studies.

Deposition of dissolved solids from aqueous solutions and corrosion of metals are two major problems associated with geothermal power production for which no foolproof remedies have yet been discovered. Scaling is dependent upon various factors. Calcium carbonate deposition is primarily influenced by the amount of carbon dioxide in solution, but is also affected by temperature, pH, and perhaps the presence of the Mg+ + ion. Silica deposition, the more serious and prevalent deposition problem, is a function of temperature, pH, and degree of supersaturation of the solution. Corrosion problems result from the presence of gases such as carbon dioxide and hydrogen sulfide, and of agents such as chloride and sulfide ions. These gases and etching ions attack condensers, turbines, and other exposed power plant components, eventually rendering them useless unless corrosion-resistant materials are used in their manufacture. This report discusses in detail the chemical, physical, and mathematical relationships of geothermal scaling and corrosion, and evaluates the potential of some of the remedies have been proposed. (Eberle-NWWA)
W78-06968

GEOTHERMAL DOWN-WELL PUMPING SYSTEM,
Sperry Research Center, Sudbury, MA.
For primary bibliographic entry see Field 8C.
W78-06969

GROUNDWATER QUALITY AND CORROSION: THE AUSTRALIAN SCENE,
For primary bibliographic entry see Field 5B.
W78-06973

ROTATING DISC SEWAGE TREATMENT SYSTEM,
Dickson Environmental Engineering Ltd., Guildford (England).
For primary bibliographic entry see Field 5D.
W78-07006

VACUUM FILTRATION, WITH PARTICULAR REFERENCE TO OPERATIONAL AND MAINTENANCE PROBLEMS,
For primary bibliographic entry see Field 5D.
W78-07007

SEWER JET CLEANER THAWS WATER MAINS.
Public Works, Vol 108, No 12, p 61, December, 1977.

Descriptors: *Sewerage, *Frozen ground, *Freezing, *Thawing, *Conduits, Water pressure, Operation and maintenance, Water conveyance, Conveyance structures, Steam, Municipal water, Municipal wastes.

Frozen water mains in Janesville, Wisconsin were thawed by jetting water at 42 F through the frozen pipe sections at a hydraulic pressure of 1,000 psi. A total of 8,000 feet of water main was cleared with the sewer cleaning equipment, supplied by Donahue and Associates of Sheboygan, Wisconsin. In sections where pipes, were completely frozen, excavation and cutting of the water main were required to introduce the water nozzle and hose. The nozzle, modified with a three-eights inch hole in the tip, and the hose were driven through the pipes by the backward pressure of the jets. The pressure from the water jets forced the freed ice in the main back to the excavation areas. A total of 300 feet of water main had to be replaced because of freezing-related damage. The water jetting technique cleared an average of 16 ft of ice/hr as opposed to an estimated 1 ft/hr with steam melting. The entire thawing operation required 62 days and 20 employees. (Lisk-FIRL)
W78-07009

LOCATING UNDERGROUND PIPES AT SEWAGE WORKS.
Pipes and Pipelines International, Vol 22, No 5, p 32, October, 1977.

Descriptors: *Surveying instruments, *Mapping, *Measurement, *Pipes, *Underground structures, Data collections, Electric cables, Instrumentation, Analytical techniques, Subsurface investigations, Waste water treatment, Municipal wastes.

Electrolocation Ltd has designed a GPR 404 subsurface survey instrument for locating underground sewage pipes, cables, and drains. The device was used by England's Thames Water Authority to locate underground structures as part of a program to update records at the Hogsmill Sewage Treatment Works. The survey unit detects, traces, and plots the courses and depths of the sub-surface pipes and equipment. The instrument is equipped with aerials for detecting equipment in areas of high interference and locating manhole covers that have become buried. Plots of individual cables can be isolated from other cables that run alongside. The survey unit can be adapted to pick up the electric signals from underground cables, to induce a signal in dead cables or metal pipes, and to follow a probe that is fed through non-metallic conduits. The survey of the Hogsmill treatment plant was conducted as a prelude to future expansion of the 11.5 mgd facility. (Lisk-FIRL)
W78-07031

INFILTRATION-INFLOW SEWER LINE ANALYZER,
For primary bibliographic entry see Field 5A.
W78-07076

DESIGN GUIDE FOR METAL AND NON-METAL TAILINGS DISPOSAL,
Bureau of Mines, Spokane, WA. Spokane Mining Research Center.
For primary bibliographic entry see Field 5E.
W78-07123

8H. Rapid Excavation

THE ENVIRONMENT OF AMCHITKA ISLAND, ALASKA.
Department of Energy, Washington, DC. Div. of Military Application.
For primary bibliographic entry see Field 6G.
W78-06702

8I. Fisheries Engineering

ANESTHETIC AND HANDLING STRESS ON SURVIVAL AND CORTISOL CONCENTRA-

TION IN YEARLING CHINOOK SALMON (ONCORHYNCHUS TSAWYTSCHA),
Oregon Cooperative Fishery Research Univ. Corvallis.
For primary bibliographic entry see Field 5C.
W78-07021

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

ELEVENTH ANNUAL REPORT PROGRAM ACTIVITIES, JULY 1, 1974-JUNE 30, 1975 (MARYLAND WATER RESOURCES RESEARCH CENTER).
Maryland Univ., College Park. Water Resources Research Center.
For primary bibliographic entry see Field 9D.
W78-06804

9D. Grants, Contracts, and Research Act Allotments

ELEVENTH ANNUAL REPORT PROGRAM ACTIVITIES, JULY 1, 1974-JUNE 30, 1975 (MARYLAND WATER RESOURCES RESEARCH CENTER).
Maryland Univ., College Park. Water Resources Research Center.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-281 156, Price codes: A04 in paper copy, A01 in microfiche. (1975). 59 p, 13 fig, 1 tab, 43 ref, 3 append. OWRT A-999-MD(11).

Descriptors: *Maryland, *Water Resources Institute, Waste water treatment, Waste water disposal, Chlorination, Aquatic bacteria, Water quality standards, Urban runoff, Flooding, Heavy metals, Sediments, Copepods, Economic impact, Oysters, Shellfish, Food chains, Estuaries, Tidal marshes, Mathematical models, Convection, Adsorption, Dispersion, Cooling tower, Pollutant identification, *Chlorinated effluents, Flood runoff, Thermal stress, Economic development.

A report by the Center Coordinator presents a brief overview of current and anticipated water problems in Maryland and a short description of current research projects. Project progress reports that fall under the annual allotment program are presented and include: Poultry Processing Plant Waste Water Disposal on Sod (A-013-Md); Fish Avoidance of Chlorinated Effluents (A-022-Md); Diffusion and Adsorption of Pollutants in Soils (A-023-Md); Feasibility of Chlorinating Feedlot Runoff to Meet Bacterial Water Quality Standards (A-024-Md); Flood Runoff from Urban Areas (A-025-Md); Heavy Metals in Chesapeake Bay Sediments (A-026-Md); Adaptation of Copepod Populations to Thermal Stress (A-027-Md); Effects of Economic Development on Water Resources (A-028-Md); and Characteristics of Urban Runoff (Title II, C-5341). Matching fund projects include: Uptake and Biochemical Effects of Heavy Metals in Shellfish (Oysters) (B-017-Md); Biochemical and Nutritional Interactions Between the Oyster (Crassostrea virginica (Gmelin)) and its Environment (B-0180-Md); and The Contributions of Tidal Marshlands to Food Chains in Estuaries (B-019-Md); all three projects have been completed and published. A journal article, 'A Predictor-Corrector Method for Solving the Convection-Dispersion Equation for Adsorption in Porous Media' (Water Resources Research, Vol. 10, No. 5, October 1975, p 1003-1011) is included in its entirety. To date, results of 'The Effects of a Cooling Tower on the Environment' are reported. Sections listing publications, theses, and papers presented and describing training and education aspects of the Program are included. (Seip-IPA)
W78-06804

PACIFIC SOUTHWEST INTER-AGENCY COMMITTEE MINUTES OF THE 77-3 MEETING, 13-14 DECEMBER 1977, LAS VEGAS, NEVADA.
Pacific Southwest Inter-Agency Committee, San Francisco, CA.
For primary bibliographic entry see Field 6E.
W78-06815

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

A LOOK AT COASTAL ENGINEERING STUDY IN JAPAN.
Japan Society of Civil Engineers, Tokyo. Committee on Coastal Engineering.
For primary bibliographic entry see Field 8B.
W78-06716

COOLING TOWERS: A BIBLIOGRAPHY (JUNE 1977 - DECEMBER 1977).
Department of Energy, Oak Ridge, TN. Environmental Sciences Information Center.
For primary bibliographic entry see Field 5G.
W78-06763

THE USE OF BIOLOGICAL INDICATOR ORGANISMS TO MONITOR TRACE METAL POLLUTION IN MARINE AND ESTUARINE ENVIRONMENTS--A REVIEW,
National Environment Protection Board of Sweden, Upsala. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W78-06832

COPPER IN THE SEA - A BIBLIOGRAPHY,
Battelle Pacific Northwest Labs., Sequim, WA. Marine Research Lab.
For primary bibliographic entry see Field 5C.
W78-06865

COPPER.
National Research Council, Washington, DC. Committee on Medical and Biologic Effects of Environmental Pollutants.
For primary bibliographic entry see Field 5B.
W78-06872

DIRECTORY OF LOCAL ASSISTANCE CENTERS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX),
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 07C.
W78-06940

10D. Specialized Information Center Services

DIRECTORY OF LOCAL ASSISTANCE CENTERS OF THE NATIONAL WATER DATA EXCHANGE (NAWDEX),
Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 07C.
W78-06940

STATUS OF THE NATIONAL WETLANDS INVENTORY,
Fish and Wildlife Service, St. Petersburg, FL.
For primary bibliographic entry see Field 07C.
W78-07159

10F. Preparation Of Reviews

COPPER.
National Research Council, Washington, DC. Committee on Medical and Biologic Effects of Environmental Pollutants.
For primary bibliographic entry see Field 05B.
W78-06872

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